



AVANTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

(Approved by A.I.C.T.E., New Delhi, & Permanently Affiliated to J.N.T.U.K., Kakinada)

NAAC B++ Accredited Institute

Cherukupally (Village), Near Tagarapuvalasa Bridge, Vizianagaram -531162.

www.aietta.ac.in, principal@aietta.ac.in

1.1.2 The institution adheres to the Academic calendar including for the conduct of CIE

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ACADEMIC CALENDAR FOR UG AND PG 2021-22

EVENT	I YEAR		II YEAR		III YEAR		IV YEAR		M.TECH			MBA			
	I SEM	II SEM	I SEM	II SEM	I SEM	II SEM	I SEM	II SEM	I SEM	II SEM	III SEM	I SEM	II SEM	III SEM	IV SEM
COMMENCEMENT OF CLASS WORK	22-11-2021	11-04-2022	01-10-2021	28-02-2022	01-10-2021	14-02-2022	01-10-2021	14-02-2022	03-01-2022	23-05-2022	17-08-2020	03-01-2022	23-05-2022	01-11-2021	14-03-2022
UNIT-I INSTRUCTIONS	22-11-2021	11-04-2022	01-10-2021	28-02-2022	01-10-2021	14-02-2022	01-10-2021	14-02-2022	03-01-2022	23-05-2022	01-11-2021	03-01-2022	23-05-2022	01-11-2021	14-03-2022
I MID EXAMINATIONS	17-01-2022	30-05-2022	22-11-2021	18-04-2022	22-11-2021	04-04-2022	22-11-2021	04-04-2022	21-02-2022	11-07-2022	20-12-2021	21-02-2022	11-07-2022	20-12-2021	02-05-2022
UNIT-II INSTRUCTIONS	24-01-2022	06-06-2022	29-11-2021	25-04-2022	29-11-2021	11-04-2022	29-11-2021	11-04-2022	28-02-2022	18-07-2022	27-12-2021	28-02-2022	18-07-2022	27-12-2021	09-05-2022
II MID EXAMINATIONS	14-03-2022	25-07-2022	07-02-2022	13-06-2022	17-01-2022	30-05-2022	17-01-2022	30-05-2022	18-04-2022	12-09-2022	14-02-2022	18-04-2022	12-09-2022	14-02-2022	27-06-2022
PREPARATION & PRACTICALS	21-03-2022	01-08-2022	07-02-2022	20-06-2022	24-01-2022	06-06-2022	24-01-2022	06-06-2022	25-04-2022	19-09-2022	21-02-2022	25-04-2022	19-09-2022	21-02-2022	04-07-2022
END EXAMINATIONS	28-03-2022	08-08-2022	14-02-2022	27-06-2022	31-01-2022	13-06-2022	31-01-2022	13-06-2022	02-05-2022	26-09-2022	28-02-2022	02-05-2022	26-09-2022	28-02-2022	11-07-2022

Principal

Avanthi Institute of Engineering and Technology

AVANTHI INSTITUTE OF ENGG. & TECH
Cherukupally (V), Chittivalasa (SAO)
Bhogapuram (M),
Vizianagaram (Dist.)-531162



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College Academic Calendar for the Academic Year of 2021-22

DATE	EVENTS
01-10-2021	Commencement of Class Work For II,III,IV B.Tech I Semester students
02-10-2021	Gandhi Jayanthi Holiday
01-10-2021 to 20-11-2021	Unit I instructions for II,III,IV B.Tech I Semester students
11-10-2021	Planning to conduct Certificate course programs
13-10-2021 to 17-10-2021	Dussehra Holidodays
19-10-2021	Milad-un-Nabi Holiday
25-10-2021	Planning to organize FDP on Disasters in civil constructions
03-11-2021	Planning to organize FDP on Trending Technologies
04-11-2021	Diwali Holidoday
22-11-2021	Commencement of Class work for I B.Tech I Semester students
22-11-2021	Planning to organize FDP on Advance in Welding & Manufacturing
22-11-2021 to 27-11-2021	Introduction classes for I B.Tech I Semester students
22-11-2021 to 27-11-2021	Mid-I Examinations for II, III and IV B.Tech I Semester students
27-11-2021	Planning to organize FDP on Machine tools
29-11-2021 to 15-01-2022	Unit I instructions for I B.Tech I Semester students
29.11.2021 to 15-01-2022	Unit II Instructions for II, III, IV B.Tech I Semester students
06-12-2021 to 11-12-2021	Planning to conduct Industrial visits
25-12-2021	Christmas Holiday
01-01-2022	New Year Celebrations
03-01-2022	Commencement of class work for I MBA I Semester & I M.Tech I semester students
03-01-2022 to 08-01-2022	Planning to conduct guest lectures
03-01-2022 to 26-02-2022	Unit I Instructions for I MBA I Semester V& I M.Tech I semester students
04-01-2022	Planning to organize FDP on Hands on training on MS-Excel
12-01-2022 to 15-01-2022	Pongal Holidays
17-01-2022 to 22-01-2022	Mid-II Examinations for II, III and IV B.Tech I Semester students, Mid-I Examinations for I B.Tech I Semester students

24-01-2022 to 29-01-2022	Preparation and Practicals for II, III and IV B.Tech I semester students
24-01-2022 to 12-03-2022	Unit-II instructions for I B.Tech I semester students
26-01-2022	Republic Day Holiday
31-01-2022 to 12-02-2022	End examinations for II, III and IV B.Tech I semester students
03-02-2022	Planning to organize FDP on Teaching methodologies
06-02-2021	Fresher's Day Celebrations
14-02-2022	Commencement of class work for II, III and IV B.Tech II semester students
14-02-2022 to -2-04-2022	Unit-I instructions for II, III, IV- B.Tech II semester Students
21-02-2022	Planning to conduct Certificate course programs
21-02-2022	Planning to organize FDP on Advance in casting & Manufacturing
21-02-2022 to -26-02-2022	Mid-I examinations for I MBA I semester & I M.Tech I semester students
28-02-2022 to 23-04-2022	Unit-II instructions for I MBA I semester & I M.Tech I semester students
01 03 2022	Maha Shivaratri Holiday
18-03-2022	Holi Holiday
14-03-2022 to 19-03-2022	Mid-II examinations for I B.Tech I semester students
21-03-2022 to 26-03-2022	Preparation and Practical's for I B.Tech I semester students
28-03-2022 to 09-04-2022	End examinations for I B.Tech I semester Students
02-04-2022	Ugadi Holiday
04-04-2022 to 09-04-2022	MID I Examinations for II, III, IV- B.Tech II semester Students
05-04-2022	Babu Jagjivan Ram Jayanthi Holiday
10-04-2022	Srirama Navami Holiday
11-04-2022	Commencement of class work for I B.Tech II semester students
11-04-2022 to 28-05-2022	Unit-II instructions for II, III, IV- B.Tech II semester Students, Unit-I instructions for I B.Tech II semester Students
14-04-2022	Dr. Ambedkar Jayanthi Holiday
15-04-2022	Good Friday Holiday
18-04-2022	Planning to organize FDP on VLSI design using EDA tools
18-04-2022 to 23-04-2022	Mid-II examinations for I MBA I semester & I M.Tech I semester students
25-04-2022 to 30-04-2022	Planning to conduct Industrial visits
25-04-2022 to 30-04-2022	Preparation and Practical's for I MBA I semester & I M.Tech II semester students
02-05-2022 to 14-05-	End examinations for I MBA I semester & I M.Tech I semester Students

2022	
03-05-2022	Ramzan Holiday
06-05-2022 to 07-05-2022	Planning to organize Youth fest celebrations
16-05-2022 to 21-05-2022	Planning to conduct guest lectures
23-05-2022	Commencement of class work for I MBA II semester & I M.Tech II semester students
23-05-2022 to 16-07-2022	Unit-I instructions for I MBA II semester & I M.Tech II semester students
30-05-2022	Planning to organize FDP on Python programming language and advanced teaching techniques
30-05-2022 to 04-06-2022	MID II Examinations for II, III, IV- B.Tech II semester Students, MID I Examinations for I B.Tech II semester Students
06-06-2022 to 11-06-2022	Preparation and Practical's for II, III and IV B.Tech II semester students
06-06-2022 to 23-07-2022	Unit-II instructions for I B.Tech II semester Students
13-06-2022 to 25-06-2022	End examinations for II, III, IV- B.Tech II semester Students
11-07-2022 to 16-07-2022	MID I Examinations for I MBA II semester & I M.Tech II semester Students
18-07-2022 to 10-09-2022	Unit-II instructions for I MBA II semester & I M.Tech II semester Students
25-07-2022 to 30-07-2022	MID II Examinations for I B.Tech II semester Students
01-08-2022 to 06-08-2022	Preparation and Practical's for I B.Tech II semester students
08-08-2022 to 28-08-2022	End examinations for I B.Tech II semester students
09-08-2022	Moharum Holiday
12-09-2022 to 17-09-2022	MID II Examinations for I MBA II semester & I M.Tech II semester Students
15-08-2022	Independence Day Celebrations
19-08-2022	Sri Krishna Janmashtami Holiday
31-08-2022	Vinayaka Chavithi Holiday
19-09-2022 to 24-09-2022	Preparation and Practical's for I MBA II semester & I M.Tech II semester students
26-09-2022 to 08-10-2022	End examinations for I MBA II semester & I M.Tech II semester students


PRINCIPAL

PRINCIPAL
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Directorate of Academic Planning
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA-533003, Andhra Pradesh, INDIA
(Established by AP Government Act No. 30 of 2008)

Lr. No. JNTUK/DAP/AC/I Year/B. Tech/2021-22

Date: 19-11-2021

Dr. R. Srinivasa Rao,
Director, Academic Planning
JNTUK, Kakinada

To
All the Principals of Affiliated Colleges,
JNTUK, Kakinada.

Academic Calendar of I Year B. Tech for the Academic Year 2021-22

I SEMESTER			
Description	From	To	Weeks
Commencement of Class Work	22.11.2021		
Induction Classes	22.11.2021	27.11.2021	1W
I Unit of Instruction	29.11.2021	15.01.2022	7W
I Mid Examinations	17.01.2022	22.01.2022	1W
II Unit of Instructions	24.01.2022	12.03.2022	7W
II Mid Examinations	14.03.2022	19.03.2022	1W
Preparation & Practicals	21.03.2022	26.03.2022	1W
End Examinations	28.03.2022	09.04.2022	2W
Commencement of II Semester Class Work	11.04.2022		
II SEMESTER			
I Unit of Instructions	11.04.2022	28.05.2022	7W
I Mid Examinations	30.05.2022	04.06.2022	1W
II Unit of Instructions	06.06.2022	23.07.2022	7W
II Mid Examinations	25.07.2022	30.07.2022	1W
Preparation & Practicals	01.08.2022	06.08.2022	1W
End Examinations	08.08.2022	20.08.2022	2W
Commencement of next Year Class Work	22.08.2022		

Note: Calendar is prepared with 8 hrs/day hence 7 weeks per instruction period

R. Srinivasulu
Director Academic Planning
Director
Academic Planning
JNTUK Kakinada

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Directorate of Academic Planning
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KAKINADA-533003, Andhra Pradesh, INDIA
(Established by AP Government Act No. 30 of 2008)

Lr. No. DAP/RAC/ II,III & IV Year /B. Tech/B. Pharmacy/2021

Date 08.10.2021

Dr. R. Srinivasa Rao,
Director, Academic Planning
JNTUK, Kakinada

To
All the Principals of Affiliated Colleges,
JNTUK, Kakinada.

Revised Academic Calendar for II, III, IV Year - B. Tech/B. Pharmacy for the AY 2021-22
(As per G.O. Rt. No. 242, Higher Education (U.E) Dept., dated 13.09.2021)

I SEMESTER			
Description	From	To	Weeks
Commencement of Class Work	01.10.2021		
I Unit of Instruction	01.10.2021	20.11.2021	7W
I Mid Examinations	22.11.2021	27.11.2021	1W
II Unit of Instructions	29.11.2021	15.01.2022	7W
II Mid Examinations	17.01.2022	22.01.2022	1W
Preparation & Practicals	24.01.2022	29.01.2022	1W
End Examinations	31.01.2022	12.02.2022	2W
Commencement of II Semester Class Work	14.02.2022		
II SEMESTER			
I Unit of Instructions	14.02.2022	02.04.2022	7W
I Mid Examinations	04.04.2022	09.04.2022	1W
II Unit of Instructions	11.04.2022	28.05.2022	7W
II Mid Examinations	30.05.2022	04.06.2022	1W
Preparation & Practicals	06.06.2022	11.06.2022	1W
End Examinations	13.06.2022	25.06.2022	2W
Commencement of next Year Class Work			
<i>Note: Calendar is prepared with 8 hrs/day hence 7 weeks per instruction period</i>			

R. Srinivasa Rao
Director Academic Planning
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Academic Planning
JNTUK Kakinada

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Directorate of Academic Planning
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KAKINADA-533003, Andhra Pradesh, INDIA
(Established by AP Government Act No. 30 of 2008)

Lr. No. JNTUK/DAP/AC/M. Tech/M. Pharmacy/I Year/2021-22

Date: 31-12-2021

Dr. KVSG Murali Krishna,
M.E, Ph.D.,
Director, Academic Planning
JNTUK, Kakinada

To
All the Principals of Affiliated Colleges,
JNTUK, Kakinada.

Revised Academic Calendar for I Year M. Tech/M. Pharmacy
Academic year 2021-22

I SEMESTER			
Description	From	To	Weeks
Commencement of Class Work	03.01.2022		
I Unit of Instruction	03.01.2022	26.02.2022	8W
I Mid Examinations	21.02.2022	26.02.2022	
II Unit of Instructions	28.02.2022	23.04.2022	8W
II Mid Examinations	18.04.2022	23.04.2022	
Preparation & Practicals	25.04.2022	30.04.2022	1W
End Examinations	02.05.2022	14.05.2022	2W
Commencement of II Semester Class Work	23.05.2022		
II SEMESTER			
I Unit of Instructions	23.05.2022	16.07.2022	8W
I Mid Examinations	11.07.2022	16.07.2022	
II Unit of Instructions	18.07.2022	10.09.2022	8W
II Mid Examinations	12.09.2022	17.09.2022	
Preparation & Practicals	19.09.2022	24.09.2022	1W
End Examinations	26.09.2022	08.10.2022	2W
Commencement of next Year Class Work	10.10.2022		


31.12.21

Director Academic Planning
Director
Academic Planning
JNTUK Kakinada

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KAKINADA-533003, Andhra Pradesh, INDIA
(Established by AP Government Act No. 30 of 2008)

Lr. No. JNTUK/DAP/AC/II Year/ M. Tech /2021-22

Date: 29-10-2021

Dr. R. Srinivasa Rao,
Director, Academic Planning
JNTUK, Kakinada

To
All the Principals of Affiliated Colleges,
JNTUK, Kakinada.

Academic Calendar for II Year M. Tech Academic Year 2021-22
(As per G.O. Rt. No.242, Higher Education (U.E) Dept., dated 13.09.2021)

I SEMESTER			
Description	From	To	Weeks
Commencement of Class Work & Commencement of Project Work Phase-I	17.08.2020		
I Unit of Instruction	01.11.2021	18.12.2021	7W
I Mid Examinations	20.12.2021	25.12.2021	1W
II Unit of Instructions	27.12.2021	12.02.2022	7W
II Mid Examinations	14.02.2022	19.02.2022	1W
Preparation & Practicals	21.02.2022	26.02.2022	1W
End Examinations	28.02.2022	12.03.2022	2W
Commencement of II Semester Class Work	14.03.2022		
II SEMESTER			
Commencement of Project Work Phase - II	14.03.2022	18.06.2022	14W
Thesis submission duration	20.06.2022	16.07.2022	4W

Note: Calendar is prepared with 8 hrs/day hence 7 weeks per instruction period

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Lr. No. JNTUK/DAP/AC/MBA/MCA/I Year/2021-22

Date: 31-12-2021

Dr. KVSG Murali Krishna,
M.E, Ph.D.,
Director, Academic Planning
JNTUK, Kakinada

To
All the Principals of Affiliated Colleges,
JNTUK, Kakinada.

Revised Academic Calendar for I Year MBA/MCA
Academic year 2021-22

I SEMESTER			
Description	From	To	Weeks
Commencement of Class Work	03.01.2022		
I Unit of Instruction	03.01.2022	26.02.2022	8W
I Mid Examinations	21.02.2022	26.02.2022	
II Unit of Instructions	28.02.2022	23.04.2022	8W
II Mid Examinations	18.04.2022	23.04.2022	
Preparation & Practicals	25.04.2022	30.04.2022	1W
End Examinations	02.05.2022	14.05.2022	2W
Commencement of II Semester Class Work	23.05.2022		
II SEMESTER			
I Unit of Instructions	23.05.2022	16.07.2022	8W
I Mid Examinations	11.07.2022	16.07.2022	
II Unit of Instructions	18.07.2022	10.09.2022	8W
II Mid Examinations	12.09.2022	17.09.2022	
Preparation & Practicals	19.09.2022	24.09.2022	1W
End Examinations	26.09.2022	08.10.2022	2W
Commencement of next Year Class Work	10.10.2022		


31.12.21
Director Academic Planning

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Director
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JNTUK Kakinada



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(Established by AP Government Act No. 30 of 2008)

Lr. No. JNTUK/DAP/AC/II Year/MBA/2021-22

Date: 29-10-2021

Dr. R. Srinivasa Rao,
Director, Academic Planning
JNTUK, Kakinada

To
All the Principals of Affiliated Colleges,
JNTUK, Kakinada.

Academic Calendar of II Year MBA for Academic year 2021-22
(As per G.O. Rt. No.242, Higher Education (U.E) Dept., dated 13.09.2021)

I SEMESTER			
Description	From	To	Weeks
Commencement of Class Work	01.11.2021		
I Unit of Instruction	01.11.2021	18.12.2021	7W
I Mid Examinations	20.12.2021	25.12.2021	1W
II Unit of Instructions	27.12.2021	12.02.2022	7W
II Mid Examinations	14.02.2022	19.02.2022	1W
Preparation & Practicals	21.02.2022	26.02.2022	1W
End Examinations	28.02.2022	12.03.2022	2W
Commencement of II Semester Class Work	14.03.2022		
II SEMESTER			
I Unit of Instructions	14.03.2022	30.04.2022	7W
I Mid Examinations	02.05.2022	07.05.2022	1W
II Unit of Instructions	09.05.2022	25.06.2022	7W
II Mid Examinations	27.06.2022	02.07.2022	1W
Preparation & Practicals	04.07.2022	09.07.2022	1W
End Examinations	11.07.2022	23.07.2022	2W

Note: Calendar is prepared with 8 hrs/day hence 7 weeks per instruction period

R. Srinivasa Rao
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JNTUK Kakinada

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ACADEMIC REGULATIONS
COURSE STRUCTURE & DETAILED SYLLABUS

For

B.Tech FOUR YEAR DEGREE COURSE

(Applicable for the batches admitted from 2016-17)



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
KAKINADA

KAKINADA – 533003, ANDHRA PRADESH, INDIA.

ACADEMIC REGULATIONS (R16) FOR B. TECH. (REGULAR)

Applicable for the students of B. Tech. (Regular) from the Academic Year 2016-17 onwards

1. Award of B. Tech. Degree

A student will be declared eligible for the award of B. Tech. Degree if he fulfils the following academic regulations:

1. A student shall be declared eligible for the award of the B. Tech Degree, if he pursues a course of study in not less than four and not more than eight academic years
2. The candidate shall register for 180 credits and secure all the 180 credits.

2. Courses of study

The following courses of study are offered at present as specializations for the B. Tech. Courses with English as medium of Instruction.

S. No	Branch
01	Civil Engineering
02	Electrical and Electronics Engineering
03	Mechanical Engineering
04	Electronics and Communication Engineering
05	Computer Science and Engineering
06	Information Technology
07	Petro Chemical Engineering
08	Chemical Engineering
09	Electronics and Instrumentation Engineering
10	Aeronautical Engineering
11	Automobile Engineering
12	Bio Technology
13	Electronics and Computer Engineering
14	Mining Engineering
15	Petroleum Engineering
16	Metallurgical Engineering
17	Agricultural Engineering

3. Distribution and Weightage of Marks

- (i) The performance of a student in each semester shall be evaluated subject – wise with a maximum of 100 marks for theory subject and 75 marks for practical subject. The project work shall be evaluated for 200 marks.
- (ii) For theory subjects the distribution shall be 30 marks for Internal Evaluation and 70 marks for the End - Examinations.
- (iii) For theory subjects, during the semester there shall be 2 tests. The weightage of Internal marks for 30 consists of Descriptive – 15, Assignment - 05 (Theory, Design, Analysis, Simulation, Algorithms, Drawing, etc. as the case may be and for Physics, Virtual Labs to be considered as Assignments) Objective -10 (Conducted at College level with 20 Multiple choice question with a weightage of ½ Mark each). The objective examination is for 20 minutes duration. The subjective examination is for 90 minutes duration conducted for 15 marks. Each subjective type test question paper shall contain **3 questions** and all questions need to be answered. The Objective examination conducted for 10 marks and subjective examination conducted for 15 marks are to be added to the assignment marks of 5 for finalizing internal marks for 30.

Internal Marks can be calculated with 80% weightage for best of the two Mids and 20% weightage for other Mid Exam As the syllabus is framed for 6 units, the 1st mid examination (both Objective and Subjective) is conducted in 1-3 units and second test in 4-6 units of each subject in a semester.

- (iv) The end semester examination is conducted covering the topics of all Units for 70 marks. End Exam Paper: Part-A 1st Question is mandatory covering all the syllabus which contains seven 2 marks questions for 14 marks with atleast 2 marks of question for each of the six units and in Part-B 4 Questions out of 6 Questions are to be answered with each carrying 14 marks . Part-A & Part-B put together gives for 70 marks.
- (v) For practical subjects there shall be continuous evaluation during the semester for 25 internal marks and 50 end examination marks. The internal 25 marks shall be awarded as follows: day to day work - 10 marks, Record-5 marks and the remaining 10 marks to be awarded by conducting an internal laboratory test. The end examination shall be conducted by the teacher concerned and external examiner.
- (vi) For the subject having design and / or drawing, (such as Engineering Graphics, Engineering Drawing, Machine Drawing) and estimation, the distribution shall be 30 marks for internal evaluation (20 marks for day – to – day work, and 10 marks for internal tests) and 70 marks for end examination. There shall be two internal tests in a Semester and the Marks for 10 can be calculated with 80% weightage for best of the two tests and 20% weightage for other test and these are to be added to the marks obtained in day to day work.
- (vii) For the seminar, Each student has to be evaluated based on the presentation of any latest topic with report of 10-15 pages and a ppt of min 10 slides. The student shall collect the information on a specialized topic and prepare a technical report, showing his understanding over the topic, and submit to the department, which shall be evaluated by the Departmental committee consisting of Head of the department, seminar supervisor and a senior faculty member. The seminar report shall be evaluated for 50 marks. There shall be no external examination for seminar.

- (viii) Out of a total of 200 marks for the project work, 60 marks shall be for Internal Evaluation and 140 marks for the End Semester Examination. The End Semester Examination (Viva – Voce) shall be conducted by the committee. The committee consists of an external examiner, Head of the Department and Supervisor of the Project. The evaluation of project work shall be conducted at the end of the IV year. The Internal Evaluation shall be on the basis of two seminars given by each student on the topic of his project and evaluated by an internal committee.
- (ix) Laboratory marks and the internal marks awarded by the College are not final. The marks are subject to scrutiny and scaling by the University wherever felt desirable. The internal and laboratory marks awarded by the College will be referred to a Committee. The Committee shall arrive at a scaling factor and the marks will be scaled as per the scaling factor. The recommendations of the Committee are final and binding. The laboratory records and internal test papers shall be preserved in the respective departments as per the University norms and shall be produced to the Committees of the University as and when they ask for.

4. Attendance Requirements

1. A student is eligible to write the University examinations if he acquires a minimum of 75% of attendance in aggregate of all the subjects.
2. Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted by the College Academic Committee
3. Shortage of Attendance below 65% in aggregate shall not be condoned.
4. A student who is short of attendance in semester may seek re-admission into that semester when offered within 4 weeks from the date of the commencement of class work.
5. Students whose shortage of attendance is not condoned in any semester are not eligible to write their end semester examination of that class.
6. A stipulated fee shall be payable towards condonation of shortage of attendance.
7. A student will be promoted to the next semester if he satisfies the (i)attendance requirement of the present semester and (ii) minimum required credits.
8. If any candidate fulfills the attendance requirement in the present semester, he shall not be eligible for readmission into the same class.

5. Minimum Academic Requirements

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no.4.

- 5.1 A student is deemed to have satisfied the minimum academic requirements if he has **earned the credits allotted to each theory/practical design/drawing subject/project by securing not less than 35% of marks in the end semester exam, and minimum 40% of marks in the sum total of the internal marks and end semester examination marks.**
- 5.2 A student shall be promoted from first year to second year if he fulfills the minimum attendance requirement.
- 5.3 A student will be **promoted from II year to III year** if he fulfills the academic requirement of **40% of the credits up to either II year I semester or II year II semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in II year II semester.**

5.4 A student shall be **promoted from III year to IV year** if he fulfils the academic requirements of **40% of the credits up to either III year I semester or III year II semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in III year II semester.**

5.5 A student shall register and put up minimum attendance in all 180 credits and earn all 180 credits.

6. Course Pattern

1. The entire course of study is for four academic years, all the years are on semester pattern.
2. A student eligible to appear for the end semester examination in a subject, but absent from it or has failed in the end semester examination, may write the exam in that subject when conducted next.
3. When a student is detained for lack of credits / shortage of attendance, he may be re-admitted into the same semester / year in which he has been detained. However, the academic regulations under which he was first admitted shall continue to be applicable to him.

7. CGPA

Marks Range Theory (Max – 100)	Marks Range Lab (Max – 75)	Letter Grade	Level	Grade Point
≥ 90	≥ 67	O	Outstanding	10
≥80 to <90	≥60 to <67	S	Excellent	9
≥70 to <80	≥52 to <60	A	Very Good	8
≥60 to <70	≥45 to <52	B	Good	7
≥50 to <60	≥37 to <45	C	Fair	6
≥40 to <50	≥30 to <37	D	Satisfactory	5
<40	<30	F	Fail	0
			Absent	0

Computation of SGPA

The following procedure is to be adopted to compute the Semester Grade Point Average. (SGPA) and Cumulative Grade Point Average (CGPA):

The **SGPA** is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e

$$\text{SGPA (Si)} = \frac{\sum (C_i \times G_i)}{\sum C_i}$$

Where C_i is the number of credits of the i th course and G_i is the grade point scored by the student in the i th course.

Computation of CGPA

- The **CGPA** is also calculated in the same manner taking into account all the courses undergone by a student over all the semester of a programme, i.e.

$$\text{CGPA} = \frac{\sum (C_i \times S_i)}{\sum C_i}$$

Where S_i is the SGPA of the i^{th} semester and C_i is the total number of credits in that semester.

- The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.
- Equivalent Percentage = $(\text{CGPA} - 0.75) \times 10$

8. Award of Class

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of B. Tech. Degree, he shall be placed in one of the following four classes:

Class Awarded	CGPA to be secured	From the CGPA secured from 180 Credits.
First Class with Distinction	≥ 7.75 with no subject failures	
First Class	≥ 6.75 with subject failures	
Second Class	≥ 5.75 to < 6.75	
Pass Class	≥ 4.75 to < 5.75	

9. Minimum Instruction Days

The minimum instruction days for each semester shall be 90 working days.

10. There shall be no branch transfers after the completion of the admission process.
11. There shall be no transfer from one college/stream to another within the Constituent Colleges and Units of Jawaharlal Nehru Technological University Kakinada.

12. Withholding of Results

If the student has not paid the dues, if any, to the university or if any case of indiscipline is pending against him, the result of the student will be withheld. His degree will be withheld in such cases.

13. Transitory Regulations

1. Discontinued or detained candidates are eligible for readmission as and when next offered.
2. The readmitted students will be governed by the regulations under which the candidate has been admitted.
3. (a) In case of transferred students from other Universities, the credits shall be transferred to JNTUK as per the academic regulations and course structure of the JNTUK.

(b) The students seeking transfer to colleges affiliated to JNTUK from various other Universities / Institutions have to obtain the credits of any equivalent subjects as prescribed by JNTUK. In addition, the transferred candidates have to pass the failed subjects at the earlier institute with already obtained sessional marks to be conducted by JNTUK.

14. General

1. Wherever the words “he”, “him”, “his”, occur in the regulations, they include “she”, “her”, “hers”.
2. The academic regulation should be read as a whole for the purpose of any interpretation.
3. In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.
4. The University may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the University.

ACADEMIC REGULATIONS (R13) FOR B. TECH. (LATERAL ENTRY SCHEME)

Applicable for the students admitted into II year B. Tech. from the Academic Year 2017-18 onwards

1. Award of B. Tech. Degree

A student will be declared eligible for the award of B. Tech. Degree if he fulfils the following academic regulations:

- 1.1 A student shall be declared eligible for the award of the B. Tech Degree, if he pursues a course of study in not less than three academic years and not more than six academic years.
- 1.2 The candidate shall register for 132 credits and secure all the 132 credits.

2. The attendance regulations of B. Tech. (Regular) shall be applicable to B.Tech.

3. Promotion Rule

A student shall be promoted from second year to third year if he fulfills the minimum attendance requirement.

A student shall be promoted from III year to IV year if he fulfils the academic requirements of 40% of the credits up to either III year I semester or III year II semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in III year II semester.

4. Award of Class

After a student has satisfied the requirement prescribed for the completion of the program and is eligible for the award of B. Tech. Degree, he shall be placed in one of the following four classes:

Class Awarded	CGPA to be secured	From the CGPA secured from 132 Credits from II Year to IV Year
First Class with Distinction	≥ 7.75 with no subject failures	
First Class	≥ 6.75 with subject failures	
Second Class	≥ 5.75 to < 6.75	
Pass Class	≥ 4.75 to < 5.75	

The marks obtained in the internal evaluation and the end semester examination shall be shown separately in the marks memorandum.

5. All the other regulations as applicable to **B. Tech. 4-year degree course (Regular)** will hold good for **B. Tech. (Lateral Entry Scheme)**.

MALPRACTICES RULES

DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/Improper conduct	Punishment
	<i>If the candidate:</i>	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the University.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the

	examination.	remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.

8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action to award suitable punishment.	

Malpractices identified by squad or special invigilators

1. Punishments to the candidates as per the above guidelines.
2. Punishment for institutions : (if the squad reports that the college is also involved in encouraging malpractices)
 - (i) A show cause notice shall be issued to the college.
 - (ii) Impose a suitable fine on the college.
 - (iii) Shifting the examination centre from the college to another college for a specific period of not less than one year.

* * * * *








Ragging

Prohibition of ragging in educational institutions Act 26 of 1997

Salient Features

- ⇒ Ragging within or outside any educational institution is prohibited.
- ⇒ Ragging means doing an act which causes or is likely to cause Insult or Annoyance of Fear or Apprehension or Threat or Intimidation or outrage of modesty or Injury to a student

	Imprisonment upto		Fine Upto
Teasing, Embarrassing and Humiliation	 6 Months	+	Rs. 1,000/-
Assaulting or Using Criminal force or Criminal intimidation	 1 Year	+	Rs. 2,000/-
Wrongfully restraining or confining or causing hurt	 2 Years	+	Rs. 5,000/-
Causing grievous hurt, kidnapping or Abducts or rape or committing unnatural offence	 5 Years	+	Rs. 10,000/-
Causing death or abetting suicide	 10 Months	+	Rs. 50,000/-

In Case of Emergency CALL TOLL FREE NO. : 1800 - 425 - 1288

LET US MAKE JNTUK A RAGGING FREE UNIVERSITY



Ragging

ABSOLUTELY NO TO RAGGING

1. Ragging is prohibited as per Act 26 of A.P. Legislative Assembly, 1997.
2. Ragging entails heavy fines and/or imprisonment.
3. Ragging invokes suspension and dismissal from the College.
4. Outsiders are prohibited from entering the College and Hostel without permission.
5. Girl students must be in their hostel rooms by 7.00 p.m.
6. All the students must carry their Identity Cards and show them when demanded
7. The Principal and the Wardens may visit the Hostels and inspect the rooms any time.



Jawaharlal Nehru Technological University Kakinada
For Constituent Colleges and Affiliated Colleges of JNTUK

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LET US MAKE JNTUK A RAGGING FREE UNIVERSITY

COURSE STRUCTURE AND SYLLABUS

For

CIVIL ENGINEERING

(Applicable for batches admitted from 2016-2017)



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India

I Year - I Semester

S. No.	Subjects	L	T	P	Credits
1-HS	English – I	4	--	--	3
2-BS	Mathematics - I	4	--	--	3
3-ES	Engineering Chemistry	4	--	--	3
4-BS	Engineering Mechanics	4	2	--	3
5-BS	Computer Programming	4	--	--	3
6-ES	Environmental Studies	4	--	--	3
7-HS	Engineering /Applied Chemistry Laboratory	--	--	3	2
8-BS	English - Communication Skills Lab - I	--	--	3	2
9-ES	Computer Programming Lab	--	--	3	2
Total Credits					24

I Year - II Semester

S. No.	Subjects	L	T	P	Credits
1-HS	English – II	4	--	--	3
2-BS	Mathematics – II (Mathematical Methods)	4	--	--	3
3-BS	Mathematics – III	4	--	--	3
4-ES	Engineering Physics	4	--	--	3
5-HS	Elements of Mechanical Engineering	4	--	--	3
6-ES	Engineering Drawing	4	--	--	3
7-BS	English - Communication Skills Lab - II	--	--	3	2
8-HS	Engineering /Applied Physics Lab	--	--	3	2
9-ES	Engineering / Applied Physics – Virtual Labs - Assignments	--	--	2	--
10	Engg. Workshop & IT Workshop	--	--	3	2
Total Credits					24

II Year - I Semester

S. No.	Subjects	L	T	P	Credits
1	Probability & Statistics	4	--	--	3
2	Basic Electrical & Electronics Engineering	4	--	--	3
3	Strength of Materials-I	4	--	--	3
4	Building Materials & Construction	4	--	--	3
5	Surveying	4	--	--	3
6	Fluid Mechanics	4	--	--	3
7	Survey Field Work - I	--	--	3	2
8	Strength of Materials Lab	--	--	3	2
MC	Professional Ethics & Human Values	--	3	--	--
Total Credits					22

II Year - II Semester

S. No.	Subjects	L	T	P	Credits
1	Building Planning & Drawing	4	--	--	3
2	Strength of Materials - II	4	--	--	3
3	Hydraulics & Hydraulic Machinery	4	--	--	3
4	Concrete Technology	4	--	--	3
5	Structural Analysis - I	4	--	--	3
6	Transportation Engineering - I	4	--	--	3
7	FM & HM Lab	--	--	3	2
8	Survey Field Work - II	--	--	3	2
MC	Managerial Economics & Financial Analysis	2	--	--	--
Total Credits					22

III Year - I Semester

S. No.	Subjects	L	T	P	Credits
1	Management Science	4	--	--	3
2	Engineering Geology	4	--	--	3
3	Structural Analysis -II	4	--	--	3
4	Design & Drawing of Reinforced Concrete Structures	4	2	--	3
5	Transportation Engineering - II	4	--	--	3
6	Concrete Technology Lab	--	--	3	2
7	Geology Lab	--	--	3	2
8	Transportation Engineering Lab	--	--	3	2
Total Credits					21

III Year - II Semester

S. No.	Subjects	L	T	P	Credits
1	Design & Drawing of Steel Structures	4	2	--	3
2	Geotechnical Engineering - I	4	--	--	3
3	Environmental Engineering -I	4	--	--	3
4	Water Resource Engineering -I	4	--	--	3
5	OPEN ELECTIVE i. Electronic Instrumentation ii. Data Base Management Systems iii. Alternative Energy Sources iv. Waste water Management v. Fundamentals of Liquefied Natural Gas vi. Green Fuel Technologies	4	--	--	3
6	Geotechnical Engineering Lab	--	--	3	2
7	Environmental Engineering Lab	--	--	3	2
8	Computer Aided Engineering Lab	--	--	3	2
Total Credits					21

IV Year - I Semester

S. No.	Subjects	L	T	P	Credits
1	Environmental Engineering - II	4	--	--	3
2	Water Resource Engineering - II	4	--	--	3
3	Geotechnical Engineering - II	4	--	--	3
4	Remote Sensing & GIS Applications	4	--	--	3
5	Elective I i. Finite Element Methods ii. Ground Improvement Techniques iii. Air Pollution & Control iv. Urban Hydrology v. Traffic Engineering	4	--	--	3
6	Elective II i. Advanced Structural Engineering ii. Advanced Foundation Engineering iii. Environmental Impact Assessment & Management iv. Ground Water Development v. Pavement Analysis and Design	4	--	--	3
7	IPR & Patents	--	2	--	--
8	GIS & CAD Lab	--	--	2	2
9	Irrigation Design & Drawing	--	--	2	2
Total Credits					22

IV Year - II Semester

S. No.	Subjects	L	T	P	Credits
1	Estimation Specification & Contracts	4	--	--	3
2	Construction Technology & Management	4	--	--	3
3	Prestressed Concrete	4	--	--	3
4	Elective III i. Bridge Engineering ii. Soil Dynamics and Foundations iii. Solid and Hazardous Waste Management iv. Water Resources Systems Planning v. Urban Transportation Planning Engg	4	--	--	3
5	Seminar on Internship Project	--	3	--	2
6	Project	--	--	--	10
Total Credits					24

Total Course Credits = 48+44 + 42 + 46 = 180

SYLLABUS

I Year - I Semester	L	T	P	C
	4	0	0	3

ENGLISH –I

(Common to All Branches)

Introduction:

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training the students to acquire communicative competence, the syllabus has been designed to develop linguistic and communicative competence of the students of Engineering.

As far as the detailed Textbooks are concerned, the focus should be on the skills of listening, speaking, reading and writing. The nondetailed Textbooks are meant for extensive reading for pleasure and profit.

Thus the stress in the syllabus is primarily on the development of communicative skills and fostering of ideas.

Objectives:

1. To improve the language proficiency of the students in English with emphasis on LSRW skills.
2. To enable the students to study and comprehend the prescribed lessons and subjects more effectively relating to their theoretical and practical components.
3. To develop the communication skills of the students in both formal and informal situations.

LISTENING SKILLS:

Objectives:

1. To enable the students to appreciate the role of listening skill and improve their pronunciation.
2. To enable the students to comprehend the speech of people belonging to different backgrounds and regions.
3. To enable the students to listen for general content, to fill up information and for specific information.

SPEAKING SKILLS:

Objectives:

1. To make the students aware of the importance of speaking for their personal and professional communication.

2. To enable the students to express themselves fluently and accurately in social and professional success.
3. To help the students describe objects, situations and people.
4. To make the students participate in group activities like roleplays, discussions and debates.
5. To make the students participate in Just a Minute talks.

READING SKILLS:

Objectives:

1. To enable the students to comprehend a text through silent reading.
2. To enable the students to guess the meanings of words, messages and inferences of texts in given contexts.
3. To enable the students to skim and scan a text.
4. To enable the students to identify the topic sentence.
5. To enable the students to identify discourse features.
6. To enable the students to make intensive and extensive reading.

WRITING SKILLS:

Objectives:

1. To make the students understand that writing is an exact formal skills.
2. To enable the students to write sentences and paragraphs.
3. To make the students identify and use appropriate vocabulary.
4. To enable the students to narrate and describe.
5. To enable the students capable of note-making.
6. To enable the students to write coherently and cohesively.
7. To make the students to write formal and informal letters.
8. To enable the students to describe graphs using expressions of comparison.
9. To enable the students to write technical reports.

Methodology:

1. The class are to be learner-centered where the learners are to read the texts to get a comprehensive idea of those texts on their own with the help of the peer group and the teacher.
2. Integrated skill development methodology has to be adopted with focus on individual language skills as per the tasks/exercise.
3. The tasks/exercises at the end of each unit should be completed by the learners only and the teacher intervention is permitted as per the complexity of the task/exercise.
4. The teacher is expected to use supplementary material wherever necessary and also generate activities/tasks as per the requirement.
5. The teacher is permitted to use lecture method when a completely new concept is introduced in the class.

Assessment Procedure: Theory

1. The formative and summative assessment procedures are to be adopted (mid exams and end semester examination).
2. Neither the formative nor summative assessment procedures should test the memory of the content of the texts given in the textbook. The themes and global comprehension of the units in the present day context with application of the language skills learnt in the unit are to be tested.
3. Only new unseen passages are to be given to test reading skills of the learners. Written skills are to be tested from sentence level to essay level. The communication formats—emails, letters and reports-- are to be tested along with appropriate language and expressions.
4. Examinations:
I mid exam + II mid exam (15% for descriptive tests+10% for online tests)= 25%

(80% for the best of two and 20% for the other)

Assignments= 5%

End semester exams=70%
5. Three take home assignments are to be given to the learners where they will have to read texts from the reference books list or other sources and write their gist in their own words.

The following text books are recommended for study in I B.Tech I Semester (Common for all branches)and I B.Pharma I Sem of JNTU Kakinada from the academic year 2016-17

(R-16 Regulations)

DETAILED TEXTBOOK:

ENGLISH FOR ENGINEERS AND TECHNOLOGISTS, Published by **Orient Blackswan Pvt Ltd**

NON-DETAILED TEXTBOOK:

PANORAMA: A COURSE ON READING, Published by **Oxford University Press India**

The course content along with the study material is divided into six units.

UNIT I:

1. 'Human Resources' from English for Engineers and Technologists.

OBJECTIVE:

To develop human resources to serve the society in different ways.

OUTCOME:

The lesson motivates the readers to develop their knowledge different fields and serve the society accordingly.

2. 'An Ideal Family' from Panorama: A Course on Reading

OBJECTIVE:

To develop extensive reading skill and comprehension for pleasure and profit.

OUTCOME:

Acquisition of writing skills

UNIT 2:

1. 'Transport: Problems and Solutions' from English for Engineers and Technologists.

OBJECTIVE:

To highlight road safety measures whatever be the mode of transport.

OUTCOME:

The lesson motivates the public to adopt road safety measures.

2. 'War' from 'Panorama : A Course on Reading'

OBJECTIVE:

To develop extensive reading skill and comprehension for pleasure and profit.

OUTCOME:

Acquisition of writing skills

UNIT 3:

1. 'Evaluating Technology' from English for Engineers and Technologists.

OBJECTIVE:

To highlight the advantages and disadvantages of technology.

OUTCOME:

The lesson creates an awareness in the readers that mass production is ultimately detrimental to biological survival.

2. 'The Verger' from 'Panorama : A Course on Reading'

OBJECTIVE:

To develop extensive reading skill and comprehension for pleasure and profit.

OUTCOME:

Acquisition of writing skills

UNIT 4:

1. 'Alternative Sources of Energy' from English for Engineers and Technologists.

OBJECTIVE:

To bring into focus different sources of energy as alternatives to the depleting sources.

OUTCOME:

The lesson helps to choose a source of energy suitable for rural India.

2. 'The Scarecrow' from Panorama : A Course on Reading

OBJECTIVE:

To develop extensive reading skill and comprehension for pleasure and profit.

OUTCOME:

Acquisition of writing skills

UNIT 5:

1. 'Our Living Environment' from English for Engineers and Technologists.

OBJECTIVE:

To highlight the fact that animals must be preserved because animal life is precious.

OUTCOME:

The lesson creates an awareness in the reader as to the usefulness of animals for the human society.

2. 'A Village Host to Nation' from Panorama : A Course on Reading

OBJECTIVE:

To develop extensive reading skill and comprehension for pleasure and profit.

OUTCOME:

Acquisition of writing skills

UNIT 6:

1. ' Safety and Training' from English for Engineers and Technologists.

OBJECTIVE:

To highlight the possibility of accidents in laboratories, industries and other places and to follow safety measures.

OUTCOME:

The lesson helps in identifying safety measures against different varieties of accidents at home and in the workplace.

2. 'Martin Luther King and Africa' from Panorama : A Course on Reading

OBJECTIVE:

To develop extensive reading skill and comprehension for pleasure and profit.

OUTCOME:

Acquisition of writing skills

NOTE:

All the exercises given in the prescribed lessons in both detailed and non-detailed textbooks relating to the theme and language skills must be covered.

OVERALL COURSE OUTCOME:

1. Using English languages, both written and spoken, competently and correctly.
2. Improving comprehension and fluency of speech.
3. Gaining confidence in using English in verbal situations.

MODEL QUESTION PAPER FOR THEORY

PART- I

Six short answer questions on 6 unit themes

One question on eliciting student's response to any of the themes

PART-II

Each question should be from one unit and the last question can be a combination of two or more units.

Each question should have 3 sub questions: A,B & C

A will be from the main text: 5 marks

B from non-detailed text: 3 marks

C on grammar and Vocabulary: 6 marks

I Year - I Semester

L	T	P	C
4	0	0	3

MATHEMATICS – I
(Common to All Branches)

Course Objectives:

1. The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course.
2. The skills derived from the course will help the student from a necessary base to develop analytic and design concepts.

Course Outcomes: At the end of the Course, Student will be able to:

1. Solve linear differential equations of first, second and higher order.
2. Determine Laplace transform and inverse Laplace transform of various functions and use Laplace transforms to determine general solution to linear ODE.
3. Calculate total derivative, Jacobian and minima of functions of two variables.

UNIT I: Differential equations of first order and first degree:

Linear-Bernoulli-Exact-Reducible to exact.

Applications: Newton's Law of cooling-Law of natural growth and decay-Orthogonal trajectories- Electrical circuits- Chemical reactions.

UNIT II: Linear differential equations of higher order:

Non-homogeneous equations of higher order with constant coefficients with RHS term of the type e^{ax} , $\sin ax$, $\cos ax$, polynomials in x , $e^{ax} V(x)$, $xV(x)$ - Method of Variation of parameters. Applications: LCR circuit, Simple Harmonic motion.

UNIT III: Laplace transforms:

Laplace transforms of standard functions-Shifting theorems - Transforms of derivatives and integrals – Unit step function –Dirac's delta function- Inverse Laplace transforms– Convolution theorem (with out proof).

Applications: Solving ordinary differential equations (initial value problems) using Laplace transforms.

UNIT IV: Partial differentiation:

Introduction- Homogeneous function-Euler's theorem-Total derivative-Chain rule-Generalized Mean value theorem for single variable (without proof)-Taylor's and Mc Laurent's series expansion of functions of two variables– Functional dependence- Jacobian.

Applications: Maxima and Minima of functions of two variables without constraints and Lagrange's method (with constraints).

UNIT V: First order Partial differential equations:

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions –solutions of first order linear (Lagrange) equation and nonlinear (standard types) equations.

UNIT VI: Higher order Partial differential equations:

Solutions of Linear Partial differential equations with constant coefficients. RHS term of the type e^{ax+by} , $\sin(ax+by)$, $\cos(ax+by)$, $x^m y^n$. Classification of second order partial differential equations.

Text Books:

1. **B.S.Grewal**, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. **N.P.Bali**, Engineering Mathematics, Lakshmi Publications.

Reference Books:

1. **Erwin Kreyszig**, Advanced Engineering Mathematics, 10th Edition, Wiley-India
2. **Micheael Greenberg**, Advanced Engineering Mathematics, 9th edition, Pearson edn
3. **Dean G. Duffy**, Advanced engineering mathematics with MATLAB, CRC Press
4. **Peter O'neil**, Advanced Engineering Mathematics, Cengage Learning.
5. **Srimanta Pal, Subodh C.Bhunia**, Engineering Mathematics, Oxford University Press.
6. **Dass H.K., Rajnish Verma. Er.**, Higher Engineering Mathematics, S. Chand Co. Pvt. Ltd, Delhi.

I Year - I Semester	L	T	P	C
	4	0	0	3

ENGINEERING CHEMISTRY

(CE, ME, PCE, PE, Met.E, Mining, Automobile, Aeronautical, Chemical, Bio.tech.)

Knowledge of basic concepts of Chemistry for Engineering students will help them as professional engineers later in design and material selection, as well as utilizing the available resources.

Learning Objectives:

- Plastics are nowadays used in household appliances; also they are used as composites (FRP) in aerospace and automotive industries.
- Fuels as a source of energy are a basic need of any industry, particularly industries like thermal power stations, steel industry, fertilizer industry etc., and hence they are introduced.
- The basics for the construction of galvanic cells are introduced. Also if corrosion is to be controlled, one has to understand the mechanism of corrosion which itself is explained by electrochemical theory.
- With the increase in demand, a wide variety of materials are coming up; some of them have excellent engineering properties and a few of these materials are introduced.
- Water is a basic material in almost all the industries, more so where steam is generated and also where it is supplied for drinking purposes.
- Materials used in major industries like steel industry, metallurgical industries and construction industries and electrical equipment manufacturing industries are introduced. Also lubrication is introduced.

UNIT I: HIGH POLYMERS AND PLASTICS

Polymerisation:- Introduction- Mechanism of polymerization - Stereo regular polymers – methods of polymerization (emulsion and suspension) -Physical and mechanical properties – **Plastics** as engineering materials : advantages and limitations – Thermoplastics and Thermosetting plastics – Compounding and fabrication (4/5 techniques)- Preparation, properties and applications of polyethene, PVC, Bakelite Teflon and polycarbonates

Elastomers :- Natural rubber- compounding and vulcanization – Synthetic rubbers : Buna S, Buna N, Thiokol and polyurethanes – Applications of elastomers.

Composite materials & Fiber reinforced plastics – Biodegradable polymers – Conducting polymers.

UNIT II: FUEL TECHNOLOGY

Fuels – Introduction – Classification – Calorific value - HCV and LCV – Dulong's formula – Bomb calorimeter – Numerical problems – Coal — Proximate and ultimate analysis – Significance of the analyses – Liquid fuels – Petroleum- Refining – Cracking – Synthetic petrol –Petrol knocking – Diesel knocking - Octane and Cetane ratings – Anti-knock agents – Power alcohol – Bio-diesel – Gaseous fuels – Natural gas, LPG and CNG – Combustion – Calculation of air for the combustion of a fuel – Flue gas analysis – Orsat apparatus – Numerical problems on combustion.

Explosives:- Rocket fuels

UNIT III: ELECTROCHEMICAL CELLS AND CORROSION

Galvanic cells - Reversible and irreversible cells – Single electrode potential – Electrochemical series and uses of this series- Standard electrodes (Hydrogen and Calomel electrodes) - Concentration Cells – Batteries: Dry Cell - Ni-Cd cells - Ni-Metal hydride cells - Li cells - Zinc – air cells.

Corrosion :- Definition – Theories of Corrosion (chemical & electrochemical) – Formation of galvanic cells by different metals, by concentration cells, by differential aeration and waterline corrosion – Passivity of metals – Pitting corrosion - Galvanic series – Factors which influence the rate of corrosion - Protection from corrosion – Design and material selection – Cathodic protection - Protective coatings: – Surface preparation – Metallic (cathodic and anodic) coatings - Methods of application on metals (Galvanizing, Tinning, Electroplating, Electroless plating).

UNIT IV: CHEMISTRY OF ADVANCED MATERIALS

Nano materials:- Introduction – Sol-gel method & chemical reduction method of preparation – Characterization by BET method and TEM methods - Carbon nano tubes and fullerenes: Types, preparation, properties and applications

Liquid crystals:- Introduction – Types – Applications

Super conductors:-Type –I, Type II – Characteristics and applications

Green synthesis:- Principles - 3or 4 methods of synthesis with examples – R₄M₄ principles

UNIT V: WATER TECHNOLOGY

Hard water:- Reasons for hardness – units of hardness - determination of hardness and alkalinity - Water for steam generation - Boiler troubles – Priming and Foaming, Scale formation, Boiler corrosion, Caustic embrittlement - Internal treatments - Softening of Hard water : Lime – Soda process, Zeolite process and numerical problems based on these processes and Ion Exchange process - Water for drinking purposes- Purification – Sterilization and disinfection : Chlorination, Break point chlorination and other methods – Reverse Osmosis and Electro Dialysis.

UNIT VI: CHEMISTRY OF ENGINEERING MATERIALS AND FUEL CELLS

Refractories: - Definition, characteristics, classification, properties, failure of refractories

Lubricants: - Definition, function, Theory and mechanism of lubricants, properties (Definition and importance)

Cement: - Constituents, manufacturing, hardening and setting, deterioration of cement

Insulators: - Thermal and electrical insulators

Fuel cells: - Hydrogen Oxygen fuel cells – Methanol Oxygen fuel cells

Outcome: The advantages and limitations of plastic materials and their use in design would be understood. Fuels which are used commonly and their economics, advantages and limitations are discussed. Reasons for corrosion and some methods of corrosion control would be understood. The students would be now aware of materials like nano materials and fullerenes and their uses. Similarly liquid crystals and superconductors are understood. The importance of green synthesis is well understood and how they are different from conventional methods is also explained. The impurities present in raw water, problems associated with them and how to avoid them are understood. The advantages and limitations

of plastic materials and their use in design would be understood. The commonly used industrial materials are introduced.

Standard Books:

1. Engineering Chemistry by Jain and Jain; Dhanpat Rai Publishing Co.
2. Engineering Chemistry by Shikha Agarwal; Cambridge University Press, 2015 edition.

Reference Books:

1. Engineering Chemistry of Wiley India Pvt. Ltd., Vairam and others, 2014 edition (second).
2. Engineering Chemistry by Prasanth Rath, Cengage Learning, 2015 edition.
3. A text book of engineering Chemistry by S. S. Dara; S. Chand & Co Ltd., Latest Edition
4. Applied Chemistry by H.D. Gesser, Springer Publishers
5. Text book of Nano-science and nanotechnology by B.S. Murthy, P. Shankar and others, University Press, IIM

I Year - I Semester

L	T	P	C
4	0	0	3

ENGINEERING MECHANICS

Objectives: The students completing this course are expected to understand the concepts of forces and its resolution in different planes, resultant of force system, Forces acting on a body, their free body diagrams using graphical methods. They are required to understand the concepts of centre of gravity and moments of inertia and their application, Analysis of frames and trusses, different types of motion, friction and application of work - energy method.

UNIT – I

Objectives: The students are to be exposed to the concepts of force and friction, direction and its application.

Introduction to Engg. Mechanics – Basic Concepts.

Systems of Forces: Coplanar Concurrent Forces – Components in Space – Resultant – Moment of Force and its Application – Couples and Resultant of Force Systems.

Friction: Introduction, limiting friction and impending motion, coulomb's laws of dry friction, coefficient of friction, cone of friction

UNIT II

Objectives: The students are to be exposed to application of free body diagrams. Solution to problems using graphical methods and law of triangle of forces.

Equilibrium of Systems of Forces: Free Body Diagrams, Equations of Equilibrium of Coplanar Systems, Spatial Systems for concurrent forces. Lamis Theorem, Graphical method for the equilibrium of coplanar forces, Converse of the law of Triangle of forces, converse of the law of polygon of forces condition of equilibrium, analysis of plane trusses.

UNIT – III

Objectives : The students are to be exposed to concepts of centre of gravity.

Centroid: Centroids of simple figures (from basic principles) – Centroids of Composite Figures

Centre of Gravity: Centre of gravity of simple body (from basic principles), centre of gravity of composite bodies, Pappus theorems.

UNIT IV

Objective: The students are to be exposed to concepts of moment of inertia and polar moment of inertia including transfer methods and their applications.

Area moments of Inertia: Definition – Polar Moment of Inertia, Transfer Theorem, Moments of Inertia of Composite Figures, Products of Inertia, Transfer Formula for Product of Inertia. **Mass Moment of Inertia:** Moment of Inertia of Masses, Transfer Formula for Mass Moments of Inertia, mass moment of inertia of composite bodies.

UNIT – V

Objectives: The students are to be exposed to motion in straight line and in curvilinear paths, its velocity and acceleration computation and methods of representing plane motion.

Kinematics: Rectilinear and Curvelinear motions – Velocity and Acceleration – Motion of Rigid Body – Types and their Analysis in Planar Motion. **Kinetics:** Analysis as a Particle and Analysis as a Rigid Body in Translation – Central Force Motion – Equations of Plane Motion – Fixed Axis Rotation – Rolling Bodies.

UNIT – VI

Objectives: The students are to be exposed to concepts of work, energy and particle motion

Work – Energy Method: Equations for Translation, Work-Energy Applications to Particle Motion, Connected System-Fixed Axis Rotation and Plane Motion. Impulse momentum method.

TEXT BOOKS :

1. Engg. Mechanics - S.Timoshenko & D.H.Young., 4th Edn - , Mc Graw Hill publications.

REFERENCES :

1. Engineering Mechanics statics and dynamics – R.C.Hibbeler, 11th Edn – Pearson Publ.
2. Engineering Mechanics, statics – J.L.Meriam, 6th Edn – Wiley India Pvt Ltd.
3. Engineering Mechanics, statics and dynamics – I.H.Shames, – Pearson Publ.
4. Mechanics For Engineers, statics - F.P.Beer & E.R.Johnston – 5th Edn Mc Graw Hill Publ.
5. Mechanics For Engineers, dynamics - F.P.Beer & E.R.Johnston – 5th Edn Mc Graw Hill Publ.
6. Theory & Problems of engineering mechanics, statics & dynamics – E.W.Nelson, C.L.Best & W.G. McLean, 5th Edn – Schaum's outline series - Mc Graw Hill Publ.
7. Singer's Engineering Mechanics: Statics And Dynamics, K. Vijay Kumar Reddy, J. Suresh Kumar, Bs Publications

8. Engineering Mechanics, Ferdinand . L. Singer, Harper – Collins.
9. Engineering Mechanics statics and dynamics , A Nelson , Mc Graw Hill publications

I Year - I Semester

L	T	P	C
4	0	0	3

COMPUTER PROGRAMMING

Learning objectives:

Formulating algorithmic solutions to problems and implementing algorithms in C.

- Notion of Operation of a CPU, Notion of an algorithm and computational procedure, editing and executing programs in Linux.
- Understanding branching, iteration and data representation using arrays.
- Modular programming and recursive solution formulation.
- Understanding pointers and dynamic memory allocation.
- Understanding miscellaneous aspects of C.
- Comprehension of file operations.

UNIT-I:

History and Hardware - Computer Hardware, Bits and Bytes, Components, Programming Languages - Machine Language, Assembly Language, Low- and High-Level Languages, Procedural and Object-Oriented Languages, Application and System Software, The Development of C Algorithms The Software Development Process.

UNIT-II:

Introduction to C Programming- Identifiers, The main () Function, The printf () Function
Programming Style - Indentation, Comments, Data Types, Arithmetic Operations, Expression Types, Variables and Declarations, Negation, Operator Precedence and Associativity, Declaration Statements, Initialization.

Assignment - Implicit Type Conversions, Explicit Type Conversions (Casts), Assignment Variations, Mathematical Library Functions, Interactive Input, Formatted Output, Format Modifiers.

UNIT -III:

Control Flow-Relational Expressions - Logical Operators:

Selection: if-else Statement, nested if, examples, Multi-way selection: switch, else-if, examples.

Repetition: Basic Loop Structures, Pretest and Posttest Loops, Counter-Controlled and Condition-Controlled Loops, The while Statement, The for Statement, Nested Loops, The do-while Statement.

UNIT-IV

Modular Programming: Function and Parameter Declarations, Returning a Value, Functions with Empty Parameter Lists, Variable Scope, Variable Storage Class, Local

Variable Storage Classes, Global Variable Storage Classes, Pass by Reference, Passing Addresses to a Function, Storing Addresses, Using Addresses, Declaring and Using Pointers, Passing Addresses to a Function.

Case Study: Swapping Values, Recursion - Mathematical Recursion, Recursion versus Iteration.

UNIT-V:

Arrays & Strings

Arrays: One-Dimensional Arrays, Input and Output of Array Values, Array Initialization, Arrays as Function Arguments, Two-Dimensional Arrays, Larger Dimensional Arrays-Matrices

Strings: String Fundamentals, String Input and Output, String Processing, Library Functions

UNIT-VI:

Pointers, Structures, Files

Pointers: Concept of a Pointer, Initialisation of pointer variables, pointers as function arguments, passing by address, Dangling memory, address arithmetic, character pointers and functions, pointers to pointers, Dynamic memory management functions, command line arguments.

Structures: Derived types, Structures declaration, Initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self referential structures, unions, typedef, bit-fields.

Data Files: Declaring, Opening, and Closing File Streams, Reading from and Writing to Text Files, Random File Access

Outcomes:

- Understand the basic terminology used in computer programming
- Write, compile and debug programs in C language.
- Use different data types in a computer program.
- Design programs involving decision structures, loops and functions.
- Explain the difference between call by value and call by reference
- Understand the dynamics of memory by the use of pointers
- Use different data structures and create/update basic data files.

Text Books:

1. ANSIC Programming, Gary J. Bronson, Cengage Learning.
2. Programming in C, BI Juneja Anita Seth, Cengage Learning.
3. The C programming Language, Dennis Richie and Brian Kernighan, Pearson Education.

Reference Books:

1. C Programming-A Problem Solving Approach, Forouzan, Gilberg, Cengage.
2. Programming with C, Bichkar, Universities Press.
3. Programming in C, ReemaThareja, OXFORD.
4. C by Example, Noel Kalicharan, Cambridge.

I Year - I Semester

L	T	P	C
4	0	0	3

ENVIRONMENTAL STUDIES

Course Learning Objectives:

The objectives of the course is to impart

- Overall understanding of the natural resources
- Basic understanding of the ecosystem and its diversity
- Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities
- An understanding of the environmental impact of developmental activities
- Awareness on the social issues, environmental legislation and global treaties

Course Outcomes:

The student should have knowledge on

- The natural resources and their importance for the sustenance of the life and recognize the need to conserve the natural resources
- The concepts of the ecosystem and its function in the environment. The need for protecting the producers and consumers in various ecosystems and their role in the food web
- The biodiversity of India and the threats to biodiversity, and conservation practices to protect the biodiversity
- Various attributes of the pollution and their impacts and measures to reduce or control the pollution along with waste management practices
- Social issues both rural and urban environment and the possible means to combat the challenges
- The environmental legislations of India and the first global initiatives towards sustainable development.
- About environmental assessment and the stages involved in EIA and the environmental audit.
- Self Sustaining Green Campus with Environment Friendly aspect of – Energy, Water and Wastewater reuse Plantation, Rain water Harvesting, Parking Curriculum.

Syllabus:

UNIT – I Multidisciplinary nature of Environmental Studies: Definition, Scope and Importance –Sustainability: Stockholm and Rio Summit–Global Environmental Challenges: Global warming and climate change, Carbon Credits, acid rains, ozone layer depletion, population growth and explosion, effects. Role of information Technology in Environment and human health.

Ecosystems: Concept of an ecosystem. - Structure and function of an ecosystem. - Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession. - Food

chains, food webs and ecological pyramids. - Introduction, types, characteristic features, structure and function of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems.

UNIT – II Natural Resources: Natural resources and associated problems

Forest resources – Use and over – exploitation, deforestation – Timber extraction – Mining, dams and other effects on forest and tribal people

Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems

Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, Sustainable mining of Granite, Lignite, Coal, Sea and River sands.

Food resources: World food problems, changes caused by non-agriculture activities-effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity

Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources Vs Oil and Natural Gas Extraction.

Land resources: Land as a resource, land degradation, Wasteland reclamation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

UNIT – III Biodiversity and its conservation: Definition: genetic, species and ecosystem diversity- classification - Value of biodiversity: consumptive use, productive use, social-Biodiversity at national and local levels. India as a mega-diversity nation - Hot-spots of biodiversity - Threats to biodiversity: habitat loss, man-wildlife conflicts - Endangered and endemic species of India – Conservation of biodiversity: conservation of biodiversity.

UNIT – IV Environmental Pollution: Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies, Sustainable Life Studies. Impact of Fire Crackers on Men and his well being.

Solid Waste Management: Sources, Classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products, Biomedical, Hazardous and e – waste management.

UNIT – V Social Issues and the Environment: Urban problems related to energy -Water conservation, rain water harvesting-Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Environmental Protection Act -Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act -Wildlife Protection Act -Forest Conservation Act-Issues involved in enforcement of environmental legislation. -Public awareness.

UNIT – VI Environmental Management: Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS, Environmental audit. Ecotourism, Green Campus – Green business and Green politics.

The student should Visit an Industry / Ecosystem and submit a report individually on any issues related to Environmental Studies course and make a power point presentation.

Text Books:

1. Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers, Vijayawada
2. Environmental Studies, R. Rajagopalan, 2nd Edition, 2011, Oxford University Press.
3. Environmental Studies, P. N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; Pearson Education, Chennai

Reference:

1. Text Book of Environmental Studies, Deeshita Dave & P. Udaya Bhaskar, Cengage Learning.
2. A Textbook of Environmental Studies, Shaashi Chawla, TMH, New Delhi
3. Environmental Studies, Benny Joseph, Tata McGraw Hill Co, New Delhi
4. Perspectives in Environment Studies, Anubha Kaushik, C P Kaushik, New Age International Publishers, 2014

		L	T	P	C
I Year - I Semester	ENGINEERING / APPLIED CHEMISTRY LABORATORY (Common to all branches)	0	0	3	2

1. Introduction to Chemistry laboratory – Molarity, Normality, Primary, secondary standard solutions, Volumetric titrations, Quantitative analysis, Qualitative analysis, etc.
2. Trial experiment - Determination of HCl using standard Na₂CO₃ solution.
3. Determination of alkalinity of a sample containing Na₂CO₃ and NaOH.
4. Determination of KMnO₄ using standard Oxalic acid solution.
5. Determination of Ferrous iron using standard K₂Cr₂O₇ solution.
6. Determination of Copper using standard K₂Cr₂O₇ solution.
7. Determination of temporary and permanent hardness of water using standard EDTA solution.
8. Determination of Copper using standard EDTA solution.
9. Determination of Iron by a Colorimetric method using thiocyanate as reagent.
10. Determination of pH of the given sample solution using pH meter.
11. Conductometric titration between strong acid and strong base.
12. Conductometric titration between strong acid and weak base.
13. Potentiometric titration between strong acid and strong base.
14. Potentiometric titration between strong acid and weak base.
15. Determination of Zinc using standard EDTA solution.
16. Determination of Vitamin – C.

Outcomes: The students entering into the professional course have practically very little exposure to lab classes. The experiments introduce volumetric analysis; redox titrations with different indicators; EDTA titrations; then they are exposed to a few instrumental methods of chemical analysis. Thus at the end of the lab course, the student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills.

Reference Books

1. A Textbook of Quantitative Analysis, Arthur J. Vogel.
2. Dr. Jyotsna Cherukuri (2012) *Laboratory Manual of engineering chemistry-II*, VGS Techno Series
3. Chemistry Practical Manual, Lorven Publications
4. K. Mulkanti (2009) *Practical Engineering Chemistry*, B.S. Publication

I Year - I Semester	L	T	P	C
	0	0	3	2

ENGLISH – COMMUNICATION SKILLS LAB -I

PRESCRIBED LAB MANUAL FOR SEMESTER I:

'INTERACT: English Lab Manual for Undergraduate Students' Published by **Orient Blackswan Pvt Ltd.**

OBJECTIVES:

To enable the students to learn through practice the communication skills of listening, speaking, reading and writing.

OUTCOME:

A study of the communicative items in the laboratory will help the students become successful in the competitive world.

The course content along with the study material is divided into six units.

UNIT 1:

1. WHY study Spoken English?
2. Making Inquiries on the phone, thanking and responding to Thanks
Practice work.

UNIT 2:

1. Responding to Requests and asking for Directions
Practice work.

UNIT 3:

1. Asking for Clarifications, Inviting, Expressing Sympathy, Congratulating
2. Apologising, Advising, Suggesting, Agreeing and Disagreeing
Practice work.

UNIT 4:

1. Letters and Sounds
Practice work.

UNIT 5:

1. The Sounds of English
Practice work.

UNIT 6:

1. Pronunciation
 2. Stress and Intonation
- Practice work.

Assessment Procedure: Laboratory

1. Every lab session (150 minutes) should be handled by not less than two teachers (three would be ideal) where each faculty has to conduct a speaking activity for 20/30 students.
2. The teachers are to assess each learner in the class for not less than 10 speaking activities, each one to be assessed for 10 marks or 10%. The average of 10 day-to-day activity assessments is to be calculated for 10 marks for internal assessment.

The rubric given below has to be filled in for all the students for all activities.

The rubric to assess the learners:

	Body language		Fluency & Audibility	Clarity in Speech	Neutralization of accent	Appropriate Language		Total 10 marks	Remarks
	Gestures & Postures	Eye Contact				Grammar	Vocabulary & expressions		

- **Lab Assessment: Internal (25 marks)**
 1. Day-to-Day activities: 10 marks
 2. Completing the exercises in the lab manual: 5 marks
 3. Internal test (5 marks written and 5 marks oral)
- **Lab Assessment: External (50 marks)**
 1. Written test: 20 marks (writing a dialogue, note-taking and answering questions on listening to an audio recording).
 2. Oral: Reading aloud a text or a dialogue- 10 marks
 3. Viva-Voce by the external examiner: 20 marks

Reference Books:

1. Strengthen your communication skills by Dr M Hari Prasad, Dr Salivendra Raju and Dr G Suvarna Lakshmi, Maruti Publications.
2. English for Professionals by Prof Eliah, B.S Publications, Hyderabad.
3. Unlock, Listening and speaking skills 2, Cambridge University Press
4. Spring Board to Success, Orient BlackSwan
5. A Practical Course in effective english speaking skills, PHI
6. Word power made handy, Dr shalini verma, Schand Company
7. Let us hear them speak, Jayashree Mohanraj, Sage texts
8. Professional Communication, Aruna Koneru, Mc Grawhill Education
9. Cornerstone, Developing soft skills, Pearson Education

I Year - I Semester

L	T	P	C
0	0	3	2

COMPUTER PROGRAMMING LAB

OBJECTIVES:

- Understand the basic concept of C Programming, and its different modules that includes conditional and looping expressions, Arrays, Strings, Functions, Pointers, Structures and File programming.
- Acquire knowledge about the basic concept of writing a program.
- Role of constants, variables, identifiers, operators, type conversion and other building blocks of C Language.
- Use of conditional expressions and looping statements to solve problems associated with conditions and repetitions.
- Role of Functions involving the idea of modularity.

Programming

Exercise - 1 Basics

- a) What is an OS Command, Familiarization of Editors - vi, Emacs
- b) Using commands like mkdir, ls, cp, mv, cat, pwd, and man
- c) C Program to Perform Adding, Subtraction, Multiplication and Division of two numbers From Command line

Exercise - 2 Basic Math

- a) Write a C Program to Simulate 3 Laws at Motion
- b) Write a C Program to convert Celsius to Fahrenheit and vice versa

Exercise - 3 Control Flow - I

- a) Write a C Program to Find Whether the Given Year is a Leap Year or not.
- b) Write a C Program to Add Digits & Multiplication of a number

Exercise – 4 Control Flow - II

- a) Write a C Program to Find Whether the Given Number is
 - i) Prime Number
 - ii) Armstrong Number
- b) Write a C program to print Floyd Triangle
- c) Write a C Program to print Pascal Triangle

Exercise – 5 Functions

- a) Write a C Program demonstrating of parameter passing in Functions and returning values.
- b) Write a C Program illustrating Fibonacci, Factorial with Recursion without Recursion

Exercise – 6 Control Flow - III

- a) Write a C Program to make a simple Calculator to Add, Subtract, Multiply or Divide Using switch...case
- b) Write a C Program to convert decimal to binary and hex (using switch call function the function)

Exercise – 7 Functions - Continued

Write a C Program to compute the values of $\sin x$ and $\cos x$ and e^x values using Series expansion. (use factorial function)

Exercise – 8 Arrays

Demonstration of arrays

- a) Search-Linear.
- b) Sorting-Bubble, Selection.
- c) Operations on Matrix.

Exercises - 9 Structures

- a) Write a C Program to Store Information of a Movie Using Structure
- b) Write a C Program to Store Information Using Structures with Dynamically Memory Allocation
- c) Write a C Program to Add Two Complex Numbers by Passing Structure to a Function

Exercise - 10 Arrays and Pointers

- a) Write a C Program to Access Elements of an Array Using Pointer
- b) Write a C Program to find the sum of numbers with arrays and pointers.

Exercise – 11 Dynamic Memory Allocations

- a) Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc () function.
- b) Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc () function.

Understand the difference between the above two programs

Exercise – 12 Strings

- a) Implementation of string manipulation operations **with** library function.
 - i) copy
 - ii) concatenate
 - iii) length
 - iv) compare
- b) Implementation of string manipulation operations **without** library function.
 - i) copy
 - ii) concatenate
 - iii) length
 - iv) compare

Exercise -13 Files

- a) Write a C programming code to open a file and to print its contents on screen.
- b) Write a C program to copy files

Exercise - 14 Files Continue

- a) Write a C program that merges two files and stores their contents in another file.
- b) Write a C program to delete a file.

OUTCOMES:

- Apply and practice logical ability to solve the problems.
- Understand C programming development environment, compiling, debugging, and linking and executing a program using the development environment
- Analyzing the complexity of problems, Modularize the problems into small modules and then convert them into programs
- Understand and apply the in-built functions and customized functions for solving the problems.
- Understand and apply the pointers, memory allocation techniques and use of files for dealing with a variety of problems.
- Document and present the algorithms, flowcharts and programs in form of user-manuals
- Identification of various computer components, Installation of software

Note:

- a) **All the Programs must be executed in the Linux Environment. (Mandatory)**
- b) **The Lab record must be a print of the LATEX (.tex) Format.**

I Year - II Semester	L	T	P	C
ENGLISH –II	4	0	0	3
(Common to All Branches)				

Introduction:

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training the students to acquire communicative competence, the syllabus has been designed to develop linguistic and communicative competence of the students of Engineering.

As far as the detailed Textbooks are concerned, the focus should be on the skills of listening, speaking, reading and writing. The nondetailed Textbooks are meant for extensive reading for pleasure and profit.

Thus the stress in the syllabus is primarily on the development of communicative skills and fostering of ideas.

Objectives:

1. To improve the language proficiency of the students in English with emphasis on LSRW skills.
2. To enable the students to study and comprehend the prescribed lessons and subjects more effectively relating to their theoretical and practical components.
3. To develop the communication skills of the students in both formal and informal situations.

LISTENING SKILLS:

Objectives:

1. To enable the students to appreciate the role of listening skill and improve their pronunciation.
2. To enable the students to comprehend the speech of people belonging to different backgrounds and regions.
3. To enable the students to listen for general content, to fill up information and for specific information.

SPEAKING SKILLS:

Objectives:

1. To make the students aware of the importance of speaking for their personal and professional communication.
2. To enable the students to express themselves fluently and accurately in social and professional success.
3. To help the students describe objects, situations and people.
4. To make the students participate in group activities like roleplays, discussions and debates.
5. To make the students participate in Just a Minute talks.

READING SKILLS:

Objectives:

1. To enable the students to comprehend a text through silent reading.
2. To enable the students to guess the meanings of words, messages and inferences of texts in given contexts.
3. To enable the students to skim and scan a text.
4. To enable the students to identify the topic sentence.
5. To enable the students to identify discourse features.
6. To enable the students to make intensive and extensive reading.

WRITING SKILLS:

Objectives:

1. To make the students understand that writing is an exact formal skills.
2. To enable the students to write sentences and paragraphs.
3. To make the students identify and use appropriate vocabulary.
4. To enable the students to narrate and describe.
5. To enable the students capable of note-making.
6. To enable the students to write coherently and cohesively.
7. To make the students to write formal and informal letters.
8. To enable the students to describe graphs using expressions of comparison.
9. To enable the students to write technical reports.

Methodology:

1. The class are to be learner-centered where the learners are to read the texts to get a comprehensive idea of those texts on their own with the help of the peer group and the teacher.
2. Integrated skill development methodology has to be adopted with focus on individual language skills as per the tasks/exercise.

3. The tasks/exercises at the end of each unit should be completed by the learners only and the teacher intervention is permitted as per the complexity of the task/exercise.
4. The teacher is expected to use supplementary material wherever necessary and also generate activities/tasks as per the requirement.
5. The teacher is permitted to use lecture method when a completely new concept is introduced in the class.

Assessment Procedure: Theory

1. The formative and summative assessment procedures are to be adopted (mid exams and end semester examination).
2. Neither the formative nor summative assessment procedures should test the memory of the content of the texts given in the textbook. The themes and global comprehension of the units in the present day context with application of the language skills learnt in the unit are to be tested.
3. Only new unseen passages are to be given to test reading skills of the learners. Written skills are to be tested from sentence level to essay level. The communication formats—emails, letters and reports-- are to be tested along with appropriate language and expressions.
4. Examinations:
 I mid exam + II mid exam (15% for descriptive tests+10% for online tests)= 25%

 (80% for the best of two and 20% for the other)

 Assignments= 5%

 End semester exams=70%
5. Three take home assignments are to be given to the learners where they will have to read texts from the reference books list or other sources and write their gist in their own words.

6.

The following text books are recommended for study in I B.Tech II Semester (Common for all branches) and I B.Pharma II Sem of JNTU Kakinada from the academic year 2016-17 (**R-16 Regulations**)

DETAILED TEXTBOOK: ENGLISH ENCOUNTERS Published by **Maruthi Publishers**.

DETAILED NON-DETAIL: THE GREAT INDIAN SCIENTISTS Published by **Cengage learning**

The course content along with the study material is divided into six units.

UNIT 1:

1. 'The Greatest Resource- Education' from English Encounters

OBJECTIVE:

Schumacher describes the education system by saying that it was mere training, something more than mere knowledge of facts.

OUTCOME:

The lesson underscores that the ultimate aim of Education is to enhance wisdom.

2. 'A P J Abdul Kalam' from The Great Indian Scientists.

OBJECTIVE:

The lesson highlights Abdul Kalam's contributions to Indian science and the awards he received.

OUTCOME:

Abdul Kalam's simple life and service to the nation inspires the readers to follow in his footsteps.

UNIT 2:

1. 'A Dilemma' from English Encounters

OBJECTIVE: The lesson centres on the pros and cons of the development of science and technology.

OUTCOME: The lesson enables the students to promote peaceful co-existence and universal harmony among people and society.

2. 'C V Raman' from The Great Indian Scientists.

OBJECTIVE:

The lesson highlights the dedicated research work of C V Raman and his achievements in Physics.

OUTCOME:

The Achievements of C V Raman are inspiring and exemplary to the readers and all scientists.

UNIT 3:

1. 'Cultural Shock': Adjustments to new Cultural Environments from English Encounters.

OBJECTIVE:

The lesson depicts of the symptoms of Cultural Shock and the aftermath consequences.

OUTCOME:

The lesson imparts the students to manage different cultural shocks due to globalization.

2. 'Homi Jehangir Bhabha' from The Great Indian Scientists.

OBJECTIVE:

The lesson highlights Homi Jehangir Bhabha's contributions to Indian nuclear programme as architect.

OUTCOME:

The seminal contributions of Homi Jehangir Bhabha to Indian nuclear programme provide an aspiration to the readers to serve the nation and strengthen it.

UNIT 4:

1. 'The Lottery' from English Encounters.

OBJECTIVE:

The lesson highlights insightful commentary on cultural traditions.

OUTCOME:

The theme projects society's need to re-examine its traditions when they are outdated.

2. 'Jagadish Chandra Bose' from The Great Indian Scientists.

OBJECTIVE:

The lesson gives an account of the unique discoveries and inventions of Jagadish Chandra Bose in Science.

OUTCOME: The Scientific discoveries and inventions of Jagadish Chandra Bose provide inspiration to the readers to make their own contributions to science and technology, and strengthen the nation.

UNIT 5:

1. 'The Health Threats of Climate Change' from English Encounters.

OBJECTIVE:

The essay presents several health disorders that spring out due to environmental changes

OUTCOME:

The lesson offers several inputs to protect environment for the sustainability of the future generations.

2. ' Prafulla Chandra Ray' from The Great Indian Scientists.

OBJECTIVE:

The lesson given an account of the experiments and discoveries in Pharmaceuticals of Prafulla Chandra Ray.

OUTCOME:

Prafulla Chandra Ray's scientific achievements and patriotic fervour provide inspiration to the reader.

UNIT 6:

1. ' The Chief Software Architect' from English Encounters

OBJECTIVE:

The lesson supports the developments of technology for the betterment of human life.

OUTCOME:

Pupil get inspired by eminent personalities who toiled for the present day advancement of software development.

2. ' Srinivasa Ramanujan' from The Great Indian Scientists.

OBJECTIVE:

The lesson highlights the extraordinary achievements of Srinivasa Ramanujan, a great mathematician and the most romantic figure in mathematics.

OUTCOME:

The lesson provides inspiration to the readers to think and tap their innate talents.

NOTE:

All the exercises given in the prescribed lessons in both detailed and non-detailed textbooks relating to the theme and language skills must be covered

MODEL QUESTION PAPER FOR THEORY

PART- I

Six short answer questions on 6 unit themes

One question on eliciting student's response to any of the themes

PART-II

Each question should be from one unit and the last question can be a combination of two or more units.

Each question should have 3 sub questions: A,B & C

A will be from the main text: 5 marks

B from non-detailed text: 3 marks

C on grammar and Vocabulary: 6 marks

I Year - II Semester	MATHEMATICS-II (Mathematical Methods)	L	T	P	C
		4	0	0	3

Course Objectives:

1. The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course.
2. The skills derived from the course will help the student from a necessary base to develop analytic and design concepts.
3. Understand the most basic numerical methods to solve simultaneous linear equations.

Course Outcomes: At the end of the Course, Student will be able to:

1. Calculate a root of algebraic and transcendental equations. Explain relation between the finite difference operators.
2. Compute interpolating polynomial for the given data.
3. Solve ordinary differential equations numerically using Euler's and RK method.
4. Find Fourier series and Fourier transforms for certain functions.
5. Identify/classify and solve the different types of partial differential equations.

UNIT I: Solution of Algebraic and Transcendental Equations:

Introduction- Bisection method – Method of false position – Iteration method – Newton-Raphson method (One variable and simultaneous Equations).

UNIT II: Interpolation:

Introduction- Errors in polynomial interpolation – Finite differences- Forward differences- Backward differences –Central differences – Symbolic relations and separation of symbols - Differences of a polynomial-Newton's formulae for interpolation – Interpolation with unequal intervals - Lagrange's interpolation formula.

UNIT III: Numerical Integration and solution of Ordinary Differential equations:

Trapezoidal rule- Simpson's $1/3^{\text{rd}}$ and $3/8^{\text{th}}$ rule-Solution of ordinary differential equations by Taylor's series-Picard's method of successive approximations-Euler's method - Runge-Kutta method (second and fourth order).

UNIT IV: Fourier Series:

Introduction- Periodic functions – Fourier series of π -periodic function - Dirichlet's conditions – Even and odd functions –Change of interval– Half-range sine and cosine series.

UNIT V: Applications of PDE:

Method of separation of Variables- Solution of One dimensional Wave, Heat and two-dimensional Laplace equation.

UNIT VI: Fourier Transforms:

Fourier integral theorem (without proof) – Fourier sine and cosine integrals - sine and cosine transforms – properties – inverse transforms – Finite Fourier transforms.

Text Books:

1. **B.S.Grewal**, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. **N.P.Bali**, Engineering Mathematics, Lakshmi Publications.

Reference Books:

1. **Dean G. Duffy**, Advanced engineering mathematics with MATLAB, CRC Press
2. **V.Ravindranath and P.Vijayalakshmi**, Mathematical Methods, Himalaya Publishing House.
3. **Erwin Kreyszig**, Advanced Engineering Mathematics, 10th Edition, Wiley-India
4. **David Kincaid, Ward Cheney**, Numerical Analysis-Mathematics of Scientific Computing, 3rd Edition, Universities Press.
5. **Srimanta Pal, Subodh C.Bhunia**, Engineering Mathematics, Oxford University Press.
6. **Dass H.K., Rajnish Verma. Er.**, Higher Engineering Mathematics, S. Chand Co. Pvt. Ltd, Delhi.

I Year - II Semester

MATHEMATICS – III

L	T	P	C
4	0	0	3

Course Objectives:

1. The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course.
2. The skills derived from the course will help the student from a necessary base to develop analytic and design concepts.
3. Understand the most basic numerical methods to solve simultaneous linear equations.

Course Outcomes: At the end of the Course, Student will be able to:

1. Determine rank, Eigenvalues and Eigen vectors of a given matrix and solve simultaneous linear equations.
2. Solve simultaneous linear equations numerically using various matrix methods.
3. Determine double integral over a region and triple integral over a volume.
4. Calculate gradient of a scalar function, divergence and curl of a vector function. Determine line, surface and volume integrals. Apply Green, Stokes and Gauss divergence theorems to calculate line, surface and volume integrals.

UNIT I: Linear systems of equations:

Rank-Echelon form-Normal form – Solution of linear systems – Gauss elimination - Gauss Jordan- Gauss Jacobi and Gauss Seidal methods.Applications: Finding the current in electrical circuits.

UNIT II: Eigen values - Eigen vectors and Quadratic forms:

Eigen values - Eigen vectors– Properties – Cayley-Hamilton theorem - Inverse and powers of a matrix by using Cayley-Hamilton theorem- Diagonalization- Quadratic forms- Reduction of quadratic form to canonical form – Rank - Positive, negative and semi definite - Index – Signature.

Applications: Free vibration of a two-mass system.

UNIT III: Multiple integrals:

Curve tracing: Cartesian, Polar and Parametric forms.

Multiple integrals: Double and triple integrals – Change of variables – Change of order of integration.

Applications: Finding Areas and Volumes.

UNIT IV: Special functions:

Beta and Gamma functions- Properties - Relation between Beta and Gamma functions- Evaluation of improper integrals.

Applications: Evaluation of integrals.

UNIT V: Vector Differentiation:

Gradient- Divergence- Curl - Laplacian and second order operators -Vector identities.

Applications: Equation of continuity, potential surfaces

UNIT VI: Vector Integration:

Line integral – Work done – Potential function – Area- Surface and volume integrals Vector integral theorems: Greens, Stokes and Gauss Divergence theorems (without proof) and related problems.

Applications: Work done, Force.

Text Books:

1. **B.S.Grewal**, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. **N.P.Bali**, Engineering Mathematics, Lakshmi Publications.

Reference Books:

1. **Greenberg**, Advanced Engineering Mathematics, 2nd edition, Pearson edn
2. **Erwin Kreyszig**, Advanced Engineering Mathematics, 10th Edition, Wiley-India
3. **Peter O'Neil**, Advanced Engineering Mathematics, 7th edition, Cengage Learning.
4. **D.W. Jordan and T.Smith**, Mathematical Techniques, Oxford University Press.
5. **Srimanta Pal, Subodh C.Bhunia**, Engineering Mathematics, Oxford University Press.
6. **Dass H.K., Rajnish Verma. Er.**, Higher Engineering Mathematics, S. Chand Co. Pvt. Ltd, Delhi.

I Year - II Semester	ENGINEERING PHYSICS	L	T	P	C
		4	0	0	3

(ME, CE, PE, PCE, MET.E, MINING, AUTOMOBILE, CHEMICAL, AERONAUTICAL, BIO.TECH)

OBJECTIVES: *Physics curriculum which is re-oriented to the needs of Circuital branches of graduate engineering courses offered by JNTUniv.Kkd. that serves as a transit to understand the branch specific advanced topics. The courses are designed to:*

- *Impart concepts of Optical Interference, Diffraction and Polarization required to design instruments with higher resolution - Concepts of coherent sources, its realization and utility optical instrumentation.*
- *Study the Structure-property relationship exhibited by solid crystal materials for their utility.*
- *Tap the Simple harmonic motion and its adaptability for improved acoustic quality of concert halls.*
- *To explore the Nuclear Power as a reliable source required to run industries*
- *To impart the knowledge of materials with characteristic utility in appliances.*

UNIT-I

INTERFERENCE: Principle of Superposition – Coherent Sources – Interference in thin films (reflection geometry) – Newton’s rings – construction and basic principle of Interferometers.

UNIT-II

DIFFRACTION: Fraunhofer diffraction at single slit cases of double slit, N-slits & Circular Aperture (Qualitative treatment only)-Grating equation - Resolving power of a grating, Telescope and Microscopes.

UNIT-III

POLARIZATION: Types of Polarization-production - Nicol Prism -Quarter wave plate and Half Wave plate – Working principle of Polarimeter (Sacharimeter)

LASERS: Characteristics– Stimulated emission – Einstein’s Transition Probabilities-Pumping schemes - Ruby laser – Helium Neon laser.

UNIT-IV

ACOUSTICS: Reverberation time - Sabine’s formula – Acoustics of concert-hall.

ULTRASONICS: Production - Ultrasonic transducers- Non-Destructive Testing – Applications.

UNIT-V

CRYSTALLOGRAPHY & X-RAY DIFFRACTION: Basis and lattice – Bravais systems-Symmetry elements- Unit cell- packing fraction – coordination number- Miller indices – Separation between successive (h k l) planes – Bragg’s law.

NUCLEAR ENERGY – SOURCE OF POWER: Mass defect & Binding Energy – Fusion and Fission as sources – Fast breeder Reactors.

UNIT-VI

MAGNETISM: Classification based on Field, Temperature and order/disorder –atomic origin – Ferromagnetism- Hysteresis- applications of magnetic materials (Para & Ferro)..

DIELECTRICS: Electric Polarization – Dielectrics in DC and AC fields – Internal field – Clausius Mossoti Equation - Loss, Breakdown and strength of dielectric materials – Ferroelectric Hysteresis and applications.

Outcome: Construction and working details of instruments, ie., Interferometer, Diffractometer and Polarimeter are learnt. Study Acoustics, crystallography magnetic and dielectric materials enhances the utility aspects of materials.

Text Books:

1. A Text book of Engineering Physics – by Dr. M.N.Avadhanulu and Dr.P.G.Kshirasagar, S.Chand & Company Ltd., (2014)
2. Physics for Engineers by M.R.Srinasan, New Age international publishers (2009)
3. Engineering Physics by D.K.Bhattacharya and Poonam Tandon , Oxford press (2015)

Reference books:

1. Applied Physics by P.K.Palanisamy , Scitech publications (2014)
2. Lasers and Non-Linear optics by B.B.Laud , Newage international publishers (2008)

I Year - II Semester

L	T	P	C
4	0	0	3

ELEMENTS OF MECHANICAL ENGINEERING

Learning Objectives: The content of this course shall provide the student the basic concepts of various mechanical systems and exposes the student to a wide range of equipment and their utility in a practical situation. It shall provide the fundamental principles of materials, fuels, Steam, I.C. Engines, compressors, hydraulic machines and transmission systems that usually exist in any process plant.

UNIT –I:

Stresses and strains: kinds of – stress-strains, elasticity and plasticity, Hooks law, stress – strain diagrams, modulus of elasticity, Poisson’s ratio, linear and volumetric strain, relation between E, N, and K, bars of uniform strength, compound bars and temperature stresses.

UNIT– II:

Types of supports – loads – Shear force and bending moment for cantilever and simply supported beams without overhanging for all types of loads.

Theory of simple bending, simple bending formula, Distribution of Flexural and Shear stress in Beam section – Shear stress formula – Shear stress distribution for some standard sections

UNIT-III:

Thin cylindrical shells: stress in cylindrical shells due to internal pressures, circumferential stress, longitudinal stress, design of thin cylindrical shells, spherical shells, change in dimension of the shell due to internal pressure, change in volume of the shell due to internal pressure.

Thick Cylinders: Lamé’s equation- cylinders subjected to inside and outside pressures columns and Struts.

UNIT-IV:

Steam boilers and Reciprocating air compressors: Classification of boilers, essentialities of boilers, selection of different types of boilers, study of boilers, boiler mountings and accessories.

Reciprocating air compressors: uses of compressed air, work done in single stage and two-stage compression, inter cooling and simple problems.

UNIT-V:

Internal combustion engines: classification of IC engines, basic engine components and nomenclature, working principle of engines, Four strokes and two stroke petrol and diesel engines, comparison of CI and SI engines, comparison of four stroke and two stroke engines, simple problems such as indicated power, brake power, friction power, specific fuel consumption, brake thermal efficiency, indicated thermal efficiency and mechanical efficiency.

UNIT-VI:

Transmission systems:Belts –Ropes and chain: belt and rope drives, velocity ratio, slip, length of belt , open belt and cross belt drives, ratio of friction tensions, centrifugal tension in a belt, power transmitted by belts and ropes, initial tensions in the belt, simple problems.

Gear trains: classification of gears, gear trains velocity ratio, simple, compound –reverted and epicyclic gear trains.

Outcomes: After completing the course, the student shall be able to determine:

- The stress/strain of a mechanical component subjected to loading.
- The performance of components like Boiler, I.C. Engine, Compressor, Steam/Hydraulic turbine, Belt, Rope and Gear.
- The type of mechanical component suitable for the required power transmission.

Text Books:

1. Strength of Materials and Mechanics of Structures, B.C.Punmia, Standard Publications and distributions, 9th edition, 1991.
2. Thermal Engineering, Ballaney,P.L., Khanna Publishers, 2003.
3. Elements of Mechanical Engineering, A.R.Asrani, S.M.Bhatt and P.K.Shah, B.S. Pubs.
4. Elements of Mechanical Engineering, M.L.Mathur, F.S.Metha&R.P.Tiwari Jain Brothers Pubs., 2009.

Reference Book:

Theory of Machines, S.S. Rattan, Tata McGraw Hil., 2004 & 2009.

I Year - II Semester

ENGINEERING DRAWING

L	T	P	C
4	0	0	3

Learning Objectives:

- Engineering drawing being the principle method of communication for engineers, the objective is to introduce the students, the techniques of constructing the various types of polygons, curves and scales. The objective is also to visualize and represent the 3D objects in 2D planes with proper dimensioning, scaling etc.

UNIT-I:

Objective: To introduce the students to use drawing instruments and to draw polygons, Engg. Curves.

Polygons: Constructing regular polygons by general methods, inscribing and describing polygons on circles.

Curves: Parabola, Ellipse and Hyperbola by general methods, cycloids, involutes, tangents & normals for the curves.

UNIT-II:

Objective: To introduce the students to use scales and orthographic projections, projections of points & simple lines.

Scales: Plain scales, diagonal scales and vernier scales

Orthographic Projections: Horizontal plane, vertical plane, profile plane, importance of reference lines, projections of points in various quadrants, projections of lines, lines parallel either to of the reference planes (HP, VP or PP)

UNIT-III:

Objective: The objective is to make the students draw the projections of the lines inclined to both the planes.

Projections of straight lines inclined to both the planes, determination of true lengths, angle of inclination and traces- HT, VT

UNIT-IV:

Objective: The objective is to make the students draw the projections of the plane inclined to both the planes.

Projections of planes: regular planes perpendicular/parallel to one plane and inclined to the other reference plane; inclined to both the reference planes.

UNIT-V:

Objective: The objective is to make the students draw the projections of the various types of solids in different positions inclined to one of the planes.

Projections of Solids – Prisms, Pyramids, Cones and Cylinders with the axis inclined to one of the planes.

UNIT-VI:

Objective: The objective is to represent the object in 3D view through isometric views. The student will be able to represent and convert the isometric view to orthographic view and vice versa.

Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

Text Books:

1. Engineering Drawing, N.D. Butt, Chariot Publications.
2. Engineering Drawing, Agarwal & Agarwal, Tata McGraw Hill Publishers.

Reference Books:

1. Engineering Drawing, K.L.Narayana& P. Kannaiah, Scitech Publishers.
2. Engineering Graphics for Degree, K.C. John, PHI Publishers.
3. Engineering Graphics, PI Varghese, McGrawHill Publishers
4. Engineering Drawing + AutoCAD, K Venugopal, V. Prabhu Raja, New Age.

	L	T	P	C
I Year - II Semester				
ENGLISH – COMMUNICATION SKILLS				
LAB – II	0	0	3	2

PRESCRIBED LAB MANUAL FOR SEMESTER II:

'**INTERACT:** English Lab Manual for Undergraduate Students' Published by **Orient Blackswan Pvt Ltd.**

OBJECTIVES:

To enable the students to learn demonstratively the communication skills of listening, speaking, reading and writing.

OUTCOME:

A study of the communicative items in the laboratory will help the students become successful in the competitive world.

The course content along with the study material is divided into six units.

UNIT 1:

1. Debating
Practice work

UNIT 2:

1. Group Discussions
Practice work

UNIT 3:

1. Presentation Skills
Practice work

UNIT 4:

1. Interview Skills
Practice work

UNIT 5:

1. Email,
2. Curriculum Vitae
Practice work

UNIT 6:

1. Idiomatic Expressions
2. Common Errors in English
Practice work

Reference Books:

1. Strengthen your communication skills by Dr M Hari Prasad, Dr Salivendra Raju and Dr G Suvarna Lakshmi, Maruti Publications.
2. English for Professionals by Prof Eliah, B.S Publications, Hyderabad.
3. Unlock, Listening and speaking skills 2, Cambridge University Press
4. Spring Board to Success, Orient BlackSwan
5. A Practical Course in effective english speaking skills, PHI
6. Word power made handy, Dr shalini verma, Schand Company
7. Let us hear them speak, Jayashree Mohanraj, Sage texts
8. Professional Communication, Aruna Koneru, Mc Grawhill Education
9. Cornerstone, Developing soft skills, Pearson Education

I Year - II Semester	L	T	P	C
	0	0	3	2

ENGINEERING/APPLIED PHYSICS LAB

(Any 10 of the following listed experiments)

Objective: *Training field oriented Engineering graduates to handle instruments and their design methods to improve the accuracy of measurements.*

LIST OF EXPERIMENTS:

1. Determination of wavelength of a source-Diffraction Grating-Normal incidence.
2. Newton's rings – Radius of Curvature of Plano - Convex Lens.
3. Determination of thickness of a spacer using wedge film and parallel interference fringes.
4. Determination of Rigidity modulus of a material- Torsional Pendulum.
5. Determination of Acceleration due to Gravity and Radius of Gyration- Compound Pendulum.
6. Melde's experiment – Transverse and Longitudinal modes.
7. Verification of laws of vibrations in stretched strings – Sonometer.
8. Determination of velocity of sound – Volume Resonator.
9. L- C- R Series Resonance Circuit.
10. Study of I/V Characteristics of Semiconductor diode.
11. I/V characteristics of Zener diode.
12. Characteristics of Thermistor – Temperature Coefficients.
13. Magnetic field along the axis of a current carrying coil – Stewart and Gee's apparatus.
14. Energy Band gap of a Semiconductor p - n junction.
15. Hall Effect in semiconductors.
16. Time constant of CR circuit.
17. Determination of wavelength of laser source using diffraction grating.
18. Determination of Young's modulus by method of single cantilever oscillations.
19. Determination of lattice constant – lattice dimensions kit.
20. Determination of Planck's constant using photocell.
21. Determination of surface tension of liquid by capillary rise method.

Outcome: *Physics lab curriculum gives fundamental understanding of design of an instrument with targeted accuracy for physical measurements.*

I Year - II Semester	L	T	P	C
	0	0	2	0

ENGINEERING /APPLIED/PHYSICS - VIRTUAL LABS – ASSIGNMENTS
(Constitutes 5% marks of 30marks of Internal-component)

Objective: *Training Engineering students to prepare a technical document and improving their writing skills.*

LIST OF EXPERIMENTS

1. Hall Effect
2. Crystal Structure
3. Hysteresis
4. Brewster's angle
5. Magnetic Levitation / SQUID
6. Numerical Aperture of Optical fiber
7. Photoelectric Effect
8. Simple Harmonic Motion
9. Damped Harmonic Motion
10. LASER – Beam Divergence and Spot size
11. B-H curve
12. Michelson's interferometer
13. Black body radiation

URL: www.vlab.co.in

Outcome: *Physics Virtual laboratory curriculum in the form of assignment ensures an engineering graduate to prepare a /technical/mini-project/ experimental report with scientific temper.*

I Year - II Semester

L	T	P	C
0	0	3	2

ENGINEERING WORKSHOP & IT WORKSHOP

ENGINEERING WORKSHOP:

Course Objective: To impart hands-on practice on basic engineering trades and skills.

Note: At least two exercises to be done from each trade.

Trade:

Carpentry

1. T-Lap Joint
2. Cross Lap Joint
3. Dovetail Joint
4. Mortise and Tennon Joint

Fitting

1. Vee Fit
2. Square Fit
3. Half Round Fit
4. Dovetail Fit

Black Smithy

1. Round rod to Square
2. S-Hook
3. Round Rod to Flat Ring
4. Round Rod to Square headed bolt

House Wiring

1. Parallel / Series Connection of three bulbs
2. Stair Case wiring
3. Florescent Lamp Fitting
4. Measurement of Earth Resistance

Tin Smithy

1. Taper Tray
2. Square Box without lid
3. Open Scoop
4. Funnel

IT WORKSHOP:

OBJECTIVES:

- Understand the basic components and peripherals of a computer.
- To become familiar in configuring a system.
- Learn the usage of productivity tools.
- Acquire knowledge about the netiquette and cyber hygiene.
- Get hands on experience in trouble shooting a system?

1. System Assembling, Disassembling and identification of Parts / Peripherals

2. Operating System Installation-Install Operating Systems like Windows, Linux along with necessary Device

Drivers.

3. MS-Office / Open Office

- a. **Word** - Formatting, Page Borders, Reviewing, Equations, symbols.
- b. **Spread Sheet** - organize data, usage of formula, graphs, charts.
- c. **Power point** - features of power point, guidelines for preparing an effective presentation.
- d. **Access**- creation of database, validate data.

4. Network Configuration & Software Installation-Configuring TCP/IP, proxy and firewall settings. Installing application software, system software & tools.

5. Internet and World Wide Web-Search Engines, Types of search engines, netiquette, cyber hygiene.

6. Trouble Shooting-Hardware trouble shooting, Software trouble shooting.

7. MATLAB- basic commands, subroutines, graph plotting.

8. LATEX-basic formatting, handling equations and images.

OUTCOMES:

- Common understanding of concepts, patterns of decentralization implementation in Africa †
- Identified opportunities for coordinated policy responses, capacity building and implementation of best practices †
- Identified instruments for improved decentralization to the local level †
- Identified strategies for overcoming constraints to effective decentralization and sustainable management at different levels

TEXT BOOKS:

1. Computer Hardware, Installation, Interfacing, Troubleshooting and Maintenance, K.L. James, Eastern Economy Edition.
2. Microsoft Office 2007: Introductory Concepts and Techniques, Windows XP Edition By Gary B. Shelly, Misty E. Vermaat and Thomas J. Cashman (2007, Paperback).
3. LATEX- User's Guide and Reference manual, Leslie Lamport, Pearson, LPE, 2/e.
4. Getting Started with MATLAB: A Quick Introduction for Scientists and Engineers, Rudraprathap, Oxford University Press, 2002.
5. Scott Mueller's Upgrading and Repairing PCs, 18/e, Scott. Mueller, QUE, Pearson, 2008
6. The Complete Computer upgrade and repair book, 3/e, Cheryl A Schmidt, Dreamtech.
7. Comdex Information Technology course tool kit Vikas Gupta, WILEY Dreamtech.
8. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.

II Year - I Semester

L	T	P	C
4	0	0	3

PROBABILITY AND STATISTICS
(Common to CE, CSE, IT, Chemical, PE, PCE, Civil Branches)

Course Objectives: To acquaint students with the fundamental concepts of probability and statistics and to develop an understanding of the role of statistics in engineering. Also to introduce numerical techniques to solve the real world applications.

Course Outcomes: At the end of the Course, Student will be able to:

1. Examine, analyze, and compare various Probability distributions for both discrete and continuous random variables.
2. Describe and compute confidence intervals for the mean of a population.
3. Describe and compute confidence intervals for the proportion and the variance of a population and test the hypothesis concerning mean, proportion and variance and perform ANOVA test.
4. Fit a curve to the numerical data.

UNIT I: Discrete Random variables and Distributions:

Introduction-Random variables- Discrete Random variable-Distribution function- Expectation-Moment Generating function-Moments and properties.

Discrete distributions: Binomial, Poisson and Geometric distributions and their fitting to data.

UNIT II: Continuous Random variable and distributions:

Introduction-Continuous Random variable-Distribution function- Expectation-Moment Generating function-Moments and properties.

Continuous distribution: Uniform, Exponential and Normal distributions, Normal approximation to Binomial distribution -Weibull, Gamma distribution.

UNIT III: Sampling Theory:

Introduction - Population and samples- Sampling distribution of means (σ known)-Central limit theorem- t-distribution- Sampling distribution of means (σ unknown)- Sampling distribution of variances - χ^2 and F-distributions- Point estimation- Maximum error of estimate - Interval estimation.

UNIT IV: Tests of Hypothesis:

Introduction -Hypothesis-Null and Alternative Hypothesis- Type I and Type II errors -Level of significance - One tail and two-tail tests- Tests concerning one mean and proportion, two means- Proportions and their differences- ANOVA for one-way and two-way classified data.

UNIT V: Curve fitting and Correlation:

Introduction - Fitting a straight line -Second degree curve-exponential curve-power curve by method of least squares-Goodness of fit.

Correlation and Regression - Properties.

UNIT VI: Statistical Quality Control Methods:

Introduction - Methods for preparing control charts – Problems using x-bar, p, R charts and attribute charts.

Text Books:

1. **Jay I.devore**, Probability and Statistics for Engineering and the Sciences.8th edition,Cengage.
2. **Richards A Johnson, Irvin Miller and Johnson E Freund**. Probability and Statistics for Engineering, 9th Edition,PHI.

Reference Books:

1. **Shron L.Myers, Keying Ye, Ronald E Walpole**, Probability and Statistics Engineers and the Scientists,8th Edition, Pearson 2007.
2. **William Menden Hall, Robert J. Bever and Barbara Bever**, Introduction to probability and statistics, Cengage learning.2009
3. **Sheldon, M. Rosss**, Introduction to probability and statistics Engineers and the Scientists,
4th edition, Academic Foundation,2011
4. **Johannes Ledolter and Robert V.Hogg**, Applied statistics for Engineers and Physical Scientists, 3rd Edition, Pearson,2010

II Year - I Semester

L	T	P	C
4	0	0	3

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

Preamble:

This course covers the topics related to analysis of various electrical circuits, operation of various electrical machines, various electronic components to perform well in their respective fields.

Learning Objectives:

- To learn the basic principles of electrical law's and analysis of networks.
- To understand the principle of operation and construction details of DC machines.
- To understand the principle of operation and construction details of transformer.
- To understand the principle of operation and construction details of alternator and 3-Phase induction motor.
- To study the operation of PN junction diode, half wave, full wave rectifiers and OP-AMPs.
- To learn the operation of PNP and NPN transistors and various amplifiers.

Outcomes:

- Able to analyse the various electrical networks.
- Able to understand the operation of DC generators, 3-point starter and conduct the Swinburne's Test.
- Able to analyse the performance of transformer.
- Able to explain the operation of 3-phase alternator and 3-phase induction motors.
- Able to analyse the operation of half wave, full wave rectifiers and OP-AMPs.
- Able to explain the single stage CE amplifier and concept of feedback amplifier.

UNIT – I, ELECTRICAL CIRCUITS:

Basic definitions, Types of network elements, Ohm's Law, Kirchhoff's Laws, inductive networks, capacitive networks, series, parallel circuits and star-delta and delta-star transformations.

UNIT – II, DC MACHINES:

Principle of operation of DC generator – emf equation - types – DC motor types –torque equation – applications – three point starter, swinburn's Test, speed control methods.

UNIT – III, TRANSFORMERS:

Principle of operation of single phase transformers – e.m.f equation – losses –efficiency and regulation.

UNIT – IV, AC MACHINES: Principle of operation of alternators – regulation by synchronous impedance method –principle of operation of 3-Phase induction motor – slip-torque characteristics - efficiency – applications.

UNIT V, RECTIFIERS & LINEAR ICs: PN junction diodes, diode applications (Half wave and bridge rectifiers). Characteristics of operation amplifiers (OP-AMP) - application of OP-AMPs(inverting, non inverting, integrator and differentiator).

UNIT VI, TRANSISTORS: PNP and NPN junction transistor, transistor as an amplifier, single stage CE Amplifier, frequency response of CE amplifier, concepts of feedback amplifier.

TEXT BOOKS:

1. Electronic Devices and Circuits, R. L. Boylestad and Louis Nashelsky, 9th edition, PEI/PHI 2006.
2. Electrical Technology by Surinder Pal Bali, Pearson Publications.
3. Electrical Circuit Theory and Technology by John Bird, Routledge Taylor &Francis Group

REFERENCES:

1. Basic Electrical Engineering, M. S. Naidu and S. Kamakshiah, TMH Publications
2. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI Publications, 2nd edition
3. Basic Electrical Engineering, Nagsarkar, Sukhija, Oxford Publications, 2nd edition
4. Industrial Electronics, G. K. Mittal, PHI

II Year - I Semester	L	T	P	C
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STRENGTH OF MATERIALS-I

Course Learning Objectives:

- To impart preliminary concepts of Strength of Material and Principles of Elasticity and Plasticity Stress strain behavior of materials and their governing laws. Introduce student the moduli of Elasticity and their relations
- To impart concepts of Bending Moment and Shear force for beams with different boundary and loading conditions and to draw the diagrams of variation across the length.
- To give concepts of stresses developed in the cross section and bending equations calculation of section modulus of sections with different cross sections
- The concepts above will be utilized in measuring deflections in beams under various loading and support conditions
- To classify cylinders based on their thickness and to derive equations for measurement of stresses across the cross section when subjected to external pressure.

Course Outcomes:

- The student will be able to understand the basic materials behavior under the influence of different external loading conditions and the support conditions
- The student will be able to draw the diagrams indicating the variation of the key performance features like bending moment and shear forces
- The student will have knowledge of bending concepts and calculation of section modulus and for determination of stresses developed in the beams and deflections due to various loading conditions
- The student will be able to assess stresses across section of the thin and thick cylinders to arrive at optimum sections to withstand the internal pressure using Lamé's equation.

SYLLABUS:

UNIT – I: Simple Stresses And Strains And Strain Energy: Elasticity and plasticity – Types of stresses and strains – Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio and volumetric strain – Elastic moduli and the relationship between them – Bars of varying section – composite bars – Temperature stresses.

Strain Energy – Resilience – Gradual, sudden, impact and shock loadings – simple applications.

UNIT – II: Shear Force And Bending Moment: Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, u.d.l., uniformly varying loads and combination of these loads – Point of contraflexure – Relation between S.F., B.M and rate of loading at a section of a beam

UNIT – III: Flexural Stresses: Theory of simple bending – Assumptions – Derivation of bending equation: $M/I = f/y = E/R$, Neutral axis – Determination bending stresses – section modulus of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections – Design of simple beam sections.

UNIT –IV: Shear Stresses: Derivation of formula – Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T angle sections, built up beams, shear centre.

UNIT – V: Deflection Of Beams: Bending into a circular arc – slope, deflection and radius of curvature – Differential equation for the elastic line of a beam – Double integration and Macaulay's methods – Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, - U.D.L. Uniformly varying load. Mohr's theorems – Moment area method – application to simple cases including overhanging beams.

UNIT – VI: Thin And Thick Cylinders: Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and Volumetric strains – changes in diameter, and volume of thin cylinders – Thin spherical shells.

Thick Cylinders: Introduction Lamé's theory for thick cylinders – Derivation of Lamé's formulae – distribution of hoop and radial stresses across thickness – design of thick cylinders – compound cylinders – Necessary difference of radii for shrinkage – Thick spherical shells.

TEXT BOOKS:

1. Strength of Materials by Strength of materials, R. K. Rajput, S. Chand & Co, New Delhi
2. Strength of Materials by S. Ramamrutham,

REFERENCES:

1. Strength of Materials by R.K Bansal, Lakshmi Publications

II Year - I Semester

L	T	P	C
4	0	0	3

BUILDING MATERIALS AND CONSTRUCTION

I. Objectives of the course:

- Initiating the student with the knowledge of basic building materials and their properties.
- Imparting the knowledge of course pattern in masonry construction and flat roofs and techniques of forming foundation, columns, beams, walls, sloped and flat roofs.
- The student is to be exposed to the various patterns of floors, walls, different types of paints and varnishes.
- Imparting the students with the techniques of formwork and scaffolding.
- The students should be exposed to classification of aggregates, moisture content of the aggregate.

II. Course outcome:

Upon the successful completion of the course:

- The student should be able to identify different building materials and their importance in building construction.
- The student is expected to differentiate brick masonry, stone masonry construction and use of lime and cement in various constructions.
- The student should have learnt the importance of building components and finishings.
- The student is expected to know the classification of aggregates, sieve analysis and moisture content usually required in building construction.

UNIT I: Stones, Bricks And Tiles Properties of building stones – relation to their structural requirements, classification of stones – stone quarrying – precautions in blasting, dressing of stone, composition of good brick earth, various methods of manufacturing of bricks. Characteristics of good tile - manufacturing methods, types of tiles. Uses of materials like Aluminium, Gypsum, Glass and Bituminous materials

UNIT II Masonry Types of masonry, English and Flemish bonds, Rubble and Ashlar Masonry. Cavity and partition walls. Wood: Structure – Properties- Seasoning of timber- Classification of various types of woods used in buildings- Defects in timber. Alternative materials for wood – Galvanized Iron, Fiber Reinforced Plastics, Steel, Aluminium.

UNIT III: Lime And Cement Lime: Various ingredients of lime – Constituents of lime stone – classification of lime – various methods of manufacture of lime.

Cement: Portland cement- Chemical Composition – Hydration, setting and fineness of cement. Various types of cement and their properties. Various field and laboratory tests for Cement. Various ingredients of cement concrete and their importance – various tests for concrete.

UNIT IV: Building Components Lintels, arches, vaults, stair cases – types. Different types of floors – Concrete, Mosaic, Terrazzo floors, Pitched, flat roofs. Lean to roof, Coupled Roofs. Trussed roofs – King and Queen post Trusses. R.C.C Roofs, Madras Terrace and Pre fabricated roofs.

UNIT V: Finishings Damp Proofing and water proofing materials and uses – Plastering Pointing, white washing and distempering. Paints: Constituents of a paint – Types of paints – Painting of new/old wood- Varnish. Form Works and Scaffoldings.

UNIT VI: Aggregates Classification of aggregate – Coarse and fine aggregates- particle shape and texture – Bond and Strength of aggregate – Specific gravity – Bulk Density, porosity and absorption – Moisture content of Aggregate- Bulking of sand – Sieve analysis.

Text Books:

1. Building Materials, S. S. Bhavikatti, Vices publications House private ltd.
2. Building Construction, S. S. Bhavikatti, Vices publications House private ltd.
3. Building Materials, B. C. Punmia, Laxmi Publications private ltd.
4. Building Construction, B.C. Punmia, Laxmi Publications (p) ltd.

References:

1. Building Materials, S. K. Duggal, New Age International Publications.
2. Building Materials, P. C. Verghese, PHI learning (P) ltd.
3. Building Materials, M. L. Gambhir, Tata McGraw Hill Publishing Co. Ltd. New Delhi.
4. Building construction, P. C. Verghese, PHI Learning (P) Ltd.
5. Building Materials, Construction and Planning, S. Mahaboob Basha, Anuradha Publications, Chennai.

II Year - I Semester

L	T	P	C
4	0	0	3

SURVEYING

Course Learning Objectives:

To introduce the students to basic principles of surveying, various methods of linear and angles measuring instruments and enable the students to use surveying equipments.

Course Outcomes:

Upon successful completion of the course, the student will be able:

- To demonstrate the basic surveying skills
- To use various surveying instruments.
- To perform different methods of surveying
- To compute various data required for various methods of surveying.
- To integrate the knowledge and produce topographical map.

Syllabus:

UNIT – I, Introduction: definition-Uses of surveying- overview of plane surveying (chain, compass and plane table), Objectives, Principles and classifications – Errors in survey measurements

UNIT – II Distances And Direction: Electronic distance measurements (EDM)- principles of electro optical EDM-Errors and corrections to linear measurements- Compass survey- Meridians, Azimuths and Bearings, declination, computation of angle. Traversing-Purpose-types of traverse-traverse computation-traverse adjustments-Introduction omitted measurements

UNIT – III Leveling And Contouring: Concept and Terminology, Levelling Instruments and their Temporary and permanent adjustments- method of levelling. Characteristics and Uses of contours- methods of conducting contour surveys.

UNIT – IV Theodolite: Description, principles-uses and adjustments – temporary and permanent, measurement of horizontal and vertical angles. Principles of Electronic Theodolite – Introduction to Trigonometrical leveling,.

Tachometric Surveying: Stadia and tangential methods of Tacheometry. Distance and Elevation formulae for Staff vertical position.

UNIT – V Curves: Types of curves, design and setting out – simple and compound curves- Introduction to geodetic surveying, Total Station and Global positioning system

UNIT – VI Computation Of Areas And Volumes: Area from field notes, computation of areas along irregular boundaries and area consisting of regular boundaries. Embankments and cutting for a level section and two level sections with and without transverse slopes, determination of the capacity of reservoir, volume of barrow pits.

Text Books:

1. Surveying, Vol No.1, 2 &3, B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain – Laxmi Publications Ltd, New Delhi.
2. Advance Surveying, Satish Gopi, R. Sathi Kumar and N. Madhu, Pearson Publications.
3. Text book of Surveying, C. Venkataramaiah, University press, India Limited.
4. Surveying and levelling, R. Subramanian, Oxford University press.

References:

1. Text book of Surveying, S.K. Duggal (Vol No. 1&2), Tata McGraw Hill Publishing Co. Ltd. New Delhi.
2. Text book of Surveying, Arora (Vol No. 1&2), Standard Book House, Delhi.
3. Higher Surveying, A.M. Chandra, New Age International Pvt ltd.
4. Fundamentals of surveying, S.K. Roy – PHI learning (P) ltd.
5. Plane Surveying, Alak de, S. Chand & Company, New Delhi.

II Year - I Semester

L	T	P	C
4	0	0	3

FLUID MECHANICS

Course Learning Objectives:

- To understand the properties of fluids and fluid statics
- To derive the equation of conservation of mass and its application
- To solve kinematic problems such as finding particle paths and stream lines
- To use important concepts of continuity equation, Bernoulli's equation and turbulence, and apply the same to problems
- To analyze laminar and turbulent flows
- To understand the various flow measuring devices
- To study in detail about boundary layers theory

Course Outcomes:

Upon successful completion of this course the students will be able to:

- Understand the various properties of fluids and their influence on fluid motion and analyse a variety of problems in fluid statics and dynamics.
- Calculate the forces that act on submerged planes and curves.
- Identify and analyse various types of fluid flows.
- Apply the integral forms of the three fundamental laws of fluid mechanics to turbulent and laminar flow through pipes and ducts in order to predict relevant pressures, velocities and forces.
- Draw simple hydraulic and energy gradient lines.
- Measure the quantities of fluid flowing in pipes, tanks and channels.

Syllabus:

UNIT I Introduction : Dimensions and units – Physical properties of fluids - specific gravity, viscosity, surface tension, vapour pressure and their influences on fluid motion, pressure at a point, Pascal's law, Hydrostatic law -atmospheric, gauge and vacuum pressures-measurement of pressure. Pressure gauges, Manometers: Differential and Micro Manometers.

UNIT – II Hydrostatics: Hydrostatic forces on submerged plane, Horizontal, Vertical, inclined and curved surfaces – Center of pressure.

Fluid Kinematics: Description of fluid flow, Stream line, path line and streak line and stream tube. Classification of flows: Steady, unsteady, uniform, non-uniform, laminar, turbulent, rotational and irrotational flows – Equation of continuity for one, two , three dimensional flows – stream and velocity potential functions, flow net analysis.

UNIT – III Fluid Dynamics: Surface and body forces – Euler’s and Bernoulli’s equations for flow along a stream line - Momentum equation and its application – forces on pipe bend.

UNIT – IV Laminar Flow And Turbulent Flows: Reynold’s experiment – Characteristics of Laminar & Turbulent flows, Shear and velocity distributions, Laws of Fluid friction, Hagen-Poiseulle Formula, Flow between parallel plates, Flow through long tubes, hydrodynamically smooth and rough flows.

Closed Conduit Flow: Darcy-Weisbach equation, Minor losses – pipes in series – pipes in parallel – Total energy line and hydraulic gradient line, variation of friction factor with Reynold’s number – Moody’s Chart, Pipe network problems, Hazen-Williams formula, Hard-Cross Method,

UNIT – V Measurement of Flow: Pitot tube, Venturi meter and Orifice meter – classification of orifices, small orifice and large orifice, flow over rectangular, triangular, trapezoidal and Stepped notches - –Broad crested weirs.

UNIT – VI Boundary Layer Theory: Boundary layer (BL) – concepts, Prandtl contribution, Characteristics of boundary layer along a thin flat plate, Vonkarman momentum integral equation, laminar and turbulent Boundary layers(no deviations)- BL in transition, separation of BL, Control of BL, flow around submerged objects-Drag and Lift- Magnus effect.

Text Books:

1. Fluid Mechanics, P. N. Modi and S. M. Seth, Standard book house, New Delhi
2. A text of Fluid mechanics and hydraulic machines, R. K. Bansal - Laxmi Publications (P) ltd., New Delhi

References:

1. Mechanics of Fluids, Merle C. Potter, David C. Wiggert and Bassem H. Ramadan, CENGAGE Learning
2. Fluid Mechanics and Machinery, C.S.P. Ojha, R. Berndtsson and P.N. Chandramouli, Oxford Higher Education.

II Year - I Semester

L	T	P	C
0	0	3	2

SURVEYING FIELD WORK-I

List of Field Works:

1. Survey by chain survey of road profile with offsets in case of road widening.
2. Survey in an area by chain survey (Closed circuit)
3. Determination of distance between two inaccessible points by using compass.
4. Finding the area of the given boundary using compass (Closed Traverse)
5. Plane table survey; finding the area of a given boundary by the method of Radiation
6. Plane table survey; finding the area of a given boundary by the method of intersection.
7. Two Point Problem by the plane table survey.
8. Fly levelling : Height of the instrument method (differential levelling)
9. Fly levelling: rise and fall method.
10. Fly levelling: closed circuit/ open circuit.
11. Fly levelling; Longitudinal Section and Cross sections of a given road profile.

Note: Any 10 field work assignments must be completed.

L	T	P	C
0	0	3	2

II Year - I Semester

STRENGTH OF MATERIALS LAB

List of Experiments

1. Tension test on Steel bar
2. Bending test on (Steel / Wood) Cantilever beam.
3. Bending test on simple support beam.
4. Torsion test
5. Hardness test
6. Spring test
7. Compression test on wood or concrete
8. Impact test
9. Shear test
10. Verification of Maxwell's Reciprocal theorem on beams.
11. Use of Electrical resistance strain gauges
12. Continuous beam – deflection test.

List of Major Equipment:

1. UTM for conducting tension test on rods
2. Steel beam for flexure test
3. Wooden beam for flexure test
4. Torsion testing machine
5. Brinnell's / Rock well's hardness testing machine
6. Setup for spring tests
7. Compression testing machine
8. Izod Impact machine
9. Shear testing machine
10. Beam setup for Maxwell's theorem verification.
11. Continuous beam setup
12. Electrical Resistance gauges

II Year - I Semester	L	T	P	C
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PROFESSIONAL ETHICS AND HUMAN VALUES

Course Objectives:

*To give basic insights and inputs to the student to inculcate Human values to grow as a responsible human beings with proper personality.

*Professional Ethics instills the student to maintain ethical conduct and discharge their professional duties.

Outcome:

*It gives a comprehensive understanding of a variety issues that are encountered by every professional in discharging professional duties.

*It provides the student the sensitivity and global outlook in the contemporary world to fulfill the professional obligations effectively.

UNIT I: Human Values: Morals, Values and Ethics – Integrity –Trustworthiness - Work Ethics – Service Learning – Civic Virtue – Respect for others – Living Peacefully – Caring – Sharing – Honesty –Courage – Value Time – Co-operation – Commitment – Empathy – Self-confidence – Spirituality- Character.

UNIT: II: Principles for Harmony: Truthfulness – Customs and Traditions -Value Education – Human Dignity – Human Rights – Fundamental Duties - Aspirations and Harmony (I, We & Nature) – Gender Bias - Emotional Intelligence – Salovey – Mayer Model – Emotional Competencies – Conscientiousness.

UNIT III: Engineering Ethics and Social Experimentation:

History of Ethics - Need of Engineering Ethics - Senses of Engineering Ethics- Profession and Professionalism —Self Interest - Moral Autonomy – Utilitarianism – Virtue Theory - Uses of Ethical Theories - Deontology- Types of Inquiry –Kohlberg’s Theory - Gilligan’s Argument –Heinz’s Dilemma - Comparison with Standard Experiments — Learning from the Past –Engineers as Managers – Consultants and Leaders – Balanced Outlook on Law - Role of Codes – Codes and Experimental Nature of Engineering.

UNIT IV: Engineers’ Responsibilities towards Safety and Risk:

Concept of Safety - Safety and Risk – Types of Risks – Voluntary v/sInvoluntary Risk – Consequences - Risk Assessment – Accountability – Liability - Reversible Effects - Threshold Levels of Risk - Delayed v/sImmediate Risk - Safety and the Engineer – Designing for Safety – Risk-Benefit Analysis-Accidents.

UNIT V: Engineers' Duties and Rights:

Concept of Duty - Professional Duties – Collegiality - Techniques for Achieving Collegiality – Senses of Loyalty - Consensus and Controversy - Professional and Individual Rights – Confidential and Proprietary Information - Conflict of Interest-Ethical egoism - Collective Bargaining – Confidentiality - Gifts and Bribes - Problem solving-Occupational Crimes-Industrial Espionage- Price Fixing-Whistle Blowing.

UNIT VI: Global Issues:

Globalization and MNCs –Cross Culture Issues - Business Ethics – Media Ethics - Environmental Ethics – Endangering Lives - Bio Ethics - Computer Ethics - War Ethics – Research Ethics -Intellectual Property Rights.

References:

1. Professional Ethics, R. Subramaniam – Oxford Publications, New Delhi.
2. Ethics in Engineering, Mike W. Martin and Roland Schinzinger - Tata McGraw-Hill – 2003.
3. Professional Ethics and Morals, A. R. Aryasri, Dharanikota Suyodhana - Maruthi Publications.
4. Engineering Ethics, Harris, Pritchard and Rabins, Cengage Learning, New Delhi.
5. Human Values & Professional Ethics, S. B. Gogate, Vikas Publishing House Pvt. Ltd., Noida.
6. Engineering Ethics & Human Values, M. Govindarajan, S. Natarajan and V. S. SenthilKumar-PHI Learning Pvt. Ltd – 2009.
7. Professional Ethics and Human Values, A. Alavudeen, R.Kalil Rahman and M. Jayakumaran – University Science Press.
8. Professional Ethics and Human Values, D. R. Kiran-Tata McGraw-Hill - 2013
9. Human Values And Professional Ethics, Jayshree Suresh and B. S. Raghavan, S.Chand Publications

II Year - II Semester

L	T	P	C
4	0	0	3

BUILDING PLANNING AND DRAWING

Objectives of the course:

- Initiating the student to different building bye-laws and regulations.
- Imparting the planning aspects of residential buildings and public buildings.
- Giving training exercises on various signs and bonds and different building units.
- Imparting the skills and methods of planning of various buildings.

Course outcome:

- Upon successful completion of the course:
- Student should be able to plan various buildings as per the building by-laws.
- The student should be able to distinguish the relation between the plan, elevation and cross section and identify the form and functions among the buildings.
- The student is expected to learn the skills of drawing building elements and plan the buildings as per requirements.

UNIT I: Building Byelaws and Regulations Introduction- terminology- objectives of building byelaws- floor area ratio- floor space index- principles under laying building bye laws- classification of buildings- open space requirements – built up area limitations- height of buildings- wall thickness – lightening and ventilation requirements.

UNIT II: Residential Buildings Minimum standards for various parts of buildings- requirements of different rooms and their grouping- characteristics of various types of residential buildings and relationship between plan, elevation and forms and functions

UNIT III: Public Buildings Planning of educational institutions, hospitals, dispensaries, office buildings, banks, industrial buildings, hotels and motels, buildings for recreation, Landscaping requirements.

UNIT IV: Sign Conventions And Bonds Brick, stone, plaster, sand filling, concrete, glass, steel, cast iron, copper alloys, aluminium alloys etc., lead, zinc, tin etc., earth, rock, timber and marbles.

English bond and Flemish bond - odd and even courses for one, one and half, two and two and half brick walls in thickness at the junction of a corner.

UNIT V: Doors, Windows, Ventilators And Roofs Panelled door, panelled and glazed door, glazed windows, panelled windows, swing ventilators, fixed ventilators, coupled roof, collar roofs.

King Post truss, Queen Post truss

Sloped and flat roof and buildings: drawing plans, Elevations and Cross Sections of given sloped and flat roof buildings.

UNIT VI: Planning And Designing Of Buildings.

Draw the Plan, Elevation and Sections of a Residential and Public buildings from the given line diagram.

Text Books:

1. Planning, designing and Scheduling, Gurucharan Singh and Jagadish Singh
2. Building planning and drawing by M. Chakravarthi.
3. 3. 'A' Series & 'B' Series of JNTU Engineering College, Anantapur,

References:

1. Building drawing, M G Shah, C M Kale and S Y Patki, Tata McGraw Hill, New Delhi.
2. Principles of Building Drawing, M G Shah and C M Kale, Trinity Publications, New Delhi.
3. Civil Engineering drawing and House planning, B. P. Verma, Khanna publishers, New Delhi.
4. Civil Engineering Building practice, Suraj Singh: CBS Publications, New Delhi, and Chennai.
5. Building Materials and Construction, G. C Saha and Joy Gopal Jana, Mcgraw Hill Education (P) India Ltd. New Delhi.

INTERNAL EXAMINATION PATTERN:

The total internal marks (30) are distributed in two components as follows:

1. Descriptive (subjective type) Weightage 60% examination:18 marks
2. Drawing Assignment : 12 marks

FINAL EXAMINATION PATTERN:

The end examination paper should consist of Part A and Part B. Part A consist of five questions in planning portion out of which three questions are to be answered. Part B should consist of two questions from drawing part out of which one is to be answered in drawing sheet. Weight age for Part A is 60% and Part B is 40%.

II Year - II Semester

L	T	P	C
4	0	0	3

STRENGTH OF MATERIALS- II

Course Learning Objectives:

- To give concepts of Principal stresses and strains developed in cross section of the beams on the cross section and stresses on any inclined plane. To impart concepts of failures in the material considering different theories
- To give concepts of torsion and governing torsion equation, and there by calculate the power transmitted by shafts and springs and design the cross section when subjected to loading using different theories of failures.
- To classify columns and calculation of load carrying capacity and to assess stresses due to axial and lateral loads for different edge conditions and to calculate combined effect of direct and bending stresses on different engineering structures.
- Introduce the concept of unsymmetrical bending in beams Location of neutral axis Deflection of beams under unsymmetrical bending.
- Impart concepts for determination of Forces in members of plane pin-jointed perfect trusses by different methods

Course Outcomes:

Upon successful completion of this course,

- The student will be able to understand the basic concepts of Principal stresses developed in a member when it is subjected to stresses along different axes and design the sections.
- The student can asses stresses in different engineering applications like shafts, springs, columns and struts subjected to different loading conditions
- The student will be able to assess forces in different types of trusses used in construction.

SYLLABUS:

UNIT- I Principal Stresses And Strains And Theories Of Failures: Introduction – Stresses on an inclined section of a bar under axial loading – compound stresses – Normal and tangential stresses on an inclined plane for biaxial stresses – Two perpendicular normal stresses accompanied by a state of simple shear – Mohr’s circle of stresses – Principal stresses and strains – Analytical and graphical solutions.

Theories Of Failures: Introduction – Various Theories of failures like Maximum Principal stress theory – Maximum Principal strain theory – Maximum shear stress theory – Maximum strain energy theory – Maximum shear strain energy theory.

UNIT – II Torsion Of Circular Shafts And Springs: Theory of pure torsion – Derivation of Torsion equations: $T/J = q/r = N\phi/L$ – Assumptions made in the theory of pure torsion – Torsional moment of resistance – Polar section modulus – Power transmitted by shafts – Combined bending and torsion and end thrust – Design of shafts according to theories of failure.

Springs: Introduction – Types of springs – deflection of close and open coiled helical springs under axial pull and axial couple – springs in series and parallel – Carriage or leaf springs.

UNIT – III Columns And Struts: Introduction – Types of columns – Short, medium and long columns – Axially loaded compression members – Crushing load – Euler's theorem for long columns- assumptions- derivation of Euler's critical load formulae for various end conditions – Equivalent length of a column – slenderness ratio – Euler's critical stress – Limitations of Euler's theory – Rankine – Gordon formula – Long columns subjected to eccentric loading – Secant formula – Empirical formulae – Straight line formula – Prof. Perry's formula.

Laterally loaded struts – subjected to uniformly distributed and concentrated loads – Maximum B.M. and stress due to transverse and lateral loading.

UNIT – IV Direct And Bending Stresses: Stresses under the combined action of direct loading and B.M. Core of a section – determination of stresses in the case of chimneys, retaining walls and dams – conditions for stability – stresses due to direct loading and B.M. about both axis.

UNIT – V Unsymmetrical Bending: Introduction – Centroidal principal axes of section – Graphical method for locating principal axes – Moments of inertia referred to any set of rectangular axes – Stresses in beams subjected to unsymmetrical bending – Principal axes – Resolution of bending moment into two rectangular axes through the centroid – Location of neutral axis Deflection of beams under unsymmetrical bending.

UNIT – VI Analysis Of Pin-Jointed Plane Frames: Determination of Forces in members of plane pin-jointed perfect trusses by (i) method of joints and (ii) method of sections. Analysis of various types of cantilever and simply supported trusses by method of joints, method of sections.

Text Books:

1. Mechanics of Materials- by R. C. Hibbler
2. Strength of materials by R. K Rajput, S.Chand and Co.

References:

1. Strength of Materials by R. Subramanian, Oxford Publications
2. Mechanics of Materials by B.C Punmia, Jain and Jain.
3. Strength of materials by R. K. Bansal, Lakshmi Publications.

II Year - II Semester

L	T	P	C
4	0	0	3

HYDRAULICS AND HYDRAULIC MACHINERY

Course Learning Objectives:

- To study about uniform and non uniform flows in open channel and also to learn about the characteristics of hydraulic jump
- To introduce dimensional analysis for fluid flow problems
- To understand the working principles of various types of hydraulic machines and Pumps.

Course Outcomes:

Upon successful completion of this course the students will be able to:

- Solve uniform and non uniform open channel flow problems.
- Apply the principals of dimensional analysis and similitude in hydraulic model testing.
- Understand the working principles of various hydraulic machineries and pumps.

Syllabus:

UNIT – I UNIFORM FLOW IN OPEN CHANNELS:

Types of channels –Types of flows - Velocity distribution – Energy and momentum correction factors – Chezy's, and Manning's formulae for uniform flow – Most Economical sections, Critical flow: Specific energy-critical depth – computation of critical depth

UNIT II NON-UNIFORM FLOW IN OPEN CHANNELS: Steady Gradually Varied flow-Dynamic equation, Mild, Critical, Steep, horizontal and adverse slopes-surface profiles-direct step method- Rapidly varied flow, hydraulic jump, energy dissipation.

UNIT – III HYDRAULIC SIMILITUDE: Dimensional analysis-Rayleigh's method and Buckingham's pi theorem-study of Hydraulic models – Geometric, kinematic and dynamic similarities-dimensionless numbers – model and prototype relations.

UNIT – IV BASICS OF TURBO MACHINERY: Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes, jet striking centrally and at tip, velocity triangles at inlet and outlet, expressions for work done and efficiency-Angular momentum principle.

UNIT – V HYDRAULIC TURBINES – I: Layout of a typical Hydropower installation – Heads and efficiencies - classification of turbines. Pelton wheel - Francis turbine - Kaplan turbine - working, working proportions, velocity diagram, work done and efficiency, hydraulic design, draft tube – theory and efficiency. Governing of turbines-surge tanks-unit and specific quantities, selection of turbines, performance characteristics-geometric similarity-cavitation.

UNIT – VI CENTRAIFUGAL-PUMPS: Pump installation details-classification-work done- Manometric head-minimum starting speed-losses and efficiencies-specific speed, multistage pumps-pumps in parallel and series - performance of pumps-characteristic curves-NPSH- Cavitation.

RECIPROCATING PUMPS: Introduction, classification, components, working, discharge, indicator diagram, work done and slip.

Text Books:

1. Open Channel flow, K. Subramanya, Tata McGraw Hill Publishers
2. A text of Fluid mechanics and hydraulic machines, R. K. Bansal, Laxmi Publications New Delhi
3. Fluid Mechanics, Modi and Seth, Standard book house.

References:

1. Fluid Flow in Pipes and Channels, G.L. Asawa, CBS
2. Fluid Mechanics and Machinery, C.S.P. OJHA, R. BERNDTSSON and P.N. Chandramouli, Oxford Higher Education.
3. Fluid Mechanics and Machinery, Md. Kaleem Khan, Oxford Higher Education.

II Year - II Semester

L	T	P	C
4	0	0	3

CONCRETE TECHNOLOGY

Course Learning Objectives:

- To learn the concepts of Concrete production and its behaviour in various environments.
- To learn the test procedures for the determination of properties of concrete.
- To understand durability properties of concrete in various environments.

Course Outcomes:

Upon successful completion of this course, student will be able to

- understand the basic concepts of concrete.
- realize the importance of quality of concrete.
- familiarize the basic ingredients of concrete and their role in the production of concrete and its behaviour in the field.
- test the fresh concrete properties and the hardened concrete properties.
- evaluate the ingredients of concrete through lab test results. design the concrete mix by BIS method.
- familiarize the basic concepts of special concrete and their production and applications. understand the behaviour of concrete in various environments.

SYLLABUS:

UNIT I : Ingredients Of Concrete Cements & Admixtures: Portland cement – Chemical composition – Hydration, Setting of cement, Fineness of cement, Structure of hydrate cement – Test for physical properties – Different grades of cements – Admixtures – Mineral and chemical admixtures – accelerators, retarders, air entrainers, plasticizers, super plasticizers, fly ash and silica fume.

Aggregates: Classification of aggregate – Particle shape & texture – Bond, strength & other mechanical properties of aggregates – Specific gravity, Bulk density, porosity, adsorption & moisture content of aggregate – Bulking of sand –Deleterious substance in aggregate – Soundness of aggregate – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Grading curves – Grading of fine & coarse Aggregates – Gap graded and well graded aggregate as per relevant IS code – Maximum aggregate size. Quality of mixing water,

UNIT – II, Fresh Concrete: Steps in Manufacture of Concrete—proportion, mixing, placing, compaction, finishing, curing – including various types in each stage. Properties of fresh concrete-Workability – Factors affecting workability – Measurement of workability by different tests, Setting times of concrete, Effect of time and temperature on workability – Segregation & bleeding – Mixing and vibration of concrete, Ready mixed concrete, Shotcrete

UNIT – III, Hardened Concrete: Water / Cement ratio – Abram’s Law – Gel space ratio – Nature of strength of concrete –Maturity concept – Strength in tension & compression – Factors affecting strength – Relation between compression & tensile strength – Curing, Testing of Hardened Concrete: Compression tests – Tension tests – Factors affecting strength – Flexure tests –Splitting tests – Non-destructive testing methods – codal provisions for NDT.

UNIT – IV, Elasticity, Creep & Shrinkage, Modulus of elasticity, Dynamic modulus of elasticity , Poisson’s ratio, Creep of concrete, Factors influencing creep, Relation between creep & time, Nature of creep, Effects of creep – Shrinkage –types of shrinkage.

UNIT – V, Mix Design: Factors in the choice of mix proportions – Durability of concrete – Quality Control of concrete – Statistical methods – Acceptance criteria – Concepts Proportioning of concrete mixes by various methods – BIS method of mix design.

UNIT – VI, Special Concretes: Ready mixed concrete, Shotcrete, Light weight aggregate concrete, Cellular concrete, No-fines concrete, High density concrete, Fibre reinforced concrete, Different types of fibres, Factors affecting properties of F.R.C, Polymer concrete, Types of Polymer concrete, Properties of polymer concrete, High performance concrete – Self consolidating concrete, SIFCON, self healing concrete.

Text Books:

1. Concrete Technology, M. S. Shetty. – S. Chand & Company
2. Concrete Technology, A. R. Santha Kumar, Oxford University Press, New Delhi

References:

1. Properties of Concrete, A. M. Neville – PEARSON – 4th edition
2. Concrete Technology, M.L. Gambhir. – Tata Mc. Graw Hill Publishers, New Delhi

II Year - II Semester

L	T	P	C
4	0	0	3

STRUCTURAL ANALYSIS - I

Course Learning Objectives:

- To give preliminary concepts of assessment of bending moment and shear force in Propped cantilevers, fixed beams and continuous beams due to various loading conditions.
- To impart concepts of Bending Moment and Shear force for beams with different boundary and loading conditions
- The procedure for development of slope deflection equations and to solve application to continuous beams with and without settlement of supports.
- The concepts of moving loads and influence lines are imparted for assessment of maximum SF and BM at a given section when loads of varying spans rolling loads of Pratt and Warren trusses.

Course Outcomes:

Upon successful completion of this course the student will be able to,

- Distinguish between the determinate and indeterminate structures.
- Identify the behaviour of structures due to the expected loads, including the moving loads, acting on the structure.
- Estimate the bending moment and shear forces in beams for different fixity conditions.
- Analyze the continuous beams using various methods -, three moment method, slope deflection method, energy theorems.
- Draw the influence line diagrams for various types of moving loads on beams/bridges.
- Analyze the loads in Pratt and Warren trusses when loads of different types and spans are passing over the truss.

Syllabus:

UNIT – I Propped Cantilevers: Analysis of propped cantilevers-shear force and Bending moment diagrams-Deflection of propped cantilevers.

UNIT – II Fixed Beams – Introduction to statically indeterminate beams with U. D. load, central point load, eccentric point load, number of point loads, uniformly varying load, couple and combination of loads - shear force and Bending moment diagrams-Deflection of fixed beams including effect of sinking of support, effect of rotation of a support.

UNIT – III Continuous Beams: Introduction-Clapeyron's theorem of three moments-Analysis of continuous beams with constant moment of inertia with one or both ends fixed-continuous beams with overhang, continuous beams with different moment of inertia for different spans-Effects of sinking of supports-shear force and Bending moment diagrams.

UNIT-IV Slope-Deflection Method: Introduction, derivation of slope deflection equation, application to continuous beams with and without settlement of supports.

UNIT – V Energy Theorems: Introduction-Strain energy in linear elastic system, expression of strain energy due to axial load, bending moment and shear forces - Castigliano's first theorem-Deflections of simple beams and pin jointed trusses.

UNIT – VI Moving Loads And Influence Lines: Introduction maximum SF and BM at a given section and absolute maximum S.F. and B.M due to single concentrated load, U. D load longer than the span, U. D load shorter than the span, two point loads with fixed distance between them and several point loads-Equivalent uniformly distributed load-Focal length.

INFLUENCE LINES: Definition of influence line for SF, Influence line for BM- load position for maximum SF at a section-Load position for maximum BM at a sections, single point load, U.D. load longer than the span, U.D. load shorter than the span- Influence lines for forces in members of Pratt and Warren trusses.

Text Books:

1. Basic Structural Analysis, C. S. Reddy Tata Mc.Graw-Hill, New Delhi.
2. Analysis of Structures by T.S. Thandavamoorthy, Oxford University Press, New Delhi
3. Analysis of Structures- Vol. I and II, V. N. Vazirani and M. M. Ratwani, Khanna Publishers, New Delhi

References:

1. Theory of Structures, B. C Punmia, A. K Jain & Arun K. Jain, Lakshmi Publications
2. Theory of Structures, R.S. Khurmi, S. Chand Publishers.
3. Structural analysis by R.C. Hibbeler, Pearson, New Delhi.
4. Structural Analysis-I, Hemanth Patel, Yogesh Patel, Synergy Knowledgeware, Mumbai
5. Structural Analysis I Analysis of Statically Determinate Structures, P. N. Chandramouli, Yesdee Publishing Pvt Limited, Chennai

II Year - II Semester	L	T	P	C
	4	0	0	3

TRANSPORTATION ENGINEERING – I

Course Learning Objectives:

The objectives of this course are:

- To impart different concepts in the field of Highway Engineering.
- To acquire design principles of Highway Geometrics and Pavements
- To learn various highway construction and maintenance procedures

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

- Plan highway network for a given area.
- Determine Highway alignment and design highway geometrics
- Design Intersections and prepare traffic management plans
- Judge suitability of pavement materials and design flexible and rigid pavements
- Construct and maintain highways

SYLLABUS:

UNIT I

Highway Planning and Alignment: Highway development in India; Classification of Roads; Road Network Patterns; Necessity for Highway Planning; Different Road Development Plans – First, second, third road development plans, road development vision 2021, Rural Road Development Plan – Vision 2025; Planning Surveys; Highway Alignment- Factors affecting Alignment- Engineering Surveys – Drawings and Reports.

UNIT – II Highway Geometric Design: Importance of Geometric Design- Design controls and Criteria- Highway Cross Section Elements- Sight Distance Elements- Stopping sight Distance, Overtaking Sight Distance and Intermediate Sight Distance- Design of Horizontal Alignment- Design of Super elevation and Extra widening- Design of Transition Curves- Design of Vertical alignment- Gradients- Vertical curves.

UNIT – III Traffic Engineering: Basic Parameters of Traffic- Volume, Speed and Density- Traffic Volume Studies; Speed studies – spot speed and speed & delay studies; Parking Studies; Road Accidents- Causes and Preventive measures - Condition Diagram and Collision Diagrams; PCU Factors, Capacity of Highways – Factors Affecting; LOS Concepts; Road

Traffic Signs; Road markings; Types of Intersections; At-Grade Intersections – Design of Plain, Flared, Rotary and Channelized Intersections; Design of Traffic Signals – Webster Method – IRC Method.

UNIT – IV, Highway Materials: Subgrade soil: classification – Group Index – Subgrade soil strength – California Bearing Ratio – Modulus of Subgrade Reaction. Stone aggregates: Desirable properties – Tests for Road Aggregates – Bituminous Materials: Types – Desirable properties – Tests on Bitumen – Bituminous paving mixes: Requirements – Marshall Method of Mix Design.

UNIT – V, Design Of Pavements: Types of pavements; Functions and requirements of different components of pavements; Design Factors

Flexible Pavements: Design factors – Flexible Pavement Design Methods – CBR method – IRC method – Burmister method – Mechanistic method – IRC Method for Low volume Flexible pavements.

Rigid Pavements: Design Considerations – wheel load stresses – Temperature stresses – Frictional stresses – Combination of stresses – Design of slabs – Design of Joints – IRC method – Rigid pavements for low volume roads – Continuously Reinforced Cement Concrete Pavements – Roller Compacted Concrete Pavements.

UNIT – VI Highway Construction and Maintenance: Types of Highway Construction – Earthwork; Construction of Earth Roads, Gravel Roads, Water Bound Macadam Roads, Bituminous Pavements and Construction of Cement Concrete Pavements.

Pavement Failures, Maintenance of Highways, pavement evaluation, strengthening of existing pavements

TEXT BOOKS:

1. Highway Engineering, Khanna S. K., Justo C. E. G and Veeraragavan A, Nem Chand Bros., Roorkee.
2. Traffic Engineering and Transportation Planning, Kadiyali L. R, Khanna Publishers, New Delhi.

REFERENCES:

1. Principles of Highway Engineering, Kadiyali L. R, Khanna Publishers, New Delhi
2. Principles of Transportation Engineering, Partha Chakroborthy and Animesh Das, PHI Learning Private Limited, Delhi
3. Highway Engineering, Paul H. Wright and Karen K Dixon, Wiley Student Edition, Wiley India (P) Ltd., New Delhi
4. Transportation Engineering - An Introduction, Jotin Khisty C, Prentice Hall, Englewood Cliffs, New Jersey.
5. Traffic & Highway Engineering by Nicholas J. Garber, Lester A. Hoel, Fifth Edition, published in 2015, CENGAGE Learning, New Delhi.
6. Transportation Engineering and Planning, Papacostas C.S. and P.D. Prevedouros, Prentice Hall of India Pvt.Ltd; New Delhi.

7. Highway Engineering, Srinivasa Kumar R, Universities Press, Hyderabad
8. Practice and Design of Highway Engineering, Sharma S. K., Principles, S. Chand & Company Private Limited, New Delhi.
9. Highway and Traffic Engineering, Subhash C. Saxena, CBS Publishers, New Delhi.
10. Transportation Engineering Volume I by C. Venkatramaiah, Universities Press, New Delhi.

II Year - II Semester

L	T	P	C
0	0	3	2

FLUID MECHANICS AND HYDRAULIC MACHINERY LAB

List of Experiments

1. Calibration of Venturimeter & Orifice meter
2. Determination of Coefficient of discharge for a small orifice by a constant head method.
3. Determination of Coefficient of discharge for an external mouth piece by variable head method.
4. Calibration of contracted Rectangular Notch and /or Triangular Notch
5. Determination of Coefficient of loss of head in a sudden contraction and friction factor.
6. Verification of Bernoulli's equation.
7. Impact of jet on vanes
8. Study of Hydraulic jump.
9. Performance test on Pelton wheel turbine
10. Performance test on Francis turbine.
11. Efficiency test on centrifugal pump.
12. Efficiency test on reciprocating pump.

List of Equipment:

1. Venturimeter setup.
2. Orifice meter setup.
3. Small orifice setup.
4. External mouthpiece setup.
5. Rectangular and Triangular notch setups.
6. Friction factor test setup.
7. Bernoulli's theorem setup.
8. Impact of jets.
9. Hydraulic jump test setup.
10. Pelton wheel and Francis turbines.
11. Centrifugal and Reciprocating pumps.

II Year - II Semester

L	T	P	C
0	0	3	2

SURVEY FIELD WORK- II

List of Experiments

1. Theodolite Survey: Determining the Horizontal and Vertical Angles by the method of repetition method.
2. Theodolite Survey: Finding the distance between two inaccessible points.
3. Theodolite Survey: Finding the height of far object.
4. Tacheomatic Survey: Heights and distance problems using tacheomatic principles.
5. One Exercise on Curve setting.
6. One Exercise on contours.
7. Total Station: Introduction to total station and practicing setting up, levelling up and elimination of parallax error.
8. Total Station: Determination of area using total station.
9. Total Station: Traversing
10. Total Station: Contouring
11. Total Station: Determination of Remote height.
12. Total Station: distance between two inaccessible points.

Note: Any 10 field work assignments must be completed.

II Year - II Semester	MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS	L	T	P	C
		2	0	0	0

Course Objectives:

- The Learning objectives of this paper is to understand the concept and nature of Managerial Economics and its relationship with other disciplines and also to understand the Concept of Demand and Demand forecasting, Production function, Input Output relationship, Cost-Output relationship and Cost-Volume-Profit Analysis.
- To understand the nature of markets, Methods of Pricing in the different market structures and to know the different forms of Business organization and the concept of Business Cycles.
- To learn different Accounting Systems, preparation of Financial Statement and uses of different tools for performance evaluation. Finally, it is also to understand the concept of Capital, Capital Budgeting and the techniques used to evaluate Capital Budgeting proposals.

UNIT-I

Introduction to Managerial Economics and demand Analysis:

Definition of Managerial Economics –Scope of Managerial Economics and its relationship with other subjects –Concept of Demand, Types of Demand, Determinants of Demand- Demand schedule, Demand curve, Law of Demand and its limitations- Elasticity of Demand, Types of Elasticity of Demand and Measurement- Demand forecasting and Methods of forecasting, Concept of Supply and Law of Supply.

UNIT – II:

Production and Cost Analysis:

Concept of Production function- Cobb-Douglas Production function- Leontief production function - Law of Variable proportions-Isoquants and Isocosts and choice of least cost factor combination-Concepts of Returns to scale and Economies of scale-Different cost concepts: opportunity costs, explicit and implicit costs- Fixed costs, Variable Costs and Total costs – Cost –Volume-Profit analysis-Determination of Breakeven point(simple problems)- Managerial significance and limitations of Breakeven point.

UNIT – III:

Introduction to Markets, Theories of the Firm & Pricing Policies:

Market Structures: Perfect Competition, Monopoly, Monopolistic competition and Oligopoly – Features – Price and Output Determination – Managerial Theories of firm: Marris and Williamson’s models – other Methods of Pricing: Average cost pricing, Limit Pricing, Market Skimming Pricing, Internet Pricing: (Flat Rate Pricing, Usage sensitive pricing) and Priority Pricing.

UNIT – IV:

Types of Business Organization and Business Cycles:

Features and Evaluation of Sole Trader, Partnership, Joint Stock Company – State/Public Enterprises and their forms – Business Cycles : Meaning and Features – Phases of a Business Cycle.

UNIT – V:

Introduction to Accounting & Financing Analysis:

Introduction to Double Entry Systems – Preparation of Financial Statements-Analysis and Interpretation of Financial Statements-Ratio Analysis – Preparation of Funds flow and cash flow statements (Simple Problems)

UNIT – VI:

Capital and Capital Budgeting: Capital Budgeting: Meaning of Capital-Capitalization- Meaning of Capital Budgeting-Time value of money- Methods of appraising Project profitability: Traditional Methods(pay back period, accounting rate of return) and modern methods(Discounted cash flow method, Net Present Value method, Internal Rate of Return Method and Profitability Index)

Course Outcome:

- *The Learner is equipped with the knowledge of estimating the Demand and demand elasticities for a product and the knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs.
- * One is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units.
- *The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis and to evaluate various investment project proposals with the help of capital budgeting techniques for decision making.

TEXT BOOKS

1. Dr. N. AppaRao, Dr. P. Vijay Kumar: ‘Managerial Economics and Financial Analysis’, Cengage Publications, New Delhi – 2011
2. Dr. A. R. Aryasri – Managerial Economics and Financial Analysis, TMH 2011
3. Prof. J.V.Prabhakararao, Prof. P. Venkatarao. ‘Managerial Economics and Financial Analysis’, Ravindra Publication.

References:

- 1.Dr. B. Kuberudu and Dr. T. V. Ramana: Managerial Economics & Financial Analysis, Himalaya Publishing House, 2014.
2. V. Maheswari: Managerial Economics, Sultan Chand.2014
3. Suma Damodaran: Managerial Economics, Oxford 2011.
4. Vanitha Agarwal: Managerial Economics, Pearson Publications 2011.
5. Sanjay Dhameja: Financial Accounting for Managers, Pearson.
6. Maheswari: Financial Accounting, Vikas Publications.
7. S. A. Siddiqui& A. S. Siddiqui: Managerial Economics and Financial Analysis, New Age International Publishers, 2012
8. Ramesh Singh, Indian Economy, 7th Edn., TMH2015
9. Pankaj Tandon A Text Book of Microeconomic Theory, Sage Publishers, 2015
10. Shailaja Gajjala and Usha Munipalle, Universities press, 2015

III Year - I Semester

L	T	P	C
4	0	0	3

MANAGEMENT SCIENCE

Course Objectives:

***To familiarize with the process of management and to provide basic insight into select contemporary management practices**

***To provide conceptual knowledge on functional management and strategic management.**

UNIT I

Introduction to Management: Concept –nature and importance of Management –Generic Functions of Management – Evaluation of Management thought- Theories of Motivation – Decision making process-Designing organization structure- Principles of organization – Organizational typology- International Management: Global Leadership and Organizational behavior Effectiveness(GLOBE) structure

UNIT II

Operations Management: Principles and Types of Management – Work study- Statistical Quality Control- Control charts (P-chart, R-chart, and C-chart) Simple problems- Material Management: Need for Inventory control- EOQ, ABC analysis (simple problems) and Types of ABC analysis (HML, SDE, VED, and FSN analysis).

UNIT III

Functional Management: Concept of HRM, HRD and PMIR- Functions of HR Manager- Wage payment plans(Simple Problems) – Job Evaluation and Merit Rating - Marketing Management- Functions of Marketing – Marketing strategies based on product Life Cycle, Channels of distributions. Operationlizing change through performance management.

UNIT IV

Project Management: (PERT/CPM): Development of Network – Difference between PERT and CPM Identifying Critical Path- Probability- Project Crashing (Simple Problems)

UNIT V

Strategic Management: Vision, Mission, Goals, Strategy – Elements of Corporate Planning Process – Environmental Scanning – SWOT analysis- Steps in Strategy Formulation and Implementation, Generic Strategy Alternatives. Global strategies, theories of Multinational Companies.

UNIT VI

Contemporary Management Practice: Basic concepts of MIS, MRP, Justin- Time(JIT) system, Total Quality Management(TQM), Six sigma and Capability Maturity Model(CMM) Levies, Supply Chain Management , Enterprise Resource Planning (ERP), Business Process outsourcing (BPO), Business process Re-engineering and Bench Marking, Balanced Score Card.

Course Outcome:

- *After completion of the Course the student will acquire the knowledge on management functions, global leadership and organizational behavior.
- *Will familiarize with the concepts of functional management project management and strategic management.

Text Books

1. Dr. P. Vijaya Kumar & Dr. N. Appa Rao, '*Management Science*' Cengage, Delhi, 2012.
2. Dr. A. R. Aryasri, '*Management Science*' TMH 2011.

References

1. Koontz & Weihrich: '*Essentials of management*' TMH 2011
2. Seth & Rastogi: *Global Management Systems*, Cengage learning , Delhi, 2011
3. Robbins: *Organizational Behaviour*, Pearson publications, 2011
4. Kanishka Bedi: *Production & Operations Management*, Oxford Publications, 2011
5. Philip Kotler & Armstrong: *Principles of Marketing*, Pearson publications
6. Biswajit Patnaik: *Human Resource Management*, PHI, 2011
7. Hitt and Vijaya Kumar: *Starategic Management*, Cengage learning
8. Prem Chadha: *Performance Management*, Trinity Press(An imprint of Laxmi Publications Pvt. Ltd.) Delhi 2015.
9. Anil Bhat& Arya Kumar : *Principles of Management*, Oxford University Press, New Delhi, 2015.

III Year - I Semester

L	T	P	C
4	0	0	3

ENGINEERING GEOLOGY

Course Learning Objectives:

The objective of this course is:

- To introduce the Engineering Geology as a subject in Civil Engineering
- To enable the student to use subject in civil engineering applications.
- To know the Geological history of India.

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

- Identify and classify the geological minerals
- Measure the rock strengths of various rocks
- Classify and measure the earthquake prone areas to practice the hazard zonation
- Classify, monitor and measure the Landslides and subsidence
- Prepares, analyses and interpret the Engineering Geologic maps
- Analyses the ground conditions through geophysical surveys.
- Test the geological material and ground to check the suitability of civil engineering project construction.
- Investigate the project site for mega/mini civil engineering projects. Site selection for mega engineering projects like Dams, Tunnels, disposal sites etc...

SYLLABUS:

UNIT-I: Introduction: Branches of Geology, Importance of Geology in Civil Engineering with case studies

Weathering: Weathering of rocks, Geological agents, weathering process of Rock, River process and their development.

UNIT-II Mineralogy And Petrology: Definitions of mineral, Structures of silicates and rock, Different methods of study of mineral and rock, The study of physical properties of minerals and rocks for megascopic study for the following minerals and rocks, Common rock forming minerals are Feldspar, Quartz Group, Olivine, Augite, Hornblende, Mica Group, Asbestos, Talc, Chlorite, Kyanite, Garnet, Calcite and other ore forming minerals are Pyrite, Hematite, Magnetite, Chlorite, Galena, Pyrolusite, Graphite, Chromite, Magnetite And Bauxite. Classification, structures, textures and forms of Igneous rocks, Sedimentary rocks, Metamorphic rocks, and their megascopic study of granite varieties, (pink, gray, green). Pegmatite, Dolerite, Basalt etc., Shale, Sand Stone, Lime Stone, Laterite, Quartzite, Gneiss, Schist, Marble, Khondalite and Slate and their importance in Civil Engineering.

UNIT-III Structural Geology: Strike, Dip and Outcrop study of common geological structures associating with the rocks such as Folds, Faults, Joints and Unconformities- parts, types, mechanism and their importance in Civil Engineering–Indian stratigraphy. Aims of stratigraphy, Principles, Geological time scale, Geological division in India, Major stratigraphic units in India.

UNIT-IV Ground Water: Water table, Cone of depression, Geological controls of Ground Water Movement, Ground Water Exploration Techniques.

Earthquakes And Land Slides: Terminology, Classification, causes and effects, Seismic areas and Seismic belts, Richter scale intensity, Precautions of building constructions in seismic areas. Classification of Landslides, Causes and Effects, measures to be taken prevent their occurrence at Landslides. Case studies.

UNIT-V Geophysics: Importance of Geophysical methods, Classification, Principles of Geophysical study by Gravity method, Magnetic method, Electrical methods, Seismic methods, Radiometric method and Electrical resistivity, Seismic refraction methods and Engineering properties of rocks.

UNIT-VI Geology of Dams, Reservoirs And Tunnels: Types and purpose of Dams, Geological considerations in the selection of a Dam site. Life of Reservoirs Purpose of Tunnelling, effects, Lining of Tunnels. Influence of Geology for successful Tunnelling.

Text Books:

1. Engineering Geology, N. Chenn Kesavulu, Laxmi Publications, 2nd Edition, 2014.
2. Engineering Geology, Subinoy Gangopadhyay, Oxford University press.

References:

1. Engineering Geology, D. Venkat Reddy, Vikas Publishing House pvt. Ltd, 2013.
2. Engineering Geology, Vasudev Kanithi, University Press.
3. Engineering Geology for Civil Engineers P. C. Varghese, PHI learning pvt. Ltd.
4. Fundamentals of Engineering Geology' P.G. Bell, B. S. P. Publications, 2012
5. Geology for Engineers and Environmental Society, Alan E Kehew, person publications, 3rd edition.
6. Engineer's Geology by S. K. Duggal, H.K. Pandey, N. Rawd, McGraw Hill education.
7. Engineering Geology, K. S. Valdiya, McGraw Hill.
8. Environmental Geology, K. S Valdiya, McGraw Hill Publications, 2nd Edition.

III Year - I Semester

L	T	P	C
4	0	0	3

STRUCTURAL ANALYSIS – II

Course Learning Objectives:

The objective of this course is:

- Familiarize Students with Different types of Structures
- Equip student with concepts of Arches
- Understand Concepts of lateral Load analysis
- Familiarize Cables and Suspension Bridges
- Understand Analysis methods Moment Distribution, Kanis Method and Matrix methods

Course Outcomes:

At the end of this course; the student will be able to

- Differentiate Determinate and Indeterminate Structures
- Carryout lateral Load analysis of structures
- Analyze Cable and Suspension Bridge structures
- Analyze structures using Moment Distribution, Kani's Method and Matrix methods

SYLLABUS:

UNIT I Three Hinged Arches: Elastic theory of arches – Eddy's theorem – Determination of horizontal thrust, bending moment, normal thrust and radial shear – effect of temperature. Hinges with supports at different levels.

Two Hinged Arches: Determination of horizontal thrust, bending moment, normal thrust and radial shear – Rib shortening and temperature stresses, Tied arches – Fixed arches – (No analytical question).

UNIT-II, Lateral Load Analysis Using Approximate Methods: application to building frames. (i) Portal Method (ii) Cantilever Method.

UNIT – III, Cable Structures and Suspension Bridges: Introduction, characteristics of cable, analysis of cables subjected to concentrated and uniformly distributed loads, anchor cable, temperature stresses, analysis of simple suspension bridge, three hinged and two hinged stiffening girder suspension bridges.

UNIT – IV Moment Distribution Method: Stiffness and carry over factors – Distribution factors – Analysis of continuous beams with and without sinking of supports – Portal frames – including Sway-Substitute frame analysis by two cycle.

UNIT – V Kani's Method: Analysis of continuous beams – including settlement of supports and single bay portal frames with and without side sway.

UNIT – VI Introduction to Matrix Methods: Flexibility methods: Introduction, application to continuous beams (maximum of two unknowns) including support settlements. Stiffness method: Introduction, application to continuous beams (maximum of two unknowns) including support settlements.

Text Books:

1. Structural Analysis, T. S. Thandavamoorthy, Oxford university press, India.
2. Structural Analysis, R.C. Hibbeler, Pearson Education, India
3. Theory of Structures – II, B. C. Punmia, Jain & Jain, Laxmi Publications, India.
4. Structural Analysis, C.S. Reddy, Tata Mc-Graw hill, New Delhi.

References:

1. Intermediate Structural Analysis, C. K. Wang, Tata McGraw Hill, India
2. Theory of structures, Ramamuratam, Dhanpatrai Publications.
3. Analysis of structures, Vazrani & Ratwani – Khanna Publications.
4. Comprehensive Structural Analysis-Vol. I & 2, R. Vaidyanathan & P. Perumal- Laxmi Publications Pvt. Ltd., New Delhi
5. Structural Analysis I, P.N. Chandramouli. Yesdee Publishing Pvt Limited
6. Structural Analysis, Aslam Kassimali, Cengage Learning
7. Matrix Methods of Structural Analysis, P.N. Godbole, R. S.. Sonaparote, PHI Learning Pvt Limited

III Year - I Semester

L	T	P	C
4	2	0	3

DESIGN AND DRAWING OF REINFORCED CONCRETE STRUCTURES

Course Learning Objectives:

The objective of this course is:

- Familiarize Students with different types of design philosophies
- Equip student with concepts of design of flexural members
- Understand Concepts of shear, bond and torsion
- Familiarize students with different types of compressions members and Design
- Understand different types of footings and their design

Course Outcomes:

At the end of this course the student will be able to

- Work on different types of design philosophies
- Carryout analysis and design of flexural members and detailing
- Design structures subjected to shear, bond and torsion
- Design different type of compression members and footings

SYLLABUS:

UNIT –I Introduction:

a) **Working stress method:** Design codes and handbooks, loading standards – Dead, live, wind and earthquake loads, Elastic theory: design constants, modular ratio, neutral axis depth and moment of resistance for balanced, under-reinforced and over-reinforced sections. Design of singly and doubly reinforced beams.

b) **Limit State Design:** Concepts of limit state design – Basic statistical principles – Characteristic loads –Characteristic strength – Partial load and safety factors – representative stress-strain curves for cold worked deformed bars and mild steel bars. Assumptions in limit state design – stress - block parameters – limiting moment of Resistance.

All units i.e. from unit II to unit VI are to be taught in Limit State Design.

UNIT –II Design for Flexure: Limit state analysis and design of singly reinforced sections-effective depth- Moment of Resistance- Doubly reinforced and flanged (T and L) beam sections- Minimum depth for a given capacity- Limiting Percentage of Steel- Minimum Tension Reinforcement-Maximum Flexural Steel- Design of Flanged Sections (T&L)- Effective width of flange –Behavior- Analysis and Design.

UNIT – III Design for Shear, Torsion and Bond: Limit state analysis and design of section for shear and torsion – concept of bond, anchorage and development length, I.S. code provisions. Design examples in simply supported and continuous beams, detailing. **Limit state design for serviceability:** Deflection, cracking and code provision, Design of formwork for beams and slabs.

UNIT – IV Slabs: Classification of slabs, design of one - way slabs, one way continuous slab using IS Coefficients (Conventional) –Design of two - way slabs-simply supported and various edge conditions using IS Coefficients .

UNIT – V Design of Compression members: Effective length of a column, Design of short and long columns – under axial loads, uniaxial bending and biaxial bending – Braced and un-braced columns – I S Code provisions.

UNIT –VI

Footings: Different types of footings – Design of isolated footings – pedestal, square, rectangular and circular footings subjected to axial loads, uni-axial and bi-axial bending moments.

NOTE: All the designs to be taught in Limit State Method

Following plates should be prepared by the students.

1. Reinforcement detailing of T-beams, L-beams and continuous beams.
2. Reinforcement detailing of columns and isolated footings.
4. Detailing of one-way, two-way and continuous slabs and waist-slab staircase.

FINAL EXAMINATION PATTERN:

The end examination paper should consist of Part A and Part B. Part A consists of two questions in Design and Drawing out of which one question is to be answered. Part B should consist of five questions and design out of which three are to be answered. Weightage for Part – A is 40% and Part- B is 60%.

Text Books:

1. Limit State Design, A. K. Jain
2. Design of Reinforced concrete Structures, N. Subrahmanyian
3. Reinforced Concrete Structures, S. Unnikrishna Pillai & Devdas Menon, Tata Mc.Graw Hill, New Delhi.

References:

1. R C C Design, B.C Punmia, A. K. Jain and A. K Jain. Lakshmi Publications
2. Reinforced Concrete Structures, N. Krishna Raju & R. N. Pranesh, New Age Publications.

IS Codes:

- 1) IS -456-2000 Code of practice for Reinforced Concrete Structures (Permitted to use in examination hall)
- 2) IS – 875
- 3) SP-16

III Year - I Semester

L	T	P	C
4	0	0	3

TRANSPORTATION ENGINEERING – II

Course Learning Objectives:

The objectives of this course are:

- To know various components and their functions in a railway track
- To acquire design principles of geometrics in a railway track.
- To know various techniques for the effective movement of trains.
- To acquire design principles of airport geometrics and pavements.
- To know the planning, construction and maintenance of Docks and Harbours.

Course Outcomes:

At the end of course, Student will be able to

- Design geometrics in a railway track.
- Design airport geometrics and airfield pavements.
- Plan, construct and maintain Docks and Harbours.

SYLLABUS:

A.RAILWAY ENGINEERING

UNIT – I Components of Railway Engineering: Permanent way components – Railway Track Gauge - Cross Section of Permanent Way - Functions of various Components like Rails, Sleepers and Ballast –Rail Fastenings – Creep of Rails- Theories related to creep – Adzing of Sleepers- Sleeper density – Rail joints.

UNIT – II Geometric Design of Railway Track: Alignment – Engineering Surveys - Gradients- Grade Compensation- Cant and Negative Super elevation- Cant Deficiency – Degree of Curve – safe speed on curves – Transition curve – Compound curves – Reverse curves – Extra clearance on curves – widening of gauge on curves – vertical curves – cheek rails on curves.

UNIT – III Turnouts & Controllers: Track layouts – Switches – Design of Tongue Rails – Crossings – Turnouts – Layout of Turnout – Double Turnout – Diamond crossing – Scissors crossing. Signal Objectives – Classification – Fixed signals – Stop signals – Signalling systems – Mechanical signalling system – Electrical signalling system – System for Controlling Train Movement – Interlocking – Modern signalling Installations.

B.AIRPORT ENGINEERING

UNIT – IV Airport Planning & Design: Airport Master plan – Airport site selection – Air craft characteristics – Zoning laws – Airport classification – Runway orientation – Wind rose diagram – Runway length – Taxiway design – Terminal area and Airport layout – Visual aids and Air traffic control.

UNIT – V Runway Design: Various Design factors – Design methods for Flexible pavements – Design methods for Rigid pavements – LCN system of Pavement Design – Airfield Pavement Failures – Maintenance and Rehabilitation of Airfield pavements – Evaluation & Strengthening of Airfield pavements – Airport Drainage – Design of surface and subsurface drainage.

C.DOCKS & HARBOURS

UNIT – VI Planning, Layout, Construction & Maintenance Of Docks & Harbors: Classification of ports – Requirement of a good port – classification of Harbors – Docks - Dry & wet docks – Transition sheds and workhouses – Layouts; Quays – construction of Quay walls – Wharves – Jetties – Tides - Tidal data and Analysis – Break waters – Dredging – Maintenance of Ports and Harbors – Navigational aids.

TEXT BOOKS:

1. Railway Engineering, Satish Chandra and Agarwal M. M., Oxford University Press, New Delhi
2. Airport Engineering, Khanna & Arora - Nemchand Bros, New Delhi.
3. Docks and Harbor Engineering, Bindra S.P. – Dhanpathi Rai & Sons, New Delhi.

REFERENCES:

1. Railway Engineering, Saxena & Arora – Dhanpat Rai, New Delhi.
2. Transportation Engineering Planning Design, Wright P. H. & Ashfort N. J., John Wiley & Sons.
3. Transportation Engineering Volume II, C Venkatramaiah, 2016, Universities Press, Hyderabad.
4. Transportation Engineering, Railways, Airports, Docks & Harbours, Srinivasa Kumar R, University Press, Hyderabad
5. Airport Engineering Planning & Design, Subhash C. Saxena, 2016, CBS Publishers, New Delhi.
6. Highway, Railway, Airport and Harbor Engineering, Subramanian K. P, Scitech Publications (India) Pvt Limited, Chennai
7. Airport Engineering, Virendra Kumar, Dhanpat Rai Publishers, New Delhi.

III Year - I Semester

L	T	P	C
0	0	3	2

CONCRETE TECHNOLOGY LAB

Course Learning Objectives:

- To test the basic properties ingredients of concrete, fresh and hardened concrete properties

Course Outcomes:

Upon successful completion of this course, student will be able to

- Determine the consistency and fineness of cement.
- Determine the setting times of cement.
- Determine the specific gravity and soundness of cement.
- Determine the compressive strength of cement.
- Determine the workability of cement concrete by compaction factor, slump and Vee – Bee tests
- Determine the specific gravity of coarse aggregate and fine aggregate by Sieve analysis.
- Determine the flakiness and elongation index of aggregates.
- Determine the bulking of sand.
- Understand the non-destructive testing procedures on concrete.

List of Experiments: At least 10 experiments must be conducted (at least one for each property)

1. Determination of normal Consistency and fineness of cement.
2. Determination of initial setting time and final setting time of cement.
3. Determination of specific gravity and soundness of cement.
4. Determination of compressive strength of cement.
5. Determination of grading and fineness modulus of Coarse aggregate by sieve analysis.
6. Determination of specific gravity of coarse aggregate
7. Determination of grading and fineness modulus of fine aggregate (sand) by sieve analysis.
8. Determination of bulking of sand.
9. Determination of workability of concrete by compaction factor method.
10. Determination of workability of concrete by slump test
11. Determination of workability of concrete by Vee-bee test.

12. Determination of compressive strength of cement concrete and its young's modulus.
13. Determination of split tensile strength of concrete.
14. Non-Destructive testing on concrete (for demonstration)

List of Equipment:

1. Standard set of sieves for coarse aggregate and fine aggregate
2. Vicat's apparatus
3. Specific gravity bottle.
4. Lechatlier's apparatus.
5. Slump Test Apparatus.
6. Compaction Factor Test Apparatus.
7. Vee- Bee test apparatus
8. Longitudinal compresso meter
9. Universal testing Machine (UTM)/Compression Testing Machine (CTM).
10. Rebound hammer, Ultrasonic pulse velocity machine, micro cover meter etc.

III Year - I Semester

L	T	P	C
0	0	3	2

ENGINEERING GEOLOGY LAB

Course Learning Objectives:

The objective of this course is:

- To identify the mega-scopic types of Ore minerals & Rock forming minerals.
- To identify the mega-scopic types of Igneous, Sedimentary, Metamorphic rocks.
- To identify the topography of the site & material selection

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

- Identify Mega-scopic minerals & their properties.
- Identify Mega-scopic rocks & their properties.
- Identify the site parameters such as contour, slope & aspect for topography.
- Know the occurrence of materials using the strike & dip problems.

SYLLABUS:

LIST OF EXPERIMENTS

1. Physical properties of minerals: Mega-scopic identification of

- a. Rock forming minerals – Quartz group, Feldspar group, Garnet group, Mica group & Talc, Chlorite, Olivine, Kyanite, Asbestos, Tourmelene, Calcite, Gypsum, etc...
- b. Ore forming minerals – Magnetite, Hematite, Pyrite, Pyralusite, Graphite, Chromite, etc...

2. Megascopic description and identification of rocks.

- a) Igneous rocks – Types of Granite, Pegmatite, Gabbro, Dolerite, Syenite, Granite Poryphery, Basalt, etc...
- b) Sedimentary rocks – Sand stone, Ferruginous sand stone, Lime stone, Shale, Laterite, Conglamorate, etc...
- c) Metamorphic rocks – Biotite – Granite Gneiss, Slate, Muscovite & Biotiteschist, Marble, Khondalite, etc...

3. Interpretation and drawing of sections for geological maps showing tilted beds, faults, unconformities etc.
4. Simple Structural Geology problems.
5. Bore hole data.
6. Strength of the rock using laboratory tests.
7. Field work – To identify Minerals, Rocks, Geomorphology & Structural Geology.

LAB EXAMINATION PATTERN:

1. Description and identification of FOUR minerals
2. Description and identification of FOUR (including igneous, sedimentary and metamorphic rocks)
3. ONE Question on Interpretation of a Geological map along with a geological section.
4. TWO Questions on Simple strike and Dip problems.
5. Bore hole problems.
6. Project report on geology.

REFERENCE:

1. Applied Engineering Geology Practical, M. T. Mauthesha Reddy, New Age International Publishers, 2nd Edition.
2. Foundations of Engineering Geology' by Tony Waltham, Spon Press, 3rd edition, 2009

III Year - I Semester

L	T	P	C
0	0	3	2

TRANSPORTATION ENGINEERING LAB

Course Learning Objectives:

The objective of this course is:

- To test crushing value, impact resistance, specific gravity and water absorption, percentage attrition, percentage abrasion, flakiness index and elongation index for the given road aggregates.
- To know penetration value, ductility value, softening point, flash and fire point, viscosity and stripping for the given bitumen grade.
- To test the stability for the given bitumen mix
- To carry out surveys for traffic volume, speed and parking.

Course outcomes:

- Ability to test aggregates and judge the suitability of materials for the road construction
- Ability to test the given bitumen samples and judge their suitability for the road construction
- Ability to obtain the optimum bitumen content for the mix design
- Ability to determine the traffic volume, speed and parking characteristics.

SYLLABUS:

I. ROAD AGGREGATES:

1. Aggregate Crushing value
2. Aggregate Impact Test.
3. Specific Gravity and Water Absorption.
4. Attrition Test
5. Abrasion Test.
6. Shape tests

II. BITUMINOUS MATERIALS:

1. Penetration Test.
2. Ductility Test.
3. Softening Point Test.
4. Flash and fire point tests.
5. Stripping Test
6. Viscosity Test.

III. BITUMINOUS MIX:

1. Marshall Stability test.

IV. TRAFFIC SURVEYS:

1. Traffic volume study at mid blocks.
2. Traffic Volume Studies (Turning Movements) at intersection.
3. Spot speed studies.
4. Parking study.

V. DESIGN & DRAWING:

1. Earthwork calculations for road works.
2. Drawing of road cross sections.
3. Rotors intersection design.

LIST OF EQUIPMENT:

1. Apparatus for aggregate crushing test.
2. Aggregate Impact testing machine
3. Pycnometers.
4. Los angles Abrasion test machine
5. Deval's Attrition test machine
6. Length and elongation gauges
7. Bitumen penetration test setup.
8. Bitumen Ductility test setup.
9. Ring and ball apparatus
10. Viscometer.
11. Marshal Mix design apparatus.
12. Enoscope for spot speed measurement.
13. Stop Watches

Text Books:

1. Highway Material Testing Manual, S. K. Khanna, C. E. G Justo and A. Veeraraghavan, Neam Chan Brothers New Chand Publications, New Delhi.

Reference Books:

1. I R C Codes of Practice
2. Asphalt Institute of America Manuals
3. Code of Practice of B.I.S.

III Year - II Semester

L	T	P	C
4	0	0	3

DESIGN AND DRAWING OF STEEL STRUCTURES

Course Learning Objectives:

The objective of this course is to:

- Familiarize Students with different types of Connections and relevant IS codes
- Equip student with concepts of design of flexural members
- Understand Design Concepts of tension and compression members in trusses
- Familiarize students with different types of Columns and column bases and their Design
- Familiarize students with Plate girder and Gantry Girder and their Design

Course Outcomes:

At the end of this course the student will be able to

- Work with relevant IS codes
- Carryout analysis and design of flexural members and detailing
- Design compression members of different types with connection detailing
- Design Plate Girder and Gantry Girder with connection detailing
- Produce the drawings pertaining to different components of steel structures

SYLLABUS:

UNIT – I Connections: Introduction: (a) Riveted connections – Definition, rivet strength and capacity- Codal Provisions, **(b) Welded connections:** Introduction, Advantages and disadvantages of welding- Strength of welds-Butt and fillet welds: Permissible stresses – IS Code requirements. Design of fillet weld subjected to moment acting in the plane and at right angles to the plane of the joints.

All units i.e. from unit II to unit-VI to be taught in Limit State Design and in Welded connections only.

UNIT – II Beams: Allowable stresses, design requirements as per IS Code-Design of simple and compound beams-Curtailment of flange plates, Beam to beam connection, check for deflection, shear, buckling, check for bearing, laterally unsupported beams.

UNIT –III Tension Members and compression members: General Design of members subjected to direct tension and bending –effective length of columns. Slenderness ratio – permissible stresses. Design of compression members, struts etc.

Roof Trusses: Different types of trusses – Design loads – Load combinations as per IS Code recommendations, structural details –Design of simple roof trusses involving the design of purlins, members and joints – tubular trusses.

UNIT – IV Design of Columns: Built up compression members – Design of lacings and battens. Design Principles of Eccentrically loaded columns, Splicing of columns.

UNIT – V Design of Column Foundations: Design of slab base and gusseted base. Column bases subjected moment.

UNIT – VI Design of Plate Girder: Design consideration – I S Code recommendations Design of plate girder-Welded – Curtailment of flange plates, stiffeners – splicing and connections.

Design of Gantry Girder: impact factors - longitudinal forces, Design of Gantry girders.

NOTE: Welding connections should be used in Units II – VI.

The students should prepare the following plates.

Plate 1 Detailing of simple beams

Plate 2 Detailing of Compound beams including curtailment of flange plates.

Plate 3 Detailing of Column including lacing and battens.

Plate 4 Detailing of Column bases – slab base and gusseted base

Plate 5 Detailing of steel roof trusses including joint details.

Plate 6 Detailing of Plate girder including curtailment, splicing and stiffeners.

FINAL EXAMINATION PATTERN:

The end examination paper should consist of Part A and Part B. part A consist of two questions in Design and Drawing out of which one question is to be answered. Part B should consist of five questions and design out of which three are to be answered. Weightage for Part – A is 40% and Part- B is 60%.

TEXT BOOKS

1. Steel Structures Design and Practice, N. Subramanian, Oxford University Press.
2. Design of steel structures, S. K. Duggal, Tata Mc Graw Hill, New Delhi
3. Design of Steel Structures S. S. Bhavikatti, I. K International Publishing House Pvt. Ltd.

REFERENCES

1. Structural Design in Steel, Sarwar Alam Raz, New Age International Publishers, New Delhi
2. Design of Steel Structures, M. Raghupathi, Tata Mc. Graw-Hill
3. Structural Design and Drawing, N. Krishna Raju; University Press,

IS Codes:

- 1) Indian Standard Code for General Construction in Steel, 3rd revision, Indian Standards Institution, New Delhi,2008.
- 2) IS – 875, Code of practice for design loads (other than earth quake) for buildings and structures (Part-1-Part 5),Bureau of Indian standards.
- 3) Steel Tables.

These codes and steel tables are permitted to use in the examinations.

III Year - II Semester

L	T	P	C
4	0	0	3

GEOTECHNICAL ENGINEERING – I

Course Learning Objectives:

The objective of this course is:

- To enable the student to find out the index properties of the soil and classify it.
- To impart the concept of seepage of water through soils and determine the seepage discharge.
- To enable the students to differentiate between compaction and consolidation of soils and to determine the magnitude and the rate of consolidation settlement.
- To enable the student to understand the concept of shear strength of soils, assessment of the shear parameters of sands and clays and the areas of their application.

Course Outcomes:

Upon the successful completion of this course

- The student must know the definition of the various parameters related to soil mechanics and establish their inter-relationships.
- The student should be able to know the methods of determination of the various index properties of the soils and classify the soils.
- The student should be able to know the importance of the different engineering properties of the soil such as compaction, permeability, consolidation and shear strength and determine them in the laboratory.
- The student should be able to apply the above concepts in day-to-day civil engineering practice.

SYLLABUS:

UNIT – I Introduction: Soil formation – soil structure and clay mineralogy – Adsorbed water – Mass- volume relationship –Relative density , Mechanism of compaction – factors affecting – effects of compaction on soil properties - compaction control.

UNIT – II Index Properties Of Soils: Grain size analysis – Sieve and Hydrometer methods – consistency limits and indices – Various Types of soil Classifications – Unified soil classification and I.S. Soil classification.

UNIT –III Permeability: Soil water – capillary rise – One dimensioned flow of water through soils – Darcy’s law- permeability – Factors affecting –laboratory determination of coefficient of permeability –Permeability of layered systems. Total, neutral and effective stresses –quick sand condition – 2-D flow and Laplace’s equation - Seepage through soils – Flow nets: Characteristics and Uses.

UNIT – IV Stress Distribution In Soils: Stresses induced by applied loads - Boussinesq’s and Westergaard’s theories for point loads and areas of different shapes– Newmark’s influence chart – 2:1 stress distribution method.

UNIT – V Consolidation: Compressibility of soils – e-p and e-log p curves – Stress history – Concept of consolidation - Spring Analogy - Terzaghi’s theory of one-dimensional Consolidation – Time rate of consolidation and degree of consolidation – Determination of coefficient of consolidation (c_v) - Over consolidated and normally consolidated clays.

UNIT – VI Shear Strength of Soils: Basic mechanism of shear strength - Mohr – Coulomb Failure theories – Stress-Strain behavior of Sands - Critical Void Ratio – Stress-Strain behavior of clays – Shear Strength determination- various drainage conditions.

Text Books:

1. Basic and Applied Soil Mechanics, Gopal Ranjan and A. S. R. Rao, New Age International Publishers.
2. Soil Mechanics and Foundation Engineering, V. N. S. Murthy, CBS publishers

References:

1. Fundamentals of Soil Mechanics, D. W. Taylor, Wiley.
2. An introduction to Geotechnical Engineering, Holtz and Kovacs; Prentice Hall.
3. Fundamentals of Geotechnical Engineering, B M Das, Cengage Learning, New Delhi.

III Year - II Semester

L	T	P	C
4	0	0	3

ENVIRONMENTAL ENGINEERING – I

Course Learning Objectives:

The course will address the following:

- Outline planning and the design of water supply systems for a community/town/city
- Provide knowledge of water quality requirement for domestic usage
- Impart understanding of importance of protection of water source quality and enlightens the efforts involved in converting raw water into clean potable water.
- Selection of valves and fixture in water distribution systems
- Impart knowledge on design of water distribution network

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

- Plan and design the water and distribution networks and sewerage systems
- Identify the water source and select proper intake structure
- Characterisation of water
- Select the appropriate appurtenances in the water supply
- Selection of suitable treatment flow for raw water treatments

SYLLABUS:

UNIT-I Introduction: Importance and Necessity of Protected Water Supply systems, Water borne diseases, Flow chart of public water supply system, Role of Environmental Engineer, Agency activities

Water Demand and Quantity Estimation: Estimation of water demand for a town or city, Per capita Demand and factors influencing it - Types of water demands and its variations- factors affecting water demand, Design Period, Factors affecting the Design period, Population Forecasting.

UNIT-II Sources of Water: Lakes, Rivers, Impounding Reservoirs, comparison of sources with reference to quality, quantity and other considerations- Capacity of storage reservoirs, Mass curve analysis. Groundwater sources of water: Types of water bearing formations, springs, Wells and Infiltration galleries, Yields from infiltration galleries.

Collection and Conveyance of Water: Factors governing the selection of the intake structure, Types of Intakes. Conveyance of Water: Gravity and Pressure conduits, Types of Pipes, Pipe Materials, Pipe joints, Design aspects of pipe lines, laying of pipe lines

UNIT-III Quality and Analysis of Water: Characteristics of water–Physical, Chemical and Biological-Analysis of Water – Physical, Chemical and Biological characteristics. Comparison of sources with reference to quality- I.S. Drinking water quality standards and WHO guidelines for drinking water

UNIT-IV Treatment of Water: Flowchart of water treatment plant, Treatment methods: Theory and Design of Sedimentation, Coagulation, Sedimentation with Coagulation, Filtration

UNIT-V Disinfection: Theory of disinfection-Chlorination and other Disinfection methods, Softening of Water, Removal of color and odours - Iron and manganese removal – Adsorption-fluoridation and defluoridation–aeration–Reverse Osmosis-Iron exchange–Ultra filtration

UNIT-VI Distribution of Water: Requirements- Methods of Distribution system, Layouts of Distribution networks, Pressures in the distribution layouts, Analysis of Distribution networks: Hardy Cross and equivalent pipe methods -Components of Distribution system: valves such as sluice valves, air valves, scour valves and check valves, hydrants, and water meters–Laying and testing of pipe lines- selection of pipe materials, pipe joints

Text Books

1. Environmental Engineering – Howard S. Peavy, Donald R. Rowe, Teorge George Tchobanoglus – Mc-Graw-Hill Book Company, New Delhi, 1985.
2. Elements of Environmental Engineering – K. N. Duggal, S. Chand & Company Ltd., New Delhi, 2012.

References

1. Water Supply Engineering – P. N. Modi.
2. Water Supply Engineering – B. C. Punmia
3. Water Supply and Sanitary Engineering – G. S. Birdie and J. S. Birdie
4. Environmental Engineering, D. Srinivasan, PHI Learning Private Limited, New Delhi, 2011.

III Year - II Semester

L	T	P	C
4	0	0	3

WATER RESOURCES ENGINEERING-I

Course Learning Objectives:

The course is designed to

- introduce hydrologic cycle and its relevance to Civil engineering
- make the students understand physical processes in hydrology and, components of the hydrologic cycle
- appreciate concepts and theory of physical processes and interactions
- learn measurement and estimation of the components hydrologic cycle.
- provide an overview and understanding of Unit Hydrograph theory and its analysis
- understand flood frequency analysis, design flood, flood routing
- appreciate the concepts of groundwater movement and well hydraulics

Course Outcomes

At the end of the course the students are expected to

- have a thorough understanding of the theories and principles governing the hydrologic processes,
- be able to quantify major hydrologic components and apply key concepts to several practical areas of engineering hydrology and related design aspects
- develop Intensity-Duration-Frequency and Depth-Area Duration curves to design hydraulic structures.
- be able to develop design storms and carry out frequency analysis
- be able to determine storage capacity and life of reservoirs.
- develop unit hydrograph and synthetic hydrograph
- be able to estimate flood magnitude and carry out flood routing.
- be able to determine aquifer parameters and yield of wells.
- be able to model hydrologic processes

SYLLABUS:

UNIT I Introduction: Engineering hydrology and its applications, Hydrologic cycle, hydrological data-sources of data.

Precipitation: Types and forms, measurement, raingauge network, presentation of rainfall data, average rainfall, continuity and consistency of rainfall data, frequency of rainfall, Intensity-Duration-Frequency (IDF) curves, Depth-Area-Duration (DAD) curves, Probable Maximum Precipitation (PMP), design storm

UNIT-II Abstractions from Precipitation: Initial abstractions.

Evaporation: factors affecting, measurement, reduction

Evapotranspiration: factors affecting, measurement, control

Infiltration: factors affecting, Infiltration capacity curve, measurement, infiltration indices.

UNIT-III Runoff: Catchment characteristics, Factors affecting runoff, components, computation- empirical formulae, tables and curves, stream gauging, rating curve, flow mass curve and flow duration curve.

Hydrograph analysis: Components of hydrograph, separation of base flow, effective rainfall hyetograph and direct runoff hydrograph, unit hydrograph, assumptions, derivation of unit hydrograph, unit hydrographs of different durations, principle of superposition and S-hydrograph methods, limitations and applications of unit hydrograph, synthetic unit hydrograph.

UNIT-IV Floods: Causes and effects, frequency analysis- Gumbel's and Log-Pearson type III distribution methods, Standard Project Flood (SPF) and Probable Maximum Flood (MPF), flood control methods and management.

Flood Routing: Hydrologic routing, channel and reservoir routing-Muskingum and Puls methods of routing.

UNIT-V Groundwater: Occurrence, types of aquifers, aquifer parameters, porosity, specific yield, permeability, transmissivity and storage coefficient, types of wells, Darcy's law, Dupuit's equation- steady radial flow to wells in confined and unconfined aquifers, yield of a open well-recuperation test.

UNIT VI Advanced Topics in Hydrology: Rainfall-runoff Modelling, instantaneous unit hydrograph (IUH) - conceptual models - Clark and Nash models, general hydrological models- Chow - Kulandaiswamy model.

Text Books:

1. Engineering Hydrology, Jayarami Reddy, P., Laxmi Publications Pvt. Ltd., (2013), New Delhi
2. Irrigation and Water Power Engineering, B. C. Punmia, Pande B. B. Lal, Ashok Kumar Jain and Arun Kumar Jain, Lakshmi Publications (P) Ltd.

References:

1. Engineering Hydrology Subramanya, K, Tata McGraw-Hill Education Pvt Ltd, (2013),New Delhi.
2. Irrigation Engineering and Hydraulic Structure, Santosh Kumar Garg, Khanna Publishers.
3. Applied hydrology, Chow V. T., D. R Maidment and L.W. Mays, Tata McGraw Hill Education Pvt Ltd, (2011), New Delhi.
4. Water Resources Engineering, Mays L.W, Wiley India Pvt. Ltd, (2013).

III Year - II Semester

L	T	P	C
4	0	0	3

Electronic Instrumentation

Open Elective

Learning Objectives:

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UNIT-I:

Introduction:

(a) **Measurement Errors:** Gross errors and systematic errors, Absolute and relative errors, Accuracy, Precision, Resolution and Significant figures.

(b) **Voltmeters and Multimeters:** Introduction Multi range voltmeter, Extending voltmeter ranges, Loading, AC voltmeter using Rectifiers – Half wave and full wave, Peak responding and True RMS voltmeters.

UNIT-II:

Digital Instruments:Digital Voltmeters – Introduction, DVM's based on $V - T$, $V - F$ and Successive approximation principles, Resolution and sensitivity, General specifications, Digital Multi-meters, Digital frequency meters, Digital measurement of time.

UNIT-III:

Oscilloscopes:Introduction, Basic principles, CRT features, Block diagram and working of each block, Typical CRT connections, Dual beam and dual trace CROs, Electronic switch.

Special Oscilloscopes:Delayed time-base oscilloscopes, Analog storage, Sampling and Digital storage oscilloscopes.

UNIT-IV:

Signal Generators:Introduction, Fixed and variable AF oscillator, Standard signal generator, Laboratory type signal generator, AF sine and Square wave generator, Function generator, Square and Pulse generator, Sweep frequency generator, Frequency synthesizer.

UNIT-V:

Measurement of resistance, inductance and capacitance: Whetstone's bridge, Kelvin Bridge; AC bridges, Capacitance Comparison Bridge, Maxwell's bridge, Wein's bridge, Wagner's earth connection .

UNIT-VI:

Transducers & Miscellaneous:Introduction, Electrical transducers, Selecting a transducer, Resistive transducer, Resistive position transducer, Strain gauges, Resistance thermometer,

Thermistor, Inductive transducer, Differential output transducers, LVDT, Piezoelectric transducer, Photoelectric transducer, Photovoltaic transducer, Semiconductor photo devices, Temperature transducers-RTD, Thermocouple.

Display devices: Digital display system, classification of display, Display devices, LEDs, LCD displays; Bolometer and RF power measurement using Bolometer; Introduction to Signal conditioning.

Outcomes:

-

Text Books:

1. Electronic Instrumentation, H. S. Kalsi, TMH, 2004.
2. Electronic Instrumentation and Measurements, David A Bell, PHI / Pearson Education, 2006.

Reference Books:

1. Principles of Measurement Systems, John P. Beatly, 3rd Edition, Pearson Education, 2000.
2. Modern Electronic Instrumentation and Measuring Techniques, Cooper D & A D Helfrick, PHI, 1998.
3. Electronic and Electrical Measurements and Instrumentation, J. B. Gupta, S. K. Kataria & Sons, Delhi.
4. Electronics & Electrical Measurements, A K Sawhney, Dhanpat Rai & Sons, 9th edition. Instrumentation & Control Systems, K. Padmaraju, Y.J. Reddy, McGraw Hill Education, 2016.

DATA BASE MANAGEMENT SYSTEMS

Open Elective

OBJECTIVES

- To learn the principles of systematically designing and using large scale Database Management Systems for various applications.

UNIT-I: An Overview of Database Management, Introduction- What is Database System- What is Database-Why Database- Data Independence- Relation Systems and Others- Summary,

Database system architecture, Introduction- The Three Levels of Architecture-The External Level- the Conceptual Level- the Internal Level- Mapping- the Database Administrator-The Database Management Systems- Client/Server Architecture.

UNIT-II:

The E/R Models, The Relational Model, Relational Calculus, Introduction to Database Design, Database Design and Er Diagrams-Entities Attributes, and Entity Sets-Relationship and Relationship Sets-Conceptual Design With the Er Models, The Relational Model Integrity Constraints Over Relations- Key Constraints –Foreign Key Constraints-General Constraints, Relational Algebra and Calculus, Relational Algebra- Selection and Projection- Set Operation, Renaming – Joins- Division- More Examples of Queries, Relational Calculus, Tuple Relational Calculus- Domain Relational Calculus.

UNIT-III:

Queries, Constraints, Triggers: The Form of Basic SQL Query, Union, Intersect, and Except, Nested Queries, Aggregate Operators, Null Values, Complex Integrity Constraints in SQL, Triggers and Active Database.

UNIT-IV:

Schema Refinement (Normalization) : Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency(1NF, 2NF and 3 NF), concept of surrogate key, Boyce-codd normal form(BCNF), Lossless join and dependency preserving decomposition, Fourth normal form(4NF).

UNIT-V:

Transaction Management and Concurrency Control:

Transaction, properties of transactions, transaction log, and transaction management with SQL using commit rollback and savepoint.

Concurrency control for lost updates, uncommitted data, inconsistent retrievals and the Scheduler. Concurrency control with locking methods : lock granularity, lock types, two phase locking for ensuring serializability, deadlocks, Concurrency control with time stamp ordering : Wait/Die and Wound/Wait Schemes, Database Recovery management : Transaction recovery.

UNIT-VI:

Overview of Storages and Indexing, Data on External Storage- File Organization and Indexing –Clustered Indexing – Primary and Secondary Indexes, Index Data Structures, Hash-Based Indexing – Tree-Based Indexing, Comparison of File Organization

OUTCOMES

- Describe a relational database and object-oriented database.
- Create, maintain and manipulate a relational database using SQL
- Describe ER model and normalization for database design.
- Examine issues in data storage and query processing and can formulate appropriate solutions.
- Understand the role and issues in management of data such as efficiency, privacy, security, ethical responsibility, and strategic advantage.
- Design and build database system for a given real world problem

Text Books:

- 1. Introduction to Database Systems, C.J Date, Pearson**
2. Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, TATA McGraw Hill 3rd Edition
3. Database Systems - The Complete Book, H G Molina, J D Ullman, J Widom Pearson

References Books:

1. Data base Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.
2. Fundamentals of Database Systems, Elmasri Navrate Pearson Education
3. Introduction to Database Systems, C.J.Date Pearson Education

ALTERNATIVE ENERGY SOURCES

Open Elective

Course Objectives: To impart the necessity of finding alternative energy sources for automobiles. To understand merits and demerits, performance characteristics of various sources of fuels and their comparison.

UNIT-I

Objective: The objective is to introduce the use and the application of different fuel types and characteristics. The student will be able to understand Solar photo-voltaic conversion and working principles.

Introduction: Need for non-conventional energy sources. Energy alternative: solar, photo-voltaic, Hydrogen, Bio mass. Electrical - their merits and demerits.

Solar photo-voltaic conversion, Collection and storage of solar energy, collection devices, flat plate collectors, concentrating type collectors, principles and working of photo-voltaic Conversion, Applications to automobiles.

UNIT-II

Objective: The objective is to expose the student about energy from bio-mass performance characteristics.

Energy from Bio mass: Photosynthesis, photosynthetic oxygen production, energy plantation. Bio gas production from organic waste, description and types of Bio gas plants, Application and limitations - Merits and demerits performance characteristics and their comparison.

UNIT-III

Objective: The objective is to expose the students to study and understand basic principles of hydrogen energy and thermo-chemical production.

Hydrogen Energy: Properties of Hydrogen, sources of Hydrogen, Thermodynamics of water splitting Production of Hydrogen, Electrolysis of water. Thermal decomposition of water. Thermo-chemical production, Biochemical production.

UNIT – IV

Objective: To learn various factors to be considered in hydrogen fuel usage, and to study performance. Design and study of future possibilities of electric automobiles.

Hydrogen fuel, Storage and Transportation methods, Applications to engines modifications necessary, precautions and safety measures - Performance characteristics in Engine and their comparison.

Electric Automobiles: Design considerations, limitations. opportunities for improvement Batteries, problems. Future

Text Books:

Reference Books:

WASTE WATER MANAGEMENT OPEN ELECTIVE

Learning Objectives:

- Outline planning and the design of waste water collection ,conveyance and treatment systems for a community/town/city
- Provide knowledge of characterization of waste water generated in a community
- Impart understanding of treatment of sewage and the need for its treatment
- Summarize the appurtenance in sewage systems and their necessity
- Teach planning and design of septic tank and imhoff tank and the disposal of the effluent from these low cost treatment systems
- Effluent disposal method and realize the importance of regulations in the disposal of effluents in rivers

UNIT-I:

Introduction to Sanitation-Systems of sanitation- relative merits and demerits - collection and conveyance of waste water - classification of sewerage systems-Estimation of sewage flow and storm water drainage- fluctuations-types of sewers- Hydraulics of sewers and storm drains-design of sewers- appurtenances in sewerage- cleaning and ventilation of sewers

UNIT-II:

Pumping of wastewater: Pumping stations-location- components- types of pumps and their suitability with regard to wastewaters.

House Plumbing: Systems of plumbing-sanitary fittings and other accessories-one pipe and two pipe systems-Design of building drainage

UNIT-III:

Sewage characteristics-Sampling and analysis of waste water-Physical, chemical and Biological examination-measurement of BOD & COD- BOD equations

Treatment of sewage: Primary treatment- Screens-grit chambers- grease traps- floatation-sedimentation-design of preliminary and primary treatment units.

UNIT-IV:

Secondary treatment: Aerobic and anaerobic treatment process -comparison.

Suspended growth process: Activated sludge process, principles, design and operational problems, modifications of Activated sludge processes, Oxidation ponds, Aerated Lagoons.

Attached Growth process: Trickling Filters-mechanism of impurities removal-classification-design -operation and maintenance problems. RBCs. Fluidized bed reactors

UNIT-V:

Miscellaneous Treatment Methods: Nitrification and Denitrification- Removal of phosphates-UASB- Membrane reactors- Integrated fixed film reactors. Anaerobic Processes: Septic Tanks, Imhoff tanks- working principles and Design-disposal of septic tank effluent-FAB Reactors

UNIT-VI:

Bio-solids (sludge) management: Characteristics- handling and treatment of sludge-thickening-anaerobic digestion of sludge

Disposal of sewage: Methods of disposal- disposal into water bodies- Oxygen sag Curve-

Disposal into sea-disposal on land- sewage sickness

Outcomes:

By the end of successful completion of this course, the students will be able to:

- Plan and design the sewerage systems
- Characterization of sewage
- Select the appropriate appurtenances in the sewerage systems
- Select the suitable treatment flow for sewage treatment
- Identify the critical point of pollution in a river for a specific amount of pollutant disposal into the river

Text Book:

1. Waste water Engineering Treatment and Reuse by Metcalf & Eddy, Tata McGraw- Hill edition.
2. Elements of Environmental Engineering by K.N. Duggal, S.Chand & Company Ltd. New Delhi, 2012.
3. Environmental Engineering by Howard S.Peavy , Donald R. Rowe, Teorge George Tchobanoglus- Mc-Graw-Hill Book Company, New Delhi, 1985
4. Wastewater Treatment for pollution control and Reuse, by soli.J Areivala, sham R Asolekar, Mc-GrawHill, New Delhi; 3rd Edition
5. Industrial water & wastewater management by KVSG MuraliKrishna

Reference Book:

1. Environmental Engineering-II: Sewage disposal and Air pollution Engineering , by Garg, S.K.,: Khanna publishers
2. Sewage treatment and disposal by Dr.P.N.Modi & Sethi.
3. Environmental Engineering, by Ruth F. Weiner and Robin Matthews- 4th Edition Elsevier, 2003
4. Environmental Engineering by D. Srinivasan, PHI Learning private Limited , New Delhi,2011.

**Fundamentals of Liquefied Natural Gas
Open Elective**

No Syllabus

Green Fuel Technologies
Open Elective

No Syllabus

III Year - II Semester

L	T	P	C
0	0	3	2

GEOTECHNICAL ENGINEERING LAB

Course Learning Objectives:

The objective of this course is:

- To impart knowledge of determination of index properties required for classification of soils.
- To teach how to determine compaction characteristics and consolidation behavior from relevant lab tests; to determine permeability of soils.
- To teach how to determine shear parameters of soil through different laboratory tests.

Course Outcomes:

Upon successful completion of this course, student will be able to

- Determine index properties of soil and classify them.
- Determine permeability of soils.
- Determine Compaction, Consolidation and shear strength characteristics.

SYLLABUS:

LIST OF EXPERIMENTS

1. Specific gravity, G
2. Atterberg's Limits.
3. Field density-Core cutter and Sand replacement methods
4. Grain size analysis by sieving
5. Hydrometer Analysis Test
6. Permeability of soil - Constant and Variable head tests
7. Compaction test
8. Consolidation test (to be demonstrated)
9. Direct Shear test
10. Triaxial Compression test (UU Test)
11. Unconfined Compression test
12. Vane Shear test
13. Differential free swell (DFS)
14. CBR Test

At least **Ten** experiments shall be conducted.

LIST OF EQUIPMENT:

1. Casagrande's liquid limit apparatus.
2. Apparatus for plastic and shrinkage limits
3. Field density apparatus for
 - a) Core cutter method
 - b) Sand replacement method
4. Set of sieves: 4.75mm, 2mm, 1mm, 0.6mm, 0.42mm, 0.3mm, 0.15mm, and 0.075mm.
5. Hydrometer
6. Permeability apparatus for
 - a) Constant head test
 - b) Variable head test
7. Universal auto compactor for I.S light and heavy compaction tests.
8. Shaking table, funnel for sand raining technique.
9. Apparatus for CBR test
10. 10 tons loading frame with proving rings of 0.5 tons and 5 tons capacity
11. One dimensional consolidation test apparatus with all accessories.
12. Triaxial cell with provision for accommodating 38 mm dia specimens.
13. Box shear test apparatus
14. Laboratory vane shear apparatus.
15. Hot air ovens (range of temperature 50⁰ - 150⁰C)

Reference:

1. Determination of Soil Properties, J. E. Bowles.
2. IS Code 2720 – relevant parts.

III Year - II Semester

L	T	P	C
0	0	3	2

ENVIRONMENTAL ENGINEERING LAB

Course Learning Objectives:

The course will address the following:

- Estimation some important characteristics of water and wastewater in the laboratory
- It also gives the significance of the characteristics of the water and wastewater

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

- Estimation some important characteristics of water and wastewater in the laboratory
- Draw some conclusion and decide whether the water is potable or not.
- Decide whether the water body is polluted or not with reference to the state parameters in the list of experiments
- Estimation of the strength of the sewage in terms of BOD and COD

SYLLABUS:

List of Experiments

1. Determination of pH and Electrical Conductivity (Salinity) of Water and Soil.
2. Determination and estimation of Total Hardness–Calcium & Magnesium.
3. Determination of Alkalinity/Acidity
4. Determination of Chlorides in water and soil
5. Determination and Estimation of total solids, organic solids and inorganic solids and settleable solids by Imhoff Cone.
6. Determination of Iron.
7. Determination of Dissolved Oxygen with D.O. Meter & Winklers Method and B.O.D.
8. Determination of N, P, K values in solid waste
9. Physical parameters – Temperature, Colour, Odour, Turbidity, Taste.
10. Determination of C.O.D.
11. Determination of Optimum coagulant dose.
12. Determination of Chlorine demand.
13. Presumptive Coliform test.

NOTE: At least 10 of the above experiments are to be conducted.

List of Equipments

- 1) pH meter
- 2) Turbidity meter
- 3) Conductivity meter
- 4) Hot air oven
- 5) Muffle furnace
- 6) Dissolved Oxygen meter
- 7) U–V visible spectrophotometer
- 8) COD Reflux Apparatus
- 9) Jar Test Apparatus
- 10) BOD incubator
- 11) Autoclave
- 12) Laminar flow chamber
- 13) Hazen's Apparatus

Text Books

1. Standard Methods for Analysis of Water and Waste Water – APHA
2. Chemical Analysis of Water and Soil by KVSG Murali Krishna, Reem Publications, New Delhi

Reference

1. Relevant IS Codes.
2. Chemistry for Environmental Engineering by Sawyer and Mc. Carty.

III Year - II Semester	L	T	P	C
	0	0	3	2

COMPUTER AIDED ENGINEERING LABORATORY

Course Learning Objectives:

The objective of this course is:

- Outline planning and the design of wastewater collection, conveyance and treatment systems for a community/town/city
- Provide knowledge of characterisation of wastewater generated in a community
- Impart understanding of treatment of sewage and the need for its treatment.
- Summarize the appurtenance in sewerage systems and their necessity
- Teach planning, and design of septic tank and imhoff tank and the disposal of the effluent from these low cost treatment systems
- Effluent disposal method and realise the importance of regulations in the disposal of effluents in rivers

Course Outcomes:

By the end of successful completion of this course, the students will be able to:

- Plan and design the sewerage systems
- Select the appropriate appurtenances in the sewerage systems
- Analyze sewage and suggest and design suitable treatment system for sewage treatment
- Identify the critical point of pollution in a river for a specific amount of pollutant disposal into the river
- Suggest a suitable disposal method with respect to effluent standards.

SYLLABUS:

UNIT – I: Introduction to Sanitation – Systems of sanitation – relative merits & demerits – collection and conveyance of waste water – sewerage – classification of sewerage systems- Estimation of sewage flow and storm water drainage – fluctuations – types of sewers - Hydraulics of sewers and storm drains– design of sewers – appurtenances in sewerage – cleaning and ventilation of sewers

UNIT – II: Pumping of wastewater: Pumping stations – location – components– types of pumps and their suitability with regard to wastewaters.

House Plumbing: Systems of plumbing-sanitary fittings and other accessories–one pipe and two pipe systems – Design of building drainage

UNIT – III: Sewage characteristics – Sampling and analysis of wastewater - Physical, Chemical and Biological Examination-Measurement of BOD and COD - BOD equations
Treatment of sewage: Primary treatment-Screens-grit chambers-grease traps–floatation–sedimentation – design of preliminary and primary treatment units.

UNIT – IV: Secondary treatment: Aerobic and anaerobic treatment process-comparison.
Suspended growth process: Activated Sludge Process, principles, designs, and operational problems, modifications of Activated Sludge Processes, Oxidation ponds, Aerated Lagoons.
Attached Growth Process: Trickling Filters–mechanism of impurities removal–classification–design-operation and maintenance problems. RBCs, Fluidized bed reactors

UNIT V: Miscellaneous Treatment Methods: Nitrification and Denitrification – Removal of Phosphates –UASB–Membrane reactors-Integrated fixed film reactors. Anaerobic Processes: Septic Tanks and Imhoff tanks- working Principles and Design–Reuse and disposal of septic tank effluent, FAB Reactors.

UNIT – VI: Bio-solids (Sludge) management: Characteristics-SVI, handling and treatment of sludge-thickening – anaerobic digestion of sludge, Sludge Drying Beds. Centrifuge.
Disposal of sewage: Methods of disposal – disposal into water bodies-Oxygen Sag Curve-Disposal into sea, disposal on land- sewage sickness.

Text Books

1. Wastewater Engineering Treatment and Reuse, Metcalf & Eddy, Tata McGraw-Hill edition.
2. Industrial Water and Wastewater Management, K.V.S.G. Murali Krishna.
3. Elements of Environmental Engineering, K. N. Duggal, S. Chand & Company Ltd. New Delhi, 2012.

References

1. Environmental Engineering, Howard S. Peavy, Donald R. Rowe, Teorge George Tchobanoglus – Mc-Graw-Hill Book Company, New Delhi, 1985
2. Wastewater Treatment for Pollution Control and Reuse, Soli. J Arceivala, Sham R Asolekar, Mc-GrawHill, NewDelhi; 3^rd Edition
3. Environmental Engineering –II: Sewage disposal and Air Pollution Engineering, Garg, S. K., Khanna Publishers
4. Sewage treatment and disposal, P. N. Modi & Sethi.
5. Environmental Engineering, Ruth F. Weiner and Robin Matthews – 4th Edition Elsevier, 2003
6. Environmental Engineering, D. Srinivasan, PHI Learning Private Limited, New Delhi, 2011.

IV Year - I Semester

L	T	P	C
4	0	0	3

ENVIRONMENTAL ENGINEERING -II

Course Learning Objectives:

The objective of this course is:

- Outline planning and the design of wastewater collection, conveyance and treatment systems for a community/town/city
- Provide knowledge of characterisation of wastewater generated in a community
- Impart understanding of treatment of sewage and the need for its treatment.
- Summarize the appurtenance in sewerage systems and their necessity
- Teach planning, and design of septic tank and imhoff tank and the disposal of the effluent from these low cost treatment systems
- Effluent disposal method and realise the importance of regulations in the disposal of effluents in rivers

Course Outcomes:

By the end of successful completion of this course, the students will be able to:

- Plan and design the sewerage systems
- Select the appropriate appurtenances in the sewerage systems
- Analyze sewage and suggest and design suitable treatment system for sewage treatment
- Identify the critical point of pollution in a river for a specific amount of pollutant disposal into the river
- Suggest a suitable disposal method with respect to effluent standards.

SYLLABUS:

UNIT – I: Introduction to Sanitation – Systems of sanitation – relative merits & demerits – collection and conveyance of waste water – sewerage – classification of sewerage systems- Estimation of sewage flow and storm water drainage – fluctuations – types of sewers - Hydraulics of sewers and storm drains– design of sewers – appurtenances in sewerage – cleaning and ventilation of sewers

UNIT – II: Pumping of wastewater: Pumping stations – location – components– types of pumps and their suitability with regard to wastewaters.

House Plumbing: Systems of plumbing-sanitary fittings and other accessories– one pipe and two pipe systems – Design of building drainage

UNIT – III: Sewage characteristics – Sampling and analysis of wastewater - Physical, Chemical and Biological Examination-Measurement of BOD and COD - BOD equations

Treatment of sewage: Primary treatment-Screens-grit chambers-grease traps– floatation– sedimentation – design of preliminary and primary treatment units.

UNIT – IV: Secondary treatment: Aerobic and anaerobic treatment process-comparison.

Suspended growth process: Activated Sludge Process, principles, designs, and operational problems, modifications of Activated Sludge Processes, Oxidation ponds, Aerated Lagoons.

Attached Growth Process: Trickling Filters–mechanism of impurities removal- classification–design-operation and maintenance problems. RBCs, Fluidized bed reactors

UNIT V: Miscellaneous Treatment Methods: Nitrification and Denitrification – Removal of Phosphates –UASB–Membrane reactors-Integrated fixed film reactors. Anaerobic Processes: Septic Tanks and Imhoff tanks- working Principles and Design–Reuse and disposal of septic tank effluent, FAB Reactors.

UNIT – VI: Bio-solids (Sludge) management: Characteristics-SVI, handling and treatment of sludge-thickening – anaerobic digestion of sludge, Sludge Drying Beds. Centrifuge.

Disposal of sewage: Methods of disposal – disposal into water bodies-Oxygen Sag Curve-Disposal into sea, disposal on land- sewage sickness.

Text Books

4. Wastewater Engineering Treatment and Reuse, Metcalf & Eddy, Tata McGraw-Hill edition.
5. Industrial Water and Wastewater Management, K.V.S.G. Murali Krishna.
6. Elements of Environmental Engineering, K. N. Duggal, S. Chand & Company Ltd. New Delhi, 2012.

References

7. Environmental Engineering, Howard S. Peavy, Donald R. Rowe, George Tchobanoglous – Mc-Graw-Hill Book Company, New Delhi, 1985
8. Wastewater Treatment for Pollution Control and Reuse, Soli. J Arceivala, Sham R Asolekar, Mc-GrawHill, NewDelhi; 3^rd Edition
9. Environmental Engineering –II: Sewage disposal and Air Pollution Engineering, Garg, S. K., Khanna Publishers
10. Sewage treatment and disposal, P. N. Modi & Sethi.
11. Environmental Engineering, Ruth F. Weiner and Robin Matthews – 4th Edition Elsevier, 2003

Environmental Engineering, D. Srinivasan, PHI Learning Private Limited, New Delhi, 2011.

IV Year - I Semester	L	T	P	C
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WATER RESOURCES ENGINEERING–II

Course Learning Objectives:

The course is designed to

- introduce the types of irrigation systems
- introduce the concepts of planning and design of irrigation systems
- discuss the relationships between soil, water and plant and their significance in planning an irrigation system
- understand design methods of erodible and non-erodible canals
- know the principles of design of hydraulic structures on permeable foundations
- know the concepts for analysis and design principles of storage and diversion head works
- learn design principles of canal structures

Course Outcomes

At the end of the course the student will be able to

- estimate irrigation water requirements
- design irrigation canals and canal network
- plan an irrigation system
- design irrigation canal structures
- plan and design diversion head works
- analyse stability of gravity and earth dams
- design ogee spillways and energy dissipation works

SYLLABUS:

UNIT-I Irrigation: Necessity and importance, principal crops and crop seasons, types, methods of application, soil-water-plant relationship, soil moisture constants, consumptive use, estimation of consumptive use, crop water requirement, duty and delta, factors affecting duty, depth and frequency of irrigation, irrigation efficiencies, water logging and drainage, standards of quality for irrigation water, crop rotation.

UNIT-II Canals: Classification, design of non-erodible canals - methods of economic section and maximum permissible velocity, economics of canal lining, design of erodible canals -Kennedy's silt theory and Lacey's regime theory, balancing depth of cutting.

UNIT III Canal Structures:

Falls: Types and location, design principles of Sarada type fall and straight glacis fall.

Regulators: Head and cross regulators, design principles

Cross Drainage Works: Types, selection, design principles of aqueduct, siphon aqueduct and super passage.

Outlets: types, proportionality, sensitivity and flexibility

River Training: Objectives and approaches

UNIT-IV Diversion Head Works: Types of diversion head works, weirs and barrages, layout of diversion head works, components. causes and failures of weirs on permeable foundations, Bligh's creep theory, Khosla's theory, design of impervious floors for subsurface flow, exit gradient.

UNIT-V Reservoir Planning: Investigations, site selection, zones of storage, yield and storage capacity of reservoir, reservoir sedimentation.

Dams: Types of dams, selection of type of dam, selection of site for a dam.

Gravity dams: Forces acting on a gravity dam, causes of failure of a gravity dam, elementary profile and practical profile of a gravity dam, limiting height of a dam, stability analysis, drainage galleries, grouting.

UNIT-VI Earth Dams: Types, causes of failure, criteria for safe design, seepage, measures for control of seepage-filters, stability analysis-stability of downstream slope during steady seepage and upstream slope during sudden drawdown conditions.

Spillways: Types, design principles of Ogee spillways, types of spillways crest gates. Energy dissipation below spillways-stilling basin and its appurtenances.

Text Books:

1. Irrigation and Water Power Engineering, B. C. Punmia, Pande B. B. Lal, Ashok Kumar Jain, Arun Kumar Jain, Lakshmi Publications (P) Ltd.
2. Irrigation Engineering and Hydraulic Structure, Santosh Kumar Garg, Khanna Publishers.

References:

1. Irrigation and Water Resources Engineering, Asawa G L (2013), New Age International Publishers
2. Irrigation Water Resources and Water Power Engineering, Modi P N (2011), Standard Book House, New Delhi

IV Year - I Semester

L	T	P	C
4	0	0	3

GEOTECHNICAL ENGINEERING – II

Course Learning Objectives:

The objective of this course is:

- To impart to the student knowledge of types of shallow foundations and theories required for the determination of their bearing capacity.
- To enable the student to compute immediate and consolidation settlements of shallow foundations.
- To impart the principles of important field tests such as SPT and Plate bearing test.
- To enable the student to imbibe the concepts of pile foundations and determine their load carrying capacity.

Course Outcomes:

Upon the successful completion of this course:

- The student must be able to understand the various types of shallow foundations and decide on their location based on soil characteristics.
- The student must be able to compute the magnitude of foundation settlement to decide the size of the foundation.
- The student must be able to use the field test data and arrive at the bearing capacity.
- The student must be able to design Piles based on the principles of bearing capacity.

SYLLABUS:

UNIT – I Stability of Slopes: Infinite and finite earth slopes in sand and clay – types of failures – factor of safety of infinite slopes – stability analysis by Swedish arc method, standard method of slices – Taylor’s Stability Number-Stability of slopes of dams and embankments - different conditions.

UNIT – II Earth Retaining Structures: Rankine’s & Coulomb’s theory of earth pressure – Culmann’s graphical method - earth pressures in layered soils.

UNIT-III Shallow Foundations – Bearing Capacity Criteria: Types of foundations and factors to be considered in their location - Bearing capacity – criteria for determination of bearing capacity – factors influencing bearing capacity – analytical methods to determine bearing capacity – Terzaghi’s theory - IS Methods. Settlement Criteria: Safe bearing pressure based on N- value – allowable bearing pressure; safe bearing capacity and settlement from plate load test – Types of foundation settlements and their determination - allowable settlements of structures.

UNIT –IV Pile Foundations: Types of piles – Load carrying capacity of piles based on static pile formulae – Dynamic pile formulae– Pile load tests - Load carrying capacity of pile groups in sands and clays.

UNIT-V Well Foundations: Types – Different shapes of well – Components of well – functions – forces acting on well foundations - Design Criteria – Determination of steining thickness and plug - construction and Sinking of wells – Tilt and shift.

UNIT – VI Soil Exploration: Need – Methods of soil exploration – Boring and Sampling methods – Field tests – Penetration Tests – Pressure meter – planning of Programme and preparation of soil investigation report.

Text Books:

1. Principles of Foundation Engineering, Das, B.M., (2011), 6th edition Cengage learning
2. Basic and Applied Soil Mechanics, Gopal Ranjan & A.S.R. Rao, New Age International Pvt. Ltd, (2004).

References:

1. Foundation Analysis and Design, Bowles, J.E., (1988), 4th Edition, McGraw-Hill Publishing Company, Newyork.
2. Analysis and Design of Substructures by Swami Saran, Sarita Prakashan, Meerut.

IV Year - I Semester

L	T	P	C
4	0	0	3

REMOTE SENSING AND GIS APPLICATIONS

Course Learning Objectives:

The course is designed to

- introduce the basic principles of Remote Sensing and GIS techniques.
- learn various types of satellite sensors and platforms
- learn concepts of visual and digital image analyses
- understand the principles of spatial analysis
- appreciate application of RS and GIS to Civil engineering

Course outcomes

At the end of the course the student will be able to

- be familiar with ground, air and satellite based sensor platforms.
- interpret the aerial photographs and satellite imageries
- create and input spatial data for GIS application
- apply RS and GIS concepts in water resources engineering
- applications of various satellite data

SYLLABUS:

UNIT – I Introduction to remote sensing: Basic concepts of remote sensing, electromagnetic radiation, electromagnetic spectrum, interaction with atmosphere, energy interaction with the earth surfaces, Characteristics of remote sensing systems

Sensors and platforms: Introduction, types of sensors, airborne remote sensing, spaceborne remote sensing, image data characteristics, digital image data formats-band interleaved by pixel, band interleaved by line, band sequential, IRS, LANDSAT, SPOT, MODIS, ASTER, RISAT and CARTOSAT

UNIT – II Image analysis: Introduction, elements of visual interpretations, digital image processing- image preprocessing, image enhancement, image classification, supervised classification, unsupervised classification.

UNIT – III Geographic Information System: Introduction, key components, application areas of GIS, map projections.

Data entry and preparation: spatial data input, raster data models, vector data models.

UNIT – IV Spatial data analysis: Introduction, overlay function-vector overlay operations, raster overlay operations, arithmetic operators, comparison and logical operators, conditional expressions, overlay using a decision table, network analysis-optimal path finding, network allocation, network tracing and buffer analysis.

UNIT – V RS and GIS applications General: Land cover and land use, agriculture, forestry, geology, geomorphology, urban applications,

UNIT – VI Applications of Hydrology, Water Resources and Disaster Management: Flood zoning and mapping, groundwater prospects and potential recharge zones, watershed management and disaster management with case studies.

TEXT BOOKS:

1. Remote sensing and GIS, Bhatta B (2008) , Oxford University Press
2. Remote Sensing and Image Interpretation, Lillesand, T.M, R.W. Kiefer and J.W. Chipman (2013), Wiley India Pvt. Ltd., New Delhi
3. Fundamentals of Geographic Information Systems, Demers, M.N, Wiley India Pvt. Ltd, 2013.

REFERENCES:

1. Fundamentals of Remote Sensing, George Joseph, Universities Press, 2013.
2. Concepts and Techniques of Geographical Information System, Chor Pang Lo and A K W Yeung, Prentice Hall (India), 2006
3. Remote Sensing and its Applications, Narayan LRA, Universities Press, 2012.
4. Introduction to Geographic Information Systems, Kand Tsung Chang, McGraw Hill Higher Education, 2009.
5. Basics of Remote sensing & GIS, Kumar S, Laxmi Publications, New Delhi, 2005.
6. Principals of Geographical Information Systems, Burrough P A and R.A. McDonnell, Oxford University Press, 1998.
7. Remote Sensing, Schowenger, R. A (2006), Elsevier publishers.

IV Year - I Semester	L	T	P	C
	4	0	0	3

FINITE ELEMENT METHODS

(Elective – I)

Course Learning Objectives:

The objective of this course is:

- Equip the students with the fundamentals of Finite Element Analysis
- Enable the students to formulate the design problems into FEA.
- Enable the students to solve Boundary value problems using FEM

Course Outcomes:

Upon completion of the course, the student will be able to

- Solve simple boundary value problems using Numerical technique of Finite element method
- Develop finite element formulation of one and two dimensional problems and solve them.
- Assemble Stiffness matrices, Apply boundary conditions and solve for the displacements
- Compute Stresses and Strains and interpret the result.

SYLLABUS:

UNIT-I Introduction: Review of stiffness method- Principle of Stationary potential energy- Potential energy of an elastic body- Rayleigh-Ritz method of functional approximation.

UNIT-II Principles of Elasticity- Equilibrium Equations- Strain Displacement relationships- Constitutive relationship for plane stress, plane strain and axi symmetric bodies of revolution with axi symmetric loading.

UNIT-III Finite Element formulation of truss element: Stiffness matrix- properties of stiffness matrix –Selection of approximate displacement functions- solution of a plane truss- transformation matrix- Galerkin’s method for 1-D truss – Computation of stress in a truss element.

UNIT-IV Finite element formulation of Beam elements: Beam stiffness- assemblage of beam stiffness matrix- Examples on Analysis of beams Subjected to Concentrated and Distributed loading.

UNIT-V Finite element formulation for plane stress and plane strain problems- Derivation of CST and LST stiffness matrix and equations-treatment of body and surface forces

UNIT-VI Iso-parametric Formulation: An isoparametric bar element- plane bilinear isoparametric element – quadratic plane element - shape functions, evaluation of stiffness matrix, consistent nodal load vector - Gauss quadrature for performing numerical integrations.

Text Books

1. A first course in the Finite Element Method, Daryl L. Logan, Thomson Publications.
2. Introduction to Finite Elements in Engineering, Tirupati R. Chandrupatla, Ashok D. Belgundu, PHI publications.,
3. Introduction to Finite Element Method, Desai & Abel CBS Publications

References:

1. Concepts and applications of Finite Element Analysis, Robert D. Cook, Michael E Plesha, John Wiley & sons Publication

GROUND IMPROVEMENT TECHNIQUES

Course Learning Objectives:

The objective of this course is:

- To make the student appreciate the need for different ground improvement methods adopted for improving the properties of remoulded and in-situ soils by adopting different techniques such as in situ densification and dewatering methods.
- To make the student understand how the reinforced earth technology and soil nailing can obviate the problems posed by the conventional retaining walls.
- To enable the students to know how geotextiles and geosynthetics can be used to improve the engineering performance of soils.
- To make the student learn the concepts, purpose and effects of grouting.

Course Outcomes:

- By the end of the course, the student should be able to possess the knowledge of various methods of ground improvement and their suitability to different field situations.
- The student should be in a position to design a reinforced earth embankment and check its stability.
- The student should know the various functions of Geosynthetics and their applications in Civil Engineering practice.
- The student should be able to understand the concepts and applications of grouting.

SYLLABUS:

UNIT- I In situ densification methods- in situ densification of granular soils- vibration at ground surface and at depth, impact at ground and at depth – in situ densification of cohesive soils – pre loading – vertical drains – sand drains and geo drains – stone columns.

UNIT –II Dewatering – sumps and interceptor ditches – single and multi stage well points – vacuum well points – horizontal wells – criteria for choice of filler material around drains – electro osmosis

UNIT- III Stabilization of soils – methods of soil stabilization – mechanical – cement – lime – bitumen and polymer stabilization – use of industrial wastes like fly ash and granulated blast furnace slag.

UNIT- IV Reinforce earth – principles – components of reinforced earth – design principles of reinforced earth walls – stability checks – soil nailing.

UNIT- V Geosynthetics – geotextiles – types – functions , properties and applications – geogrids , geomembranes and gabions - properties and applications.

UNIT-VI Grouting – objectives of grouting – grouts and their applications – methods of grouting – stage of grouting – hydraulic fracturing in soils and rocks – post grout tests

Text Books:

1. Ground Improvement Techniques, Purushotham Raj, Laxmi Publications, New Delhi.
2. Ground Improvement Techniques, Nihar Ranjan Patro, Vikas Publishing House (p) limited , New Delhi.
3. An introduction to Soil Reinforcement and Geosynthetics, G. L. Siva Kumar Babu, Universities Press.

Reference:

1. Ground Improvement, M.P. Moseley, Blackie Academic and Professional, USA.
2. Designing with Geosynthetics, R. M Koerner, Prentice Hall

AIR POLLUTION AND CONTROL

Course Learning Objectives:

The course will address the following:

- To know the analysis of air pollutants
- To know the Threshold Limit Values (TLV) of various air pollutants
- To acquire the design principles of particulate and gaseous control
- To learn plume behaviour in different environmental conditions
- To learn carbon credits for various day to day activities

Course Learning Outcomes:

Upon successful completion of this course, the students will be able to:

- Decide the ambient air quality based on the analysis of air pollutants
- Design particulate and gaseous control measures for an industry
- Judge the plume behaviour in a prevailing environmental condition
- Estimate carbon credits for various day to day activities

SYLLABUS:

UNIT – I Air Pollution: Sampling and analysis of air pollutants, conversion of ppm into $\mu\text{g}/\text{m}^3$. Definition of terms related to air pollution and control - secondary pollutants - Indoor air pollution – Ozone holes and Climate Change and its impact - Carbon Trade.

UNIT-II Thermodynamics and Kinetics of Air-pollution: Applications in the removal of gases like SO_x , NO_x , CO and HC - Air-fuel ratio- Computation and Control of products of combustion, Automobile pollution. Odour pollution control, Flares.

UNIT – III Meteorology and Air Pollution: Properties of atmosphere: Heat, Pressure, Wind forces, Moisture and relative Humidity, Lapse Rates - Influence of Terrain and Meteorological phenomena on plume behaviour and Air Quality - Wind rose diagrams and Isopleths Plume Rise Models

UNIT-IV Ambient Air Quality Management: Monitoring of SPM - RPM SO_2 ; NO_x and CO - Stack Monitoring for flue gases - Micro-meteorological monitoring – Noise Monitoring - Weather Station. Emission Standards- Gaussian Model for Plume Dispersion

UNIT-V Air Pollution Control: Control of particulates – Control at Sources, Process Changes, Equipment modifications, Design and operation of control Equipments – Settling Chambers, Cyclone separators –Fabric filters–Scrubbers, Electrostatic precipitators

UNIT – VI Air Pollution Control Methods: Control of NO_x and SO_x emissions – Environmental friendly fuels - In-plant Control Measures, process changes, methods of removal and recycling. Environmental criteria for setting industries and green belts.

Text Books:

1. Air Pollution and Control, K.V.S.G. Murali Krishna, Laxmi Publications, New Delhi, 2015
2. Air Pollution, M. N. Rao and H. V. N. Rao, Tata McGraw Hill Company.

Reference:

1. An Introduction to Air pollution, R. K. Trivedy and P.K. Goel, B.S. Publications.
2. Air Pollution by Wark and Warner - Harper & Row, New York.

URBAN HYDROLOGY

Course Learning Objectives:

The course is designed to:

- appreciate the impact of urbanization on catchment hydrology
- understand the importance of short duration rainfall runoff data for urban hydrology studies.
- learn the techniques for peak flow estimation for storm water drainage system design.
- understand the concepts in design of various components of urban drainage systems
- learn some of the best management practices in urban drainage.
- understand the concepts of preparation master urban drainage system

Course Outcomes

At the end of the course the student will be able to

- develop intensity duration frequency curves for urban drainage systems
- develop design storms to size the various components of drainage systems.
- apply best management practices to manage urban flooding.
- prepare master drainage plan for an urbanized area.

SYLLABUS:

UNIT I Introduction: Urbanisation and its effect on water cycle – urban hydrologic cycle – trends in urbanisation – Effect of urbanisation on hydrology

UNIT II Precipitation Analysis: Importance of short duration of rainfall and runoff data, methods of estimation of time of concentration for design of urban drainage systems, Intensity-Duration -Frequency (IDF) curves, design storms for urban drainage systems.

UNIT III Approaches to urban drainage: Time of concentration, peak flow estimation approaches , rational method, NRCS curve number approach, runoff quantity and quality, wastewater and stormwater reuse , major and minor systems.

UNIT IV Elements of drainage systems: Open channel, underground drains, appurtenances, pumping, source control.

UNIT V Analysis and Management: Stormwater drainage structures, design of stormwater network- Best Management Practices–detention and retention facilities, swales, constructed wetlands, models available for stormwater management.

UNIT VI Master drainage plans: Issues to be concentrated upon – typical urban drainage master plan, interrelation between water resources investigation and urban planning processes, planning objectives, comprehensive planning , use of models in planning

Text Books:

1. Manual on Drainage in Urbanised area, Geiger W. F., J Marsalek, W. J. Rawls and F. C. Zuidema, (1987 - 2 volumes), UNESCO,
2. Urban Hydrology, Hall M J (1984), Elsevier Applied Science Publisher.
3. Hydrology – Quantity and Quality Analysis, Wanielista M P and Eaglin (1997), Wiley and Sons
4. Urban Hydrology, Hydraulics and Stormwater Quality: Engineering Applications and Computer Modelling, Akan A.O and R.L. Houghtalen (2006), Wiley International.

References:

1. Stormwater Detention for Drainage, Stahre P and Urbonas B (1990), Water Quality and CSO Management, Prentice Hall.
2. Urban water cycle processes and interactions, Marsalek et. al. (2006), Publication No. 78, UNESCO, Paris(<http://www.bvsde.paho.org/bvsacd/cd63/149460E.pdf>)
3. Frontiers in Urban Water Management – Deadlock or Hope, by Maksimovic C and J A Tejada-Guibert (2001), IWA Publishing

TRAFFIC ENGINEERING

Course Learning Objectives:

The objective of this course is:

- To know various components and characteristics of traffic.
- To know various traffic control devices and principles of highway safety.
- To understand the detrimental effects of traffic on environment
- To know highway capacity and level of service concepts.
- To learn about intelligent vehicle highway systems.

Course Outcomes:

At the end of course, Student can

- Determine traffic speed, volume, travel time and density.
- Design traffic signals
- Determine highway capacity

SYLLABUS:

UNIT- I Components Of The Traffic System: Human-Vehicle–Environment System; characteristics of Road users, Vehicles, Highways and their classification, Traffic Studies: Inventories, Volume studies; Speed, Travel time and Delay studies, Intersection studies, Pedestrian studies; Parking studies; Accident studies.

UNIT- II Traffic Characteristics: Microscopic and macroscopic flow characteristics: Time headways; Temporal, spatial and model flow patterns; Interrupted and Un interrupted traffic. Microscopic and macroscopic speed characteristics: Vehicular speed Trajectories; Speed characteristics – Mathematical distribution; Speed and travel time variations; Travel time and delay studies. Microscopic and Macroscopic density characteristics: Distance headway characteristics; Car-following theories; Density measurement techniques; Density contour maps

UNIT- III Traffic Control Devices & Highway Safety: Traffic signs & Markings; Signal Warrants; Signal phasing and Development of phase plans; Fixed and Vehicle activated signals; Webster method; ARRB method; Drew's Method; IRC method; Signal coordination; Area Traffic control. Accident characteristics – Road – Driver – Vehicle; Accident recording and Analysis; Highway Safety Improvement Program; Safety Audit.

UNIT-IV Environmental Considerations: Air pollution: Kinds of pollutants; Air pollution standards; Measures of air quality; modelling and control. Noise pollution: Measurement of sound levels; Acceptable limits, Prediction of noise levels, Traffic noise control.

UNIT- V Highway Capacity And Level Of Service: Capacity and level of service; Factors affecting Capacity and LOS; Capacity of Rural Highways, Capacity of Urban Roads; HCM and IRC standards.

UNIT- VI Intelligent Vehicle – Highway Systems: Traffic surveillance and monitoring; IVHS programs, Role of IVHS, IVHS categories, Benefits and Costs of IVHS

Text Books

1. Traffic Engineering: Theory and Practice, Pignataro LJ., Prentice hall, Inc
2. Traffic and Transport planning, Kadiyali L.R., Khanna Publishers

References:

1. Traffic Engineering Hand Book, Institute of Transportation Engineers, 4 Ed., Prentice Hall
2. Traffic Engineering, Mc Shane, WR and RP Roess, Prentice Hall
3. Highway Traffic analysis and design, Salter RJ and NB Hounsell, 3rd ed., Macmillan
4. Traffic Planning and Engineering, Hobbs FD., Pergamon press
5. Traffic flow fundamentals, May, A.D., Prentice Hall

IV Year - I Semester	L	T	P	C
	4	0	0	3

ADVANCED STRUCTURAL ENGINEERING

(Elective-II)

Course Learning Objectives:

The objective of this course is:

- Familiarize Students with Raft Foundations and Retaining walls
- Equip student with concepts of design of different types of RCC water tanks
- Understand Concepts of flat slabs
- Familiarize different types of Bunkers, Silos and Chimneys
- Understand different types of transmission towers

Course Outcomes:

At the end of this course the student will be able to

- Design raft foundations and different types of RCC retaining walls
- Carryout analysis and design of different types of RCC water tanks
- Solve the problems design of RCC Bunkers, Silos and Chimneys
- Understand various types of transmission towers and loading on them.

SYLLABUS:

UNIT – I Analysis and Design of Raft Foundations – Design of RCC Retaining walls: Cantilever and Counter fort

UNIT – II Analysis and Design of RCC Water Tanks, Circular and Rectangular types- Intze tank including staging.

UNIT – III Analysis and Design of Flat Slabs- Direct Design and Equivalent Frame Methods- Check for Punching shear

UNIT – IV Analysis and Design of Bunkers and Silos- Concepts of Loading

UNIT-V Analysis and Design of Chimney, Concepts of loading

UNIT-VI Introduction to Transmission Towers- Principles and procedures

Text books:

1. Reinforced Concrete Structures' Vol-2, B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt. Ltd., New Delhi
2. Reinforced Concrete Structures, N. Subrahmanian, Oxford Publishers
3. Design Drawing of Concrete and Steel Structures, N. Krishna Raju University Press 2005.

References:

1. Essentials of Bridge Engineering, D. Johnson Victor, Oxford and IBM publication Co., Pvt. Ltd.
2. Reinforced concrete design, S. U, Pillai and D. Menon, Tata Mc.Grawhill Publishing Company

Codes: Relevant IS: codes.

INTERNAL EXAMINATION PATTERN:

The total internal marks (30) are distributed in three components as follows:

1. Descriptive (subjective type) examination : 25 marks
2. Assignment : 05 marks

FINAL EXAMINATION PATTERN:

The end examination paper should consist of Part A and Part B. part A consist of two questions in Design and Drawing out of which one question is to be answered. Part B should consist of five questions and design out of which three are to be answered. Weightage for Part – A is 40% and Part- B is 60%.

ADVANCED FOUNDATION ENGINEERING

Course Learning Objectives:

The objective of this course is:

- To enable the student to appreciate how Meyerhof's general bearing capacity equations are important over Terzaghi's bearing capacity equation.
- To teach the student special methods of computation of settlements and the corrections to be applied to settlements.
- To enable the student to understand the advanced concepts of design of pile foundations.
- To teach the student the problems posed by expansive soils and the foundation practices appropriate to expansive soils.
- To enable the student to learn the difference between isolated and combined footings, the determination of bearing capacity of mats and proportioning of footings.

Course Outcomes:

Upon successful completion of this course, student will be able to

- compute the safe bearing capacity of footings subjected to vertical and inclined loads.
- understand the advanced methods of settlement computations and proportion foundation footings.
- appreciate the methods of computing the pull-out capacity and negative skin friction of piles and compute the settlements of pile groups in clays.
- appreciate the problems posed by expansive soils and the different foundation practices devised.
- appreciate the difference between isolated footings and combined footings and mat foundations.

SYLLABUS:

UNIT-I Bearing capacity of Foundations using general bearing capacity equation – Meyerhof's, Brinch Hansen's and Vesic's methods- Bearing capacity of Layered Soils: Strong layer over weak layer, Weak layer on strong layer – Bearing capacity of foundations on a top of slope – Bearing capacity of foundations at the edge of the slope.

UNIT-II Settlement analysis: Immediate settlement of footings resting on granular soils – Schmertmann & Hartman method – De Beer and Martens method - Immediate settlement in clays – Janbu's method – correction for consolidation settlement using Skempton and Bjerrum's method – Correction for construction period

UNIT-III Mat foundations – Purpose and types of isolated and combined footings – Mats/Rafts – Proportioning of footings – Ultimate bearing capacity of mat foundations – allowable bearing capacity of mats founded in clays and granular soils – compensated rafts.

UNIT-IV Earth-retaining structures – cantilever sheet piles – anchored bulkheads – fixed and free earth support methods – design of anchors – braced excavations – function of different components – forces in ties – stability against bottom heave.

UNIT-V Pile foundations – single pile versus group of piles – load-carrying capacity of pile groups – negative skin friction (NSF) -settlement of pile groups in sands and clays – laterally loaded piles in granular soils – Reese and Matlock method – laterally loaded piles in cohesive soils – Davisson and Gill method – Broms' analysis.

UNIT-VI Foundations in expansive soils – definitions of swell potential and swelling pressure – determination of free swell index – factors affecting swell potential and swelling pressure – foundation practices – sand cushion method – CNS layer - drilled piers and belled piers – under-reamed piles – moisture control methods.

Text Books:

1. Principles of Foundation Engineering, BM Das, CENTAG Learning
2. Soil Mechanics and Foundation Engineering, VNS Murthy, CBS Publishers

Reference:

1. Foundation Analysis and Design, J.E. Bowles, John Wiley
2. Foundation Design, W.C. Teng, Prentice Hall Publishers

ENVIRONMENTAL IMPACT ASSESSMENT AND MANAGEMENT

Course Learning Objectives:

The objective of this course is:

- To impart knowledge on different concepts of Environmental Impact Assessment
- To know procedures of risk assessment
- To learn the EIA methodologies and the criterion for selection of EIA methods
- To pre-requisites for ISO 14001 certification
- To know the procedures for environmental clearances and audit
- To appreciate the importance of stakeholder participation in EIA

Course Learning Outcomes

Upon successful completion of this course, the students will be able to:

- Prepare EMP, EIS, and EIA report
- Identify the risks and impacts of a project
- Selection of an appropriate EIA methodology
- Evaluation the EIA report
- Estimate the cost benefit ratio of a project
- Know the role of stakeholder and public hearing in the preparation of EIA

SYLLABUS:

UNIT – I Basic concept of EIA: Elements of EIA-factors affecting EIA-Initial environmental Examination-life cycle analysis preparation of Environmental Base map-Classification of environmental parameters – role of stakeholders in the EIA preparation – stages in EIA

UNIT – II E I A Methodologies: introduction, Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods, cost/benefit Analysis - EIS and EMP

UNIT-III Impact of Developmental Activities and Land use: Introduction and Methodology for the assessment of soil and ground water, Delineation of study area, Identification of actives- application of remote sensing and GIS for EIA.

UNIT-IV Procurement of relevant soil quality, Impact prediction, Assessment of Impact significance, Identification and Incorporation of mitigation measures - E I A with reference to

surface water, Air and Biological environment: Methodology for the assessment of Impacts on surface water environment, Generalized approach for assessment of Air pollution Impact.

UNIT – V Assessment of Impact of development Activities on Vegetation and wildlife, environmental Impact of Deforestation.

Environmental Risk Assessment and Risk management in EIA: Risk assessment and treatment of uncertainty-key stages in performing an Environmental Risk Assessment-advantages of Environmental Risk Assessment

UNIT-VI EIA notification by Ministry of Environment and Forest (Govt. of India):

Provisions in the EIA notification, procedure for environmental clearance, procedure for conducting environmental impact assessment report- evaluation of EIA report. Environmental legislation objectives, evaluation of Audit data and preparation of Audit report. Post Audit activities, Concept of ISO and ISO 14000.

Case studies and preparation of Environmental Impact assessment statement for various Industries.

Text Books:

1. Environmental Impact Assessment, Canter Larry W., McGraw-Hill education Edi (1996)
2. Environmental Impact Assessment Methodologies, Y. Anjaneyulu, B. S. Publication, Sultan Bazar, Hyderabad.

References:

1. Environmental Science and Engineering, J. Glynn and Gary W. Hein Ke – Prentice Hall Publishers
2. Environmental Science and Engineering, Suresh K. Dhaneja, S. K. , Katania & Sons Publication., New Delhi.
3. Environmental Pollution and Control, H. S. Bhatia, Galgotia Publication (P) Ltd, Delhi

GROUND WATER DEVELOPMENT

Course Learning Objectives:

The course is designed to

- appreciate groundwater as an important natural resource.
- understand flow towards wells in confined and unconfined aquifers.
- understand the principles involved in design and construction of wells.
- create awareness on improving the groundwater potential using various recharge techniques.
- know the importance of saline water intrusion in coastal aquifers and its control measures.
- appreciate various geophysical approaches for groundwater exploration.
- learn groundwater management using advanced tools.

Course Outcomes

At the end of the course the student will be able to

- estimate aquifer parameters and yield of wells
- analyse radial flow towards wells in confined and unconfined aquifers.
- design wells and understand the construction practices.
- interpret geophysical exploration data for scientific source finding of aquifers.
- determine the process of artificial recharge for increasing groundwater potential.
- take effective measures for controlling saline water intrusion.
- apply appropriate measures for groundwater management.

SYLLABUS:

UNIT – I Introduction Groundwater in the hydrologic cycle, groundwater occurrence, aquifer parameters and their determination, general groundwater flow equation.

Well Hydraulics Steady radial flow and unsteady radial flow to a well in confined and unconfined aquifers, Theis solution, Jacob and Chow's methods, Leaky aquifers.

UNIT – II Well Design Water well design-well diameter, well depth, well screen-screen length, slot size, screen diameter and screen selection, design of collector wells, infiltration gallery

UNIT III Well Construction and Development Water wells, drilling methods-rotary drilling, percussion drilling, well construction-installation of well screens-pull-back method, open- hole, bail- down and wash-down methods, well development-mechanical surging using

compressed air, high velocity jetting of water, over pumping and back washing, well completion, well disinfection, well maintenance.

UNIT IV Artificial Recharge Concept of artificial recharge of groundwater, recharge methods-basin, stream-channel, ditch and furrow, flooding and recharge well methods, recharge mounds and induced recharge

Saline Water Intrusion Occurrence of saline water intrusion, Ghyben- Herzberg relation, Shape of interface, control of saline water intrusion.

UNIT – V Geophysics Surface methods of exploration of groundwater – Electrical resistivity and Seismic refraction methods, Sub-surface methods – Geophysical logging and resistivity logging. Aerial Photogrammetry applications

UNIT – VI Groundwater Modelling and Management Basic principles of groundwater modelling- Analog models-viscous fluid models and membrane models, digital models-Finite difference and finite element models, Concepts of groundwater management, basin management by conjunctive use-case studies.

Text Books:

1. Groundwater, Raghunath H M, New Age International Publishers, 2005.
2. Groundwater Hydrology, Todd D. K., Wiley India Pvt Ltd., 2014.
3. Groundwater Hydrology, Todd D K and L W Mays, CBS Publications, 2005.

References:

1. Groundwater Assessment and Management, Karanth K R, Tata McGraw Hill Publishing Co., 1987.
2. Groundwater Hydrology, Bouwer H, McGraw Hill Book Company, 1978.
3. Groundwater Systems Planning and Management, Willis R and W.W.G. Yeh, Prentice Hall Inc., 1986.
4. Groundwater Resources Evaluation, Walton W C, McGraw Hill Book Company, 1978.

PAVEMENT ANALYSIS AND DESIGN

Course Learning Objectives:

The objectives of this course are:

- To know various factors affecting pavement design
- To know various concepts for the stresses in pavements.
- To understand material characterisation and mix design concepts.
- To acquire design principles of flexible and rigid pavements.
- To acquire design principles of shoulders, overlays and drainage.

Course Outcomes:

At the end of course, Student will be able to

- Determine stresses in pavements
- Design bituminous mixes
- Design flexible pavements using various methods
- Design rigid pavements using various methods
- Design shoulders, overlays and drainage.

SYLLABUS:

UNIT-I Factors Affecting Pavement Design: Variables Considered in Pavement Design, Types of Pavements, Functions of Individual Layers, Classification of Axle Types of Rigid Chassis and Articulated Commercial Vehicles, Legal Axle and Gross Weights on Single and Multiple Units, Tire Pressure, Contact Pressure, EAL and ESWL Concepts, Traffic Analysis: ADT, AADT, Truck Factor, Growth Factor, Lane, Directional Distributions & Vehicle Damage Factors, Effect of Transient & Moving Loads.

UNIT-II Stresses In Pavements: *Vehicle-Pavement Interaction:* Transient, Random & Damping Vibrations, Steady State of Vibration, Experiments on Vibration, Stress Inducing Factors in Flexible and Rigid pavements; ***Stress in Flexible Pavements:*** Visco-Elastic Theory and Assumptions, Layered Systems Concepts, Stress Solutions for One, Two and Three Layered Systems, Fundamental Design Concepts; ***Stresses in Rigid Pavements:*** Westergaard's Theory and Assumptions, Stresses due to Curling, Stresses and Deflections due to Loading, Frictional Stresses, Stresses in Dowel Bars & Tie Bars, Introduction to DAMA, KENLAYER & KENSLABS Programs

UNIT-III Material Characterisation & Mix Design Concepts: CBR and Modulus of Subgrade Reaction of Soil, Mineral aggregates – Blending of aggregates, binders, polymer and rubber modified bitumen, Resilient, Diametral Resilient and Complex (Dynamic) Moduli of Bituminous Mixes, Permanent Deformation Parameters and other Properties, Effects and Methods of Stabilisation and Use of Geo Synthetics; Marshall's and Hveem's Methods of Bituminous Concrete Mix Design, Field Implications of Stability and Flow Values, Introduction to Super Pave Mix Design, IRC Cement Concrete Mix Design

UNIT-IV Design of Flexible Pavements: Flexible Pavement Design Concepts, Asphalt Institute's Methods with HMA and other Base Combinations, AASHTO, Road Note No 29 & IRC Methods, Design of Runways & Taxiways, Design of Low Volume Rural Roads

UNIT-V Design Of Rigid Pavements: Calibrated Mechanistic Design Process, PCA, AASHTO & IRC Specifications, Introduction to Prestressed and Continuously Reinforced Cement Concrete Pavement Design, Rigid Pavement Design for Low Volume Rural Roads.

UNIT-VI Design Of Shoulders, Overlays & Drainage: Shoulder Design Considerations, Traffic Prediction, Parking, Regular & Encroaching Traffic, Thickness Design Specifications for Flexible & Rigid Shoulders; Types & Design of Overlays: AI's Principal Component Analysis & IRC Methods of Overlay Design, Importance of Profile Correction Course; Pavement Drainage Concepts, Drainage Related Failures, Inflow-Outflow Concepts, Condition of Continuity, Surface and Sub Surface Drainage Design Specifications

Text Books:

1. Pavement Analysis and Design, Yang H. Huang, Pearson Education, Second Edition.
2. Principles of Pavement Design, Yoder. J. &Witczak Mathew, W. John Wiley & Sons Inc
3. Pavement Design, Srinivasa Kumar R, Universities Press, Hyderabad

References:

1. Design of Functional Pavements, Nai C. Yang, McGraw Hill Publications
2. Pavement and Surfacing for Highway & Airports, MichealSargious, Applied Science Publishers Limited.
3. Principles of Transportation Engineering, Patha Chakroborty and Animesh Das, PHI Learning Private Limited, Delhi
4. Dynamics of Pavement Structures, G. Martineek, Chapman & Hall Inc
5. Concrete Pavements, A.F. Stock, Elsevier, Applied Science Publishers
6. Pavement Evaluation Maintenance Management System, R Srinivas Kumar, Universities Press, Hyderabad.

IV Year - I Semester

L	T	P	C
0	2	0	0

IPR & PATENTS

Objectives:

***To know the importance of Intellectual property rights, which plays a vital role in advanced Technical and Scientific disciplines.**

***Imparting IPR protections and regulations for further advancement, so that the students can familiarize with the latest developments.**

UNIT I: Introduction to Intellectual Property Rights (IPR)

Concept of Property - Introduction to IPR – International Instruments and IPR - WIPO - TRIPS – WTO -Laws Relating to IPR - IPR Tool Kit - Protection and Regulation - Copyrights and Neighboring Rights – Industrial Property – Patents - Agencies for IPR Registration – Traditional Knowledge –Emerging Areas of IPR - Layout Designs and Integrated Circuits – Use and Misuse of Intellectual Property Rights.

UNIT II: Copyrights and Neighboring Rights

Introduction to Copyrights – Principles of Copyright Protection – Law Relating to Copyrights - Subject Matters of Copyright – Copyright Ownership – Transfer and Duration – Right to Prepare Derivative Works –Rights of Distribution – Rights of Performers – Copyright Registration – Limitations – Infringement of Copyright – Relief and Remedy – Case Law - Semiconductor Chip Protection Act.

UNIT III: Patents

Introduction to Patents - Laws Relating to Patents in India – Patent Requirements – Product Patent and Process Patent - Patent Search - Patent Registration and Granting of Patent - Exclusive Rights – Limitations - Ownership and Transfer — Revocation of Patent – Patent Appellate Board - Infringement of Patent – Compulsory Licensing — Patent Cooperation Treaty – New developments in Patents – Software Protection and Computer related Innovations.

UNIT IV: Trademarks

Introduction to Trademarks – Laws Relating to Trademarks – Functions of Trademark – Distinction between Trademark and Property Mark – Marks Covered under Trademark Law - Trade Mark Registration – Trade Mark Maintenance – Transfer of rights - Deceptive Similarities - Likelihood of Confusion - Dilution of Ownership – Trademarks Claims and Infringement – Remedies – Passing Off Action.

UNIT V: Trade Secrets

Introduction to Trade Secrets – General Principles - Laws Relating to Trade Secrets - Maintaining Trade Secret – Physical Security – Employee Access Limitation – Employee

Confidentiality Agreements – Breach of Contract – Law of Unfair Competition – Trade Secret Litigation – Applying State Law.

Unit VI: Cyber Law and Cyber Crime

Introduction to Cyber Law – Information Technology Act 2000 - Protection of Online and Computer Transactions - E-commerce - Data Security – Authentication and Confidentiality - Privacy - Digital Signatures – Certifying Authorities - Cyber Crimes - Prevention and Punishment – Liability of Network Providers.

- Relevant Cases Shall be dealt where ever necessary.

Outcome:

*** IPR Laws and patents pave the way for innovative ideas which are instrumental for inventions to seek Patents.**

*** Student get an insight on Copyrights, Patents and Software patents which are instrumental for further advancements.**

References:

1. Intellectual Property Rights (Patents & Cyber Law), Dr. A. Srinivas. Oxford University Press, New Delhi.
2. Deborah E. Bouchoux: Intellectual Property, Cengage Learning, New Delhi.
3. Prabhuddha Ganguli: Intellectual Property Rights, Tata Mc-Graw –Hill, New Delhi
4. Richard Stim: Intellectual Property, Cengage Learning, New Delhi.
5. Kompal Bansal & Parishit Bansal Fundamentals of IPR for Engineers, B. S. Publications (Press).
6. Cyber Law - Texts & Cases, South-Western's Special Topics Collections.
7. R. Radha Krishnan, S. Balasubramanian: Intellectual Property Rights, Excel Books. New Delhi.
8. M. Ashok Kumar and Mohd Iqbal Ali: Intellectual Property Rights, Serials Pub.

IV Year - I Semester

L	T	P	C
0	0	3	2

GIS & CAD LAB

Course Learning Objectives:

The course is designed to

- Introduce image processing and GIS software
- familiarize structural analysis software
- understand the process of digitization, creation of thematic map from toposheets and maps
- learn to apply GIS software to simple problems in water resources and transportation engineering
- learn to analyze 2 D and 3D frame steel tubular truss using structural analysis software
- learn to analyze and design retaining wall and simple towers

Course outcomes

At the end of the course the student will be able to

- work comfortably on GIS software
- digitize and create thematic map and extract important features
- develop digital elevation model
- use structural analysis software to analyze and design 2D and 3D frames
- design and analyze retaining wall and simple towers using CADD software.

SYLLABUS:

GIS:

SOFTWARES:

1. Arc GIS 9.0
2. ERDAS 8.7
3. Mapinfo 6.5

Any one or Equivalent.

EXERCISES IN GIS:

1. Digitization of Map/Toposheet
2. Creation of thematic maps.
3. Estimation of features and interpretation

4. Developing Digital Elevation model
5. Simple applications of GIS in water Resources Engineering & Transportation Engineering.

COMPUTER AIDED DESIGN AND DRAWING:

SOFTWARE:

1. STAAD PRO / Equivalent/
2. STRAAP
3. STUDDS

EXCERCISIES:

1. 2-D Frame Analysis and Design
2. Steel Tabular Truss Analysis and Design
3. 3-D Frame Analysis and Design
4. Retaining Wall Analysis and Design
5. Simple Tower Analysis and Design

TEXT BOOK:

1. 'Concept and Techniques of GIS' by C.P.L.O. Albert, K.W. Yong, Printice Hall Publishers.

IV Year - I Semester

L	T	P	C
0	0	3	2

IRRIGATION DESIGN AND DRAWING

Course Learning Objectives:

To understand design principle of various irrigation structures

Course Outcomes:

At the end of the course the student will be able to To design various irrigation structures.

SYLLABUS:

Design and drawing of

1. Surplus weir
2. Tank sluice with a tower head
3. Canal drop-Notch type
4. Canal regulator
5. Under tunnel
6. Syphon aqueduct type III

Final Examination pattern: Any two question of the above six designs may be asked out of which the candidated has to answer one question. The duration of the examination is three hours.

Text Books:

1. Water Resources Engineering – Principles and Practice by C. Satyanarayana Murthy, New age International Publishers.

Reference :

1. Irrigation Engineering and Hydraulic Structures, S. K. Garg, Standard Book House.
2. Irrigation and Water Power Engineering, B. C Punmia & Lal, Lakshmi Publications Pvt. Ltd., New Delhi.

IV Year - II Semester

L	T	P	C
4	0	0	3

ESTIMATION SPECIFICATION & CONTRACTS

Course Learning Objectives:

The objective of this course is to enable the students to:

- Understand the quantity calculations of different components of the buildings.
- Understand the rate analysis of different quantities of the buildings components.
- Learn various specifications and components of the buildings.

Course Outcomes:

Upon the successful completion of this course:

- The student should be able to determine the quantities of different components of buildings.
- The student should be in a position to find the cost of various building components.
- The student should be capable of finalizing the value of structures.

SYLLABUS:

UNIT – I General items of work in Building – Standard Units Principles of working out quantities for detailed and abstract estimates –Approximate method of Estimating.

UNIT – II Rate Analysis – Working out data for various items of work over head and contingent charges.

UNIT-III Earthwork for roads and canals, Reinforcement bar bending and bar requirement schedules.

UNIT – IV Contracts – Types of contracts – Contract Documents – Conditions of contract, Valuation of buildings Standard specifications for different items of building construction.

UNIT-V Detailed Estimation of Buildings using individual wall method.

UNIT –VI Detailed Estimation of Buildings using centre line method.

FINAL EXAMINATION PATTERN:

The end examination paper should consist of SIX questions from Unit 1 to Unit 4, out of which THREE are to be answered (60% weight-age) & ONE mandatory question (40% weight-age) from Units 5 & 6 is to be answered.

Text Books:

1. Estimating and Costing, B.N. Dutta, UBS publishers, 2000.
2. Civil Engineering Contracts and Estimates, B. S. Patil, Universities Press (India) Pvt. Ltd., Hyd.
3. Construction Planning and Technology, Rajiv Gupta, CBS Publishers & Distributors Pvt. Ltd. New Delhi.
4. Estimating and Costing, G.S. Birdie.

References:

1. Standard Schedule of rates and standard data book, Public works department.
2. IS 1200 (Parts I to XXV-1974/ Method of Measurement of Building & Civil Engg Works – B.I.S.
3. Estimation, Costing and Specifications, M. Chakraborti; Laxmi publications.
4. National Building Code

IV Year - II Semester

L	T	P	C
4	0	0	3

CONSTRUCTION TECHNOLOGY AND MANAGEMENT

Course Learning Objectives:

The objective of this course is:

- to introduce to the student the concept of project management including network drawing and monitoring
- to introduce various equipments like earth moving equipment, trucks and handling equipment, aggregate production and construction equipment and machinery, related to construction.
- to introduce the importance of safety in construction projects

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

- appreciate the importance of construction planning
- understand the functioning of various earth moving equipment
- know the methods of production of aggregate products and concreting and usage of machinery required for the works.
- apply the gained knowledge to project management and construction techniques

SYLLABUS:

UNIT- I Construction project management and its relevance – qualities of a project manager – project planning – coordination –scheduling - monitoring – bar charts – milestone charts – critical Path Method – Applications

UNIT -II Project Evaluation and Review Technique – cost analysis - updating – crashing for optimum cost – crashing for optimum resources – allocation of resources

UNIT- III Construction equipment – economical considerations – earthwork equipment – Trucks and handling equipment – rear dump trucks – capacities of trucks and handling equipment – calculation of truck production – compaction equipment – types of compaction rollers

UNIT -IV Hoisting and earthwork equipment – hoists – cranes – tractors - bulldozers – graders – scrapers– draglines - clamshell buckets

UNIT -V Concreting equipment – crushers – jaw crushers – gyratory crushers – impact crushers – selection of crushing equipment - screening of aggregate – concrete mixers – mixing and placing of concrete – consolidating and finishing

UNIT –VI Construction methods – earthwork – piling – placing of concrete – form work – fabrication and erection – quality control and safety engineering

Text Books:

1. Construction Planning Equipment and Methods, Peurifoy and Schexnayder , Shapira, Tata Mcgrawhill
2. Construction Project Management Theory and Practice, Kumar Neeraj Jha (2011), Pearson.
3. Construction Technology, Subir K. Sarkar and Subhajt Saraswati, Oxford University press.
4. Project Planning and Control with PERT and CPM, B. C. Punamia and K K Khandelwal, Laxmi Publications Pvt Ltd. Hyderabad.

References:

1. Construction Project Management - An Integrated Approach, Peter Fewings , Taylor and Francis
2. Construction Management Emerging Trends and Technologies, Trefor Williams , Cengage learning.
3. Hand Book of Construction Management, P. K. Joy, Trinity Press Chennai, New Delhi.

IV Year - II Semester

L	T	P	C
4	0	0	3

PRESTRESSED CONCRETE

Course Learning Objectives:

The objective of this course is:

- Familiarize Students with concepts of prestressing
- Equip student with different systems and devices used in prestressing
- Understand the different losses of prestress including short and long term losses
- Familiarize students with the analysis and design of prestressed concrete members under flexure, shear and torsion

Course Outcomes:

At the end of this course the student will be able to

- Understand the different methods of prestressing
- Estimate effective prestress including the short and long term losses
- Analyze and design prestressed concrete beams under flexure and shear
- Understand the relevant IS Codal provisions for prestressed concrete

SYLLABUS:

UNIT-I Basic concepts of Prestressing- Advantages and Applications of Prestressed Concretes, High Strength Concrete- Permissible Stresses, Shrinkage, Creep, Deformation Characteristics, High strength Steel- Types, Strength- Permissible Stresses- Relaxation of Stress, Cover Requirements.

UNIT-II Prestressing Systems- Introduction, Tensioning devices, Pre-tensioning Systems, Post tensioning Systems, Basic Assumptions in Analysis of prestress and design, Analysis of prestress, Resultant Stresses at a section- pressure line- Concepts of load balancing- Stresses in Tendons, Cracking moment.

UNIT-III Losses of Pre-stressing- Loss of Pre-stress in pre-tensioned and post tensioned members due to various causes -Elastic shortening of concrete, shrinkage of concrete, creep of concrete, Relaxation stress in steel, slip in anchorage, differential shrinkage- bending of members and frictional losses- Total losses allowed for design

UNIT-IV Design for Flexural resistance- Types of flexural failure – Code procedures- Design of sections for flexure- Control of deflections- Factors influencing Deflection- Prediction of short term and long term deflections.

UNIT-V Design for Shear and Torsion- Shear and Principal Stresses- Design of Shear reinforcements- Codal Provisions- Design for Torsion, Design for Combined bending, shear and torsion.

UNIT-VI Transfer of Prestress in pre tensioned members- Transmission length- Bond stresses- end zone reinforcement- Codal provisions- Anchorage zone Stresses in Post tensioned members- Stress distribution in end block- Anchorage Zone reinforcement.

Text Books

1. Prestressed Concrete, N. Krishna Raju, Tata McGraw hill
2. Prestressed Concrete, S. Ramamrutham

References:

1. Prestressed Concrete, P. Dayaratnam
2. Prestressed Concrete, T. Y. Lin & Burns, Wiley Publications

IV Year - II Semester

L	T	P	C
4	0	0	3

BRIDGE ENGINEERING

(Elective – III)

Course Learning Objectives:

The objective of this course is:

- Familiarize Students with different types of Bridges and IRC standards
- Equip student with concepts and design of Slab Bridges, T Beam Bridges, Box Culverts
- Understand concepts of design of Plate Girder Bridges
- Familiarize with different methods of inspection of bridges and maintenance

Course Outcomes:

At the end of this course the student will be able to

- Explain different types of Bridges with diagrams and Loading standards
- Carryout analysis and design of Slab bridges, T Beam bridges, Box culvers and suggest structural detailing
- Carryout analysis and design of Plate girder bridges
- Organize for attending inspections and maintenance of bridges and prepare reports.

SYLLABUS:

UNIT-I Introduction- Bridges- Types- Slab bridges, T Beam, Arch bridges, Cable Stayed bridges, prestressed concrete bridges, Truss Bridges, Culverts, - Nomenclature- Selection of Bridge Site- Economical span- Abutments pier and end connections- types of foundations- Open, Pile, Well Foundations, Bearings – Types- Introduction to Loading standards- Railway and IRC Loading

UNIT-II Slab bridges- Wheel load on slab- effective width method- slabs supported on two edges- cantilever slabs- dispersion length- Design of interior panel of slab- Guyon's – Massonet Method –Hendry- Jaegar Methods- Courbon's theory- Pigeaud's method

UNIT-III T-Beam bridges- Analysis and design of various elements of bridge –Design of deck slab, Longitudinal girders, Secondary beams- Reinforcement detailing

UNIT-IV Plate Girder Bridges: Elements of plate girder and their design-web- flange- intermediate stiffener- vertical stiffeners- bearing stiffener- Splices, Design problem with detailing

UNIT-V Box Culverts: Loading – Analysis and Design- Reinforcement detailing.

UNIT-VI Sub structure-Abutments-Stability analysis of abutments-piers-loads on piers-Analysis of piers-Wing walls-Design problems.

Text Book

1. Essentials of Bridge Engineering, Jhonson Victor D
2. Design of Bridge Structures, T. R. Jagadeesh, M.A. Jayaram, PHI
3. Design of Bridges, N. Krishna Raju, Tata McGraw Hill

References:

1. Design of Concrete Bridges, Aswini, Vazirani, Ratwani
2. Design of Steel Structures, B. C. Punmai, Jain & Jain, Lakshmi Publications
3. Design of R C Structures, B. C. Punmai, Jain & Jain, Lakshmi Publications

SOIL DYNAMICS AND FOUNDATIONS

Course Learning Objectives:

The basic course in soil mechanics/geotechnical engineering generally introduces the fundamental concepts, principles and applications of soil as engineering material with properties under static loading. This course on 'Soil Dynamics' discusses

- About the fundamentals of vibrations
- about the behaviour and properties/response of soil as a material which is subjected to various types of dynamic or cyclic time-dependent loadings.
- the design and analysis for machine foundations come along with this course to consider the dynamic properties of both soil and foundation as combined mass. Behaviour of various geotechnical structures such as shallow and deep foundations, retaining structures due to various types of time-dependent dynamic loading are discussed here along with the reference to design code provisions.
- Phenomena like liquefaction and lateral spreading of soil are also discussed.
- Discusses about the laboratory and field tests to compute the dynamic soil properties of the soil mass.

Course Outcomes:

- On successful completion of these course, the student able to
- Use theory of vibrations to find the behavior of soil under dynamic loading
- Design machine foundations under different loads and soil conditions
- Understand the liquefaction phenomena
- Conduct various laboratory and field tests to determine the dynamic soil properties and its interpretation.
- Design vibration isolators under any vibratory machines.

SYLLABUS:

UNIT-I Introduction: Types of motion- SHM- Fundamental definitions- SDOF systems- Free and forced vibration with and without damping - Constant force and rotating mass type excitation –Types of damping-Equivalent stiffness of springs in series and parallel. – Resonance and its effect - magnification-logarithmic decrement –Transmissibility.

UNIT-II Theories of Vibration Analysis- EHS Theory and lumped parameter model- Different modes of vibration- Natural frequency of foundation soil system – Barkan and IS methods – Pressure bulb concept – Reisner Theory – Limitations of Reisner theory – Sung’s solutions -- Pauw’s Analogy – Heigh’s Theory.

UNIT-III Dynamic properties of soils, Determination of E, G and Poisons ratio from field and laboratory tests, recommendations of Indian codes- Stress waves in bounded elastic medium- Use of wave theory in the determination of elastic properties, Elastic coefficients of soils and their determination- damping factor from free and forced vibration tests.– Block vibration test – Determination of Damping factor.

UNIT-IV Types of machine foundations – general requirements design – criteria for machine foundations, permissible amplitudes and bearing pressure
Design data, design criteria, IS code provisions for the design foundations of reciprocating machines.

UNIT-V Design data, design criteria, IS code provisions for the design foundations of Impact type of machines.

UNIT-VI Vibration Isolation: Transmissibility, Principles of isolation- Methods of isolation- Vibration isolators- Types and their characterizes
Special Topics: Liquefaction of soils, CSR, CRR, Factor of safety against liquefaction - Dynamic bearing capacity, Earth retaining structures under dynamic loads

Text Book:

1. Soil Mechanics and Machine foundations, Swami Saran, Galgotia Publications.
2. Fundamentals of Soil Dynamics, B M Das, Centage Learning

References:

1. Vibrations of Soils and Foundations, Richart Hall and Woods
2. Vibration Analysis and Foundation Dynamics, NSV Kameswara Rao, Wheeler Publishing, New Delhi.
3. Foundations of Machines- Analysis and Design, Prakash and Puri
4. Analysis and design of Foundations for Vibrations, P J Moore
5. Dynamics of bases and Foundations, D D Barkar

SOLID AND HAZARDOUS WASTE MANAGEMENT

Course Learning Objectives:

The objective of this course is:

- To impart the knowledge the methods of collection and optimization of collection routing of municipal solid waste
- To acquire the principles of treatment of municipal solid waste
- To know the impact of solid waste on the health of the living beings
- To learn the criterion for selection of landfill and its design
- to plan the methods of processing such as composting the municipal organic waste

Course Learning Outcomes

Upon successful completion of this course, the students will be able to:

- Design the collection systems of solid waste of a town
- Design treatment of municipal solid waste and landfill
- Know the criteria for selection of landfill
- Characterise the solid waste and design a composting facility
- Know the Method of treatment and disposal of Hazardous wastes.

SYLLABUS:

UNIT- I Introduction to Solid Waste Management: Goals and objectives of solid waste management, Classification of Solid Waste - Factors Influencing generation of solid waste - sampling and characterization –Future changes in waste composition, major legislation, monitoring responsibilities, Terms related to ISWM like WTE, ULB, TLV etc..Measurement of NPK and Calorific value.

UNIT- II Basic Elements in Solid Waste Management: Elements and their inter relationship – principles of solid waste management- onsite handling, storage and processing of solid waste

Collection of Solid Waste: Type and methods of waste collection systems, analysis of collection system - optimization of collection routes– alternative techniques for collection system.

UNIT- III Transfer, Transport and Transformation of Waste: Need for transfer operation, compaction of solid waste - transport means and methods, transfer station types and design requirements. Unit operations used for separation and transformation: shredding - materials separation and recovery, source reduction and waste minimization

UNIT- IV Processing and Treatment: Processing of solid waste - Waste transformation through combustion and composting. Market yard wastes and warming composting and vermin composting, anaerobic methods for materials recovery and treatment – Energy recovery – biogas generation and cleaning– Incinerators.

UNIT- V Disposal of Solid Waste: Methods of Disposal, Landfills: Site selection, design and operation, drainage and leachate collection systems –designated waste landfill remediation. Case studies

UNIT VI Hazardous Waste Management- sources, collection, transport, treatment and disposal methods; Biomedical waste Management; Electronic waste Management; Environmental law related to waste Management; Case studies.

Text Books:

1. Integrated Solid Waste Management, George Tchobanoglous, McGraw Hill Publication, 1993

References:

1. Solid Waste Engineering, Vesilind, P.A., Worrell, W., Reinhart, D., Cengage learning, New Delhi, 2004
2. Hazardous Waste Management, Charles A. Wentz, McGraw Hill Publication, 1995.
3. Solid and Hazardous Waste Management PM Cherry, CBS Publishers and Distributors. New Delhi, 2016.
4. Solid Waste Engineering, William A Worrell, P Aarue Vesilind, Cengage Learning, New Delhi 2016

WATER RESOURCES SYSTEMS PLANNING

Course Learning Objectives:

The course is designed to

- introduce the concepts of system analysis in the planning, design, and operation of water resources.
- appreciate mathematical optimization methods and models.
- learn and apply basic economic analysis tools to water resources projects.
- understand linear, nonlinear and dynamic programming techniques and apply them to various water resources systems planning and design problems.
- appreciate simulation and management techniques in water resources systems.

Course Outcomes

At the end of the course the student will be able to

- apply optimization methods to solve problems related to water resource systems.
- perform basic economic analysis to evaluate the economic feasibility of water resources projects
- formulate optimization models for decision making in water resources systems.
- use simulation models for planning and design of Water Resources Systems.

SYLLABUS:

UNIT – I Introduction: Concepts of systems analysis, definition, systems approach to water resources planning and management, role of optimization models, objective function and constraints, types of optimization techniques.

UNIT – II Linear programming: Formulation of linear programming models, graphical method, simplex method, application of linear programming in water resources, revised simplex method, duality in linear programming, sensitivity analysis.

UNIT – III Dynamic programming: Principles of optimality, forward and backward recursive dynamic programming, curse of dimensionality, application for resource allocation.

UNIT – VI Non-linear optimization techniques: Classical optimization techniques, Lagrange methods, Kuhn-Tucker conditions, Search techniques, overview of Genetic Algorithm

UNIT – V Water Resources Economics: Basics of engineering economics, economic analysis, conditions of project optimality, benefit and cost analysis

UNIT – VI Simulation and management: Application of simulation techniques in water resources, planning of reservoir system, optimal operation of single reservoir system,

allocation of water resources, optimal cropping pattern, conjunctive use of surface and sub-surface water resources.

Text Books:

1. Water Resources System Analysis, Vedula S and P. P. Mujumdar, McGraw Hill Company Ltd, 2005.
2. Water Resources Economics, James D and R. Lee, Oxford Publishers, 2005.

References:

1. Water Resources Systems Planning and Management - An Introduction to Methods, Models and Applications, Loucks D P and E V Bee, UNESCO Publications, 2005
(http://ecommons.cornell.edu/bitstream/1813/2804/21/00_intro.pdf)
2. Optimal design of water distribution networks, Bhawe, P. R, Narosa Publishing house, 2003.

URBAN TRANSPORTATION PLANNING

SYLLABUS:

UNIT –I Urban Transportation Problems & Travel Demand: Urban Issues, Travel Characteristics, Evolution of Planning Process, Supply and Demand – Systems approach; Trends, Overall Planning process, Long term Vs Short term planning, Demand Function, Independent Variables, Travel Attributes, Assumptions in Demand Estimation, Sequential, and Simultaneous Approaches, Aggregate and Disaggregate Techniques.

UNIT –II Data Collection And Inventories: Collection of data – Organisation of surveys and Analysis, Study Area, Zoning, Types and Sources of Data, Road Side Interviews, Home Interview Surveys, Commercial Vehicle Surveys, Sampling Techniques, Expansion Factors, Accuracy Checks, Use of Secondary Sources, Economic data – Income – Population – Employment – Vehicle Owner Ship.

UNIT –III Trip Generation & Distribution: UTPS Approach, Trip Generation Analysis: Zonal Models, Category Analysis, Household Models, Trip Attraction models, Commercial Trip Rates; Trip Distribution: Growth Factor Methods, Gravity Models, Opportunity Models, Time Function Iteration Models.

UNIT –IV Mode Choice Analysis: Mode Choice Behaviour, Competing Modes, Mode Split Curves, Aggregate and Disaggregate Approaches; Discrete Choice Analysis, Choice sets, Maximum Utility, Probabilistic Models: Binary Logit, Multinomial Logit Model – IIA property; Aggregation

UNIT –V Traffic Assignment: Diversion Curves; Basic Elements of Transport Networks, Coding, Route Properties, Path Building Criteria, Skimming Tree, All-or-Nothing Assignment, Capacity Restraint Techniques, Reallocation of Assigned Volumes, Equilibrium Assignment.

UNIT –VI Corridor Identification, Plan Preparation & Evaluation: Master plans, Selection of Corridor, Corridor Identification, Corridor deficiency Analysis; Travel Forecasts to Evaluate Alternative Improvements, Impacts of New Development on Transportation Facilities. Pivot Point Analysis, Environmental and Energy Analysis; Case studies

Text Books:

1. Introduction to Urban System Planning, Hutchinson, B.G., McGraw Hill.
2. Transportation Engineering - An Introduction, Khisty C.J., Prentice Hall

References:

1. Introduction to Transportation Planning, Bruton M.J., Hutchinson of London.
2. Fundamentals of Transportation Planning, Papacostas, Tata McGraw Hill
3. Urban Transportation Planning: A decision oriented Approach, Mayer M and Miller E, McGraw Hill
4. Traffic Engineering and Transportation Planning, Kadiyali.L.R., Khanna Publishers, New Delhi.
5. Metropolitan Transportation Planning, Dicky, J.W., Tata McGraw Hill

IV Year - I Semester

L	T	P	C
0	3	0	2

SEMINAR

IV Year - I Semester

L	T	P	C
0	0	0	10

PROJECT WORK

The main objective of the Project work is

- To enable the student apply engineering knowledge that has been taught all through the programme for solving practical engineering problem.
- To enable the student capable for prblem solving / problem shooting.
- To instill and inculcate team spirit/ team work in to the minds of the students.
- To enable/ train the students report making/ documnetation.
- To provide students an opportunity to use any civil engineering software for their project work.

Out comes of the Project work.

Up on completion of the Project work, the student will be able to

- Apply all levels of Engineering knowledge in solving the Engineering problems.
- Work together with team spirit.
- Use Civil Engineering software at least one.
- Document the projects

COURSE STRUCTURE AND SYLLABUS

For

ELECTRICAL AND ELECTRONICS ENGINEERING

(Applicable for batches admitted from 2016-2017)



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India

I Year – I Semester

S. No	Subjects	L	T	P	Credits
1-HS	English – I	4	--	--	3
2-BS	Mathematics - I	4	--	--	3
3-ES	Applied Chemistry	4	--	--	3
4-BS	Engineering Mechanics	4	--	--	3
5-BS	Computer Programming	4	--	--	3
6-ES	Environmental Studies	4	--	--	3
7-HS	Applied / Engineering Chemistry Laboratory	--	--	3	2
8-BS	English- Communication Skills Laboratory - I	--	--	3	2
9-ES	Computer Programming Laboratory	--	--	3	2
Total Credits					24

I Year – II Semester

S. No	Subjects	L	T	P	Credits
1-HS	English – II	4	--	--	3
2-BS	Mathematics – II (Mathematical Methods)	4	--	--	3
3-BS	Mathematics – III	4	--	--	3
4-ES	Applied Physics	4	--	--	3
5	Electrical Circuit Analysis - I	4	--	--	3
6-ES	Engineering Drawing	4	--	--	3
7-BS	English - Communication Skills Laboratory - II	--	--	3	2
8-HS	Applied / Engineering Physics Laboratory	--	--	3	2
9-ES	Applied / Engineering Physics – Virtual Labs - Assignments	--	--	2	--
10	Engg.Workshop & IT Workshop	--	--	3	2
Total Credits					24

II Year – I Semester

S. No	Subjects	L	T	P	Credits
1	Electrical Circuit Analysis - II	4	--	--	3
2	Electrical Machines-I	4	--	--	3
3	Basic Electronics and Devices	4	--	--	3
4	Electro Magnetic Fields	4	--	--	3
5	Thermal and Hydro Prime Movers	4	--	--	3
6	Managerial Economics & Financial Analysis	4	--	--	3
7	Thermal and Hydro Laboratory	--	--	3	2
8	Electrical Circuits Laboratory	--	--	3	2
Total Credits					22

II Year – II Semester

S. No	Subjects	L	T	P	Credits
1	Electrical Measurements	4	--	--	3
2	Electrical Machines-II	4	--	--	3
3	Switching Theory and Logic Design	4	--	--	3
4	Control Systems	4	--	--	3
5	Power Systems-I	4	--	--	3
6	Management Science	4	--	--	3
7	Electrical Machines -I Laboratory	--	--	3	2
8	Electronic Devices & Circuits Laboratory	--	--	3	2
Total Credits					22

III Year – I Semester

S. No	Subjects	L	T	P	Credits
1	Power Systems-II	4	--	--	3
2	Renewable Energy Sources	4	--	--	3
3	Signals and Systems	4	--	--	3
4	Pulse & Digital Circuits	4	--	--	3
5	Power Electronics	4	--	--	3
6	Electrical Machines-II Laboratory	--	--	3	2
7	Control Systems Laboratory	--	--	3	2
8	Electrical Measurements Laboratory	--	--	3	2
9-MC	IPR & Patents	--	2	--	--
Total Credits					21

III Year – II Semester

S. No	Subjects	L	T	P	Credits
1	Power Electronic Controllers & Drives	4	--	--	3
2	Power System Analysis	4	--	--	3
3	Micro Processors and Micro controllers	4	--	--	3
4	Data Structures	4	--	--	3
5	Open Elective 1. Unix and Shell Programming 2. OOPS Through JAVA 3. VLSI Design 4. Robotics 5. Neural Networks & Fuzzy Logic 6. Energy Audit and Conservation & Management	4	--	--	3
6	Power Electronics Laboratory	--	--	3	2
7	Microprocessors & Microcontrollers Laboratory	--	--	3	2
8	Data Structures Laboratory	--	--	3	2
9-MC	Professional Ethics & Human Values	--	3	--	--
Total Credits					21

IV Year – I Semester

S. No	Subjects	L	T	P	Credits
1	Utilization of Electrical Energy	4	--	--	3
2	Linear IC Applications	4	--	--	3
3	Power System Operation & Control	4	--	--	3
4	Switchgear and Protection	4	--	--	3
5	<u>Elective – I:</u> 1. Electrical Machine Modeling and Analysis 2. Advanced Control Systems 3. Programmable Logic Controllers & Applications 4. Instrumentation	4	--	--	3
6	<u>Elective – II:</u> 1. Optimization Techniques 2. Electric Power Quality 3. Special Electrical Machines	4	--	--	3
7	Electrical Simulation Laboratory	--	--	2	2
8	Power Systems & Simulation Laboratory	--	--	2	2
Total Credits					22

IV Year - II Semester

S. No	Subjects	L	T	P	Credits
1	Digital Control Systems	4	--	--	3
2	HVDC Transmission	4	--	--	3
3	Electrical Distribution Systems	4	--	--	3
4	<u>Elective – III:</u> 1. High Voltage Engineering 2. Flexible Alternating Current Transmission Systems 3. Power System Reforms	4	--	--	3
5	Seminar	--	3	--	2
6	Project	--	--	--	10
Total Credits					24

SYLLABUS

I Year - I Semester

L	T	P	C
4	0	0	3

ENGLISH - I

Introduction:

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training the students to acquire communicative competence, the syllabus has been designed to develop linguistic and communicative competence of the students of Engineering.

As far as the detailed Textbooks are concerned, the focus should be on the skills of listening, speaking, reading and writing. The nondetailed Textbooks are meant for extensive reading for pleasure and profit.

Thus the stress in the syllabus is primarily on the development of communicative skills and fostering of ideas.

Objectives:

1. To improve the language proficiency of the students in English with emphasis on LSRW skills.
2. To enable the students to study and comprehend the prescribed lessons and subjects more effectively relating to their theoretical and practical components.
3. To develop the communication skills of the students in both formal and informal situations.

LISTENING SKILLS:

Objectives:

1. To enable the students to appreciate the role of listening skill and improve their pronunciation.
2. To enable the students to comprehend the speech of people belonging to different backgrounds and regions.
3. To enable the students to listen for general content, to fill up information and for specific information.

SPEAKING SKILLS:

Objectives:

1. To make the students aware of the importance of speaking for their personal and professional communication.
2. To enable the students to express themselves fluently and accurately in social and professional success.
3. To help the students describe objects, situations and people.
4. To make the students participate in group activities like roleplays, discussions and debates.
5. To make the students participate in Just a Minute talks.

READING SKILLS:

Objectives:

1. To enable the students to comprehend a text through silent reading.
2. To enable the students to guess the meanings of words, messages and inferences of texts in given contexts.
3. To enable the students to skim and scan a text.
4. To enable the students to identify the topic sentence.
5. To enable the students to identify discourse features.
6. To enable the students to make intensive and extensive reading.

WRITING SKILLS:

Objectives:

1. To make the students understand that writing is an exact formal skills.
2. To enable the students to write sentences and paragraphs.
3. To make the students identify and use appropriate vocabulary.
4. To enable the students to narrate and describe.
5. To enable the students capable of note-making.
6. To enable the students to write coherently and cohesively.
7. To make the students to write formal and informal letters.
8. To enable the students to describe graphs using expressions of comparison.
9. To enable the students to write technical reports.

Methodology:

1. The class are to be learner-centered where the learners are to read the texts to get a comprehensive idea of those texts on their own with the help of the peer group and the teacher.
2. Integrated skill development methodology has to be adopted with focus on individual language skills as per the tasks/exercise.
3. The tasks/exercises at the end of each unit should be completed by the learners only and the teacher intervention is permitted as per the complexity of the task/exercise.
4. The teacher is expected to use supplementary material wherever necessary and also generate activities/tasks as per the requirement.
5. The teacher is permitted to use lecture method when a completely new concept is introduced in the class.

Assessment Procedure: Theory

1. The formative and summative assessment procedures are to be adopted (mid exams and end semester examination).
2. Neither the formative nor summative assessment procedures should test the memory of the content of the texts given in the textbook. The themes and global comprehension of the units in the present day context with application of the language skills learnt in the unit are to be tested.
3. Only new unseen passages are to be given to test reading skills of the learners. Written skills are to be tested from sentence level to essay level. The communication formats—emails, letters and reports-- are to be tested along with appropriate language and expressions.
4. Examinations:
I mid exam + II mid exam (15% for descriptive tests+10% for online tests)= 25%

(80% for the best of two and 20% for the other)

Assignments= 5%

End semester exams=70%

5. Three take home assignments are to be given to the learners where they will have to read texts from the reference books list or other sources and write their gist in their own words.

The following text books are recommended for study in I B.Tech I Semester (Common for all branches)and I B.Pharma I Sem of JNTU Kakinada from the academic year 2016-17

(R-16 Regualtions)

DETAILED TEXTBOOK:

ENGLISH FOR ENGINEERS AND TECHNOLOGISTS, Published by **Orient Blackswan Pvt Ltd**

NON-DETAILED TEXTBOOK:

PANORAMA: A COURSE ON READING, Published by **Oxford University Press India**

The course content along with the study material is divided into six units.

UNIT I:

1. 'Human Resources' from English for Engineers and Technologists.

OBJECTIVE:

To develop human resources to serve the society in different ways.

OUTCOME:

The lesson motivates the readers to develop their knowledge different fields and serve the society accordingly.

2. 'An Ideal Family' from Panorama: A Course on Reading

OBJECTIVE:

To develop extensive reading skill and comprehension for pleasure and profit.

OUTCOME:

Acquisition of writing skills

UNIT 2:

1. ' Transport: Problems and Solutions' from English for Engineers and Technologists.

OBJECTIVE:

To highlight road safety measures whatever be the mode of transport.

OUTCOME:

The lesson motivates the public to adopt road safety measures.

2. 'War' from 'Panorama : A Course on Reading'

OBJECTIVE:

To develop extensive reading skill and comprehension for pleasure and profit.

OUTCOME:

Acquisition of writing skills

UNIT 3:

1. 'Evaluating Technology' from English for Engineers and Technologists.

OBJECTIVE:

To highlight the advantages and disadvantages of technology.

OUTCOME:

The lesson creates an awareness in the readers that mass production is ultimately detrimental to biological survival.

2. 'The Verger' from 'Panorama : A Course on Reading'

OBJECTIVE:

To develop extensive reading skill and comprehension for pleasure and profit.

OUTCOME:

Acquisition of writing skills

UNIT 4:

1. 'Alternative Sources of Energy' from English for Engineers and Technologists.

OBJECTIVE:

To bring into focus different sources of energy as alternatives to the depleting sources.

OUTCOME:

The lesson helps to choose a source of energy suitable for rural India.

2. 'The Scarecrow' from Panorama : A Course on Reading

OBJECTIVE:

To develop extensive reading skill and comprehension for pleasure and profit.

OUTCOME:

Acquisition of writing skills

UNIT 5:

1. 'Our Living Environment' from English for Engineers and Technologists.

OBJECTIVE:

To highlight the fact that animals must be preserved because animal life is precious.

OUTCOME:

The lesson creates an awareness in the reader as to the usefulness of animals for the human society.

2. 'A Village Host to Nation' from Panorama : A Course on Reading

OBJECTIVE:

To develop extensive reading skill and comprehension for pleasure and profit.

OUTCOME:

Acquisition of writing skills

UNIT 6:

1. ' Safety and Training' from English for Engineers and Technologists.

OBJECTIVE:

To highlight the possibility of accidents in laboratories, industries and other places and to follow safety measures.

OUTCOME:

The lesson helps in identifying safety measures against different varieties of accidents at home and in the workplace.

2. 'Martin Luther King and Africa' from Panorama : A Course on Reading

OBJECTIVE:

To develop extensive reading skill and comprehension for pleasure and profit.

OUTCOME:

Acquisition of writing skills

NOTE:

All the exercises given in the prescribed lessons in both detailed and non-detailed textbooks relating to the theme and language skills must be covered.

OVERALL COURSE OUTCOME:

1. Using English languages, both written and spoken, competently and correctly.
2. Improving comprehension and fluency of speech.
3. Gaining confidence in using English in verbal situations.

MODEL QUESTION PAPER FOR THEORY

PART- I

Six short answer questions on 6 unit themes

One question on eliciting student's response to any of the themes

PART-II

Each question should be from one unit and the last question can be a combination of two or more units.

Each question should have 3 sub questions: A,B & C

A will be from the main text: 5 marks

B from non-detailed text: 3 marks

C on grammar and Vocabulary: 6 marks

I Year - I Semester

L	T	P	C
4	0	0	3

MATHEMATICS-I
(Common to ALL branches of First Year B.Tech.)

Course Objectives:

1. The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course.
2. The skills derived from the course will help the student from a necessary base to develop analytic and design concepts.

Course Outcomes: At the end of the Course, Student will be able to:

1. Solve linear differential equations of first, second and higher order.
2. Determine Laplace transform and inverse Laplace transform of various functions and use Laplace transforms to determine general solution to linear ODE.
3. Calculate total derivative, Jacobian and minima of functions of two variables.

UNIT I: Differential equations of first order and first degree:

Linear-Bernoulli-Exact-Reducible to exact.

Applications: Newton's Law of cooling-Law of natural growth and decay-Orthogonal trajectories- Electrical circuits- Chemical reactions.

UNIT II: Linear differential equations of higher order:

Non-homogeneous equations of higher order with constant coefficients with RHS term of the type e^{ax} , $\sin ax$, $\cos ax$, polynomials in x , $e^{ax} V(x)$, $xV(x)$ - Method of Variation of parameters. Applications: LCR circuit, Simple Harmonic motion.

UNIT III: Laplace transforms:

Laplace transforms of standard functions-Shifting theorems - Transforms of derivatives and integrals – Unit step function –Dirac's delta function- Inverse Laplace transforms– Convolution theorem (with out proof).

Applications: Solving ordinary differential equations (initial value problems) using Laplace transforms.

UNIT IV: Partial differentiation:

Introduction- Homogeneous function-Euler's theorem-Total derivative-Chain rule-Generalized Mean value theorem for single variable (without proof)-Taylor's and Mc Laurent's series expansion of functions of two variables– Functional dependence- Jacobian.

Applications: Maxima and Minima of functions of two variables without constraints and Lagrange's method (with constraints).

UNIT V: First order Partial differential equations:

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions –solutions of first order linear (Lagrange) equation and nonlinear (standard types) equations.

UNIT VI: Higher order Partial differential equations:

Solutions of Linear Partial differential equations with constant coefficients. RHS term of the type e^{ax+by} , $\sin(ax+by)$, $\cos(ax+by)$, $x^m y^n$. Classification of second order partial differential equations.

Text Books:

1. **B.S.Grewal**, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. **N.P.Bali**, Engineering Mathematics, Lakshmi Publications.

Reference Books:

1. **Erwin Kreyszig**, Advanced Engineering Mathematics, 10th Edition, Wiley-India
2. **Micheael Greenberg**, Advanced Engineering Mathematics, 9th edition, Pearson edn
3. **Dean G. Duffy**, Advanced engineering mathematics with MATLAB, CRC Press
4. **Peter O'neil**, Advanced Engineering Mathematics, Cengage Learning.
5. **Srimanta Pal, Subodh C.Bhunia**, Engineering Mathematics, Oxford University Press.
6. **Dass H.K., Rajnish Verma. Er.**, Higher Engineering Mathematics, S. Chand Co. Pvt. Ltd, Delhi.

APPLIED CHEMISTRY
(EEE, ECE, CSE, IT, EIE, E. Com. E.)

Knowledge of basic concepts of Chemistry for Engineering students will help them as professional engineers later in design and material selection, as well as utilizing the available resources.

Learning Objectives:

- Plastics are nowadays used in household appliances; also they are used as composites (FRP) in aerospace industries.
- Fuels as a source of energy are a basic need of any industry, particularly industries like thermal power stations, steel industry, fertilizer industry etc., and hence they are introduced.
- The basics for the construction of galvanic cells as well as some of the sensors used in instruments are introduced. Also if corrosion is to be controlled, one has to understand the mechanism of corrosion which itself is explained by electrochemical theory.
- With the increase in demand, a wide variety of materials are coming up; some of them have excellent engineering properties and a few of these materials are introduced.
- Understanding of crystal structures will help to understand the conductivity, semiconductors and superconductors. Magnetic properties are also studied.
- With the increase in demand for power and also with depleting sources of fossil fuels, the demand for alternative sources of fuels is increasing. Some of the prospective fuel sources are introduced.

UNIT I: HIGH POLYMERS AND PLASTICS

Polymerisation : Introduction- Mechanism of polymerization - Stereo regular polymers – methods of polymerization (emulsion and suspension) -Physical and mechanical properties – Plastics as engineering materials : advantages and limitations – Thermoplastics and Thermosetting plastics – Compounding and fabrication (4/5 techniques)- Preparation, properties and applications of polyethene, PVC, Bakelite Teflon and polycarbonates
Elastomers – Natural rubber- compounding and vulcanization – Synthetic rubbers : Buna S, Buna N, Thiokol and polyurethanes – Applications of elastomers.
Composite materials & Fiber reinforced plastics – Biodegradable polymers – Conducting polymers.

UNIT II: FUEL TECHNOLOGY

Fuels:- Introduction – Classification – Calorific value - HCV and LCV – Dulong's formula – Bomb calorimeter – Numerical problems – Coal — Proximate and ultimate analysis – Significance of the analyses – Liquid fuels – Petroleum- Refining – Cracking – Synthetic petrol –Petrol knocking – Diesel knocking - Octane and Cetane ratings – Anti-knock agents – Power alcohol – Bio-diesel – Gaseous fuels – Natural gas. LPG and CNG – Combustion – Calculation of air for the combustion of a fuel – Flue gas analysis – Orsat apparatus – Numerical problems on combustion.

Explosives:- Introduction, classification, examples: RDX, TNT and ammonium nitrite - rocket fuels.

UNIT III: ELECTROCHEMICAL CELLS AND CORROSION

Galvanic cells - Reversible and irreversible cells – Single electrode potential – Electrochemical series and uses of this series- Standard electrodes (Hydrogen and Calomel electrodes) - Concentration Cells – Batteries: Dry Cell - Ni-Cd cells - Ni-Metal hydride cells - Li cells - Zinc – air cells.

Corrosion:- Definition – Theories of Corrosion (electrochemical) – Formation of galvanic cells by different metals, by concentration cells, by differential aeration and waterline corrosion – Passivity of metals – Pitting corrosion - Galvanic series – Factors which influence the rate of corrosion - Protection from corrosion – Design and material selection – Cathodic protection - Protective coatings: – Surface preparation – Metallic (cathodic and anodic) coatings - Methods of application on metals (Galvanizing, Tinning, Electroplating, Electroless plating)

UNIT IV: CHEMISTRY OF ADVANCED MATERIALS

Nano materials:- Introduction – Sol-gel method & chemical reduction method of preparation – Characterization by BET method and TEM methods - Carbon nano tubes and fullerenes: Types, preparation, properties and applications

Liquid crystals:- Introduction – Types – Applications

Superconductors :- Type-I & Type-2, properties & applications

Green synthesis:- Principles - 3 or 4 methods of synthesis with examples – R₄M₄ principles

UNIT V: SOLID STATE CHEMISTRY

Types of solids - close packing of atoms and ions - BCC , FCC, structures of rock salt - cesium chloride- spinel - normal and inverse spinels,

Non-elemental **semiconducting Materials:-** Stoichiometric, controlled valency & Chalcogen photo/semiconductors, Preparation of Semiconductors - Semiconductor Devices:- p-n junction diode as rectifier – junction transistor.

Insulators (electrical and electronic applications)

Magnetic materials:- Ferro and ferri magnetism. Hall effect and its applications.

UNIT VI: NON CONVENTIONAL ENERGY SOURCES AND STORAGE DEVICES

Solar Energy: - Introduction, application of solar energy, conversion of solar energy (Thermal

conversion & photo conversion) – photovoltaic cell: design, working and its importance

Non-conventional energy sources:

- (i) Hydropower include setup a hydropower plant (schematic diagram)
- (ii) Geothermal energy: Introduction-schematic diagram of a geothermal power plant
- (iii) Tidal and wave power: Introduction- Design and working-movement of tides and their effect on sea level.
- (iv) Ocean thermal energy: Introduction, closed-cycle, ocean thermal energy conversion (OTEC), open cycle OTEC, hybrid OTEC, schematic diagram and explanation.
- (v) Biomass and biofuels

Fuel cells:- Introduction - cell representation, H₂-O₂ fuel cell: Design and working, advantages and limitations. Types of fuel cells: Alkaline fuel cell - methanol-oxygen - phosphoric acid fuel cells - molten carbonate fuel cells.

Outcomes: The advantages and limitations of plastic materials and their use in design would be understood. Fuels which are used commonly and their economics, advantages and limitations are discussed. Reasons for corrosion and some methods of corrosion control would be understood. The students would be now aware of materials like nano-materials and fullerenes and their uses. Similarly liquid crystals and superconductors are understood. The importance of green synthesis is well understood and how they are different from conventional methods is also explained. Conductance phenomenon is better understood. The students are exposed to some of the alternative fuels and their advantages and limitations.

Standard Books:

1. Engineering Chemistry by Jain and Jain; Dhanpat Rai Publishing Co.
2. Engineering Chemistry by Shikha Agarwal; Cambridge University Press, 2015 edition.

Reference Books:

1. Engineering Chemistry of Wiley India Pvt. Ltd., Vairam and others, 2014 edition (second).
2. Engineering Chemistry by Prasanth Rath, Cengage Learning, 2015 edition.
3. A text book of engineering Chemistry by S. S. Dara; S. Chand & Co Ltd., Latest Edition
4. Applied Chemistry by H.D. Gesser, Springer Publishers
5. Text book of Nano-science and nanotechnology by B.S. Murthy, P. Shankar and others, University Press, IIM

ENGINEERING MECHANICS

Objectives: The students completing this course are expected to understand the concepts of forces and its resolution in different planes, resultant of force system, Forces acting on a body, their free body diagrams using graphical methods. They are required to understand the concepts of centre of gravity and moments of inertia and their application, Analysis of frames and trusses, different types of motion, friction and application of work - energy method.

UNIT – I

Objectives: The students are to be exposed to the concepts of force and friction, direction and its application.

Introduction to Engg. Mechanics – Basic Concepts.

Systems of Forces: Coplanar Concurrent Forces – Components in Space – Resultant – Moment of Force and its Application – Couples and Resultant of Force Systems.

Friction: Introduction, limiting friction and impending motion, coulomb's laws of dry friction, coefficient of friction, cone of friction

UNIT II

Objectives: The students are to be exposed to application of free body diagrams. Solution to problems using graphical methods and law of triangle of forces.

Equilibrium of Systems of Forces: Free Body Diagrams, Equations of Equilibrium of Coplanar Systems, Spatial Systems for concurrent forces. Lamis Theorem, Graphical method for the equilibrium of coplanar forces, Converse of the law of Triangle of forces, converse of the law of polygon of forces condition of equilibrium, analysis of plane trusses.

UNIT – III

Objectives : The students are to be exposed to concepts of centre of gravity.

Centroid: Centroids of simple figures (from basic principles) – Centroids of Composite Figures

Centre of Gravity: Centre of gravity of simple body (from basic principles), centre of gravity of composite bodies, Pappus theorems.

UNIT IV

Objective: The students are to be exposed to concepts of moment of inertia and polar moment of inertia including transfer methods and their applications.

Area moments of Inertia: Definition – Polar Moment of Inertia, Transfer Theorem, Moments of Inertia of Composite Figures, Products of Inertia, Transfer Formula for Product of Inertia. **Mass Moment of Inertia:** Moment of Inertia of Masses, Transfer Formula for Mass Moments of Inertia, mass moment of inertia of composite bodies.

UNIT – V

Objectives: The students are to be exposed to motion in straight line and in curvilinear paths, its velocity and acceleration computation and methods of representing plane motion.

Kinematics: Rectilinear and Curvilinear motions – Velocity and Acceleration – Motion of Rigid Body – Types and their Analysis in Planar Motion. **Kinetics:** Analysis as a Particle and Analysis as a Rigid Body in Translation – Central Force Motion – Equations of Plane Motion – Fixed Axis Rotation – Rolling Bodies.

UNIT – VI

Objectives: The students are to be exposed to concepts of work, energy and particle motion

Work – Energy Method: Equations for Translation, Work-Energy Applications to Particle Motion, Connected System-Fixed Axis Rotation and Plane Motion. Impulse momentum method.

TEXT BOOKS :

1. Engg. Mechanics - S.Timoshenko & D.H.Young., 4th Edn - , Mc Graw Hill publications.

REFERENCES :

1. Engineering Mechanics statics and dynamics – R.C.Hibbeler, 11th Edn – Pearson Publ.
2. Engineering Mechanics, statics – J.L.Meriam, 6th Edn – Wiley India Pvt Ltd.
3. Engineering Mechanics, statics and dynamics – I.H.Shames, – Pearson Publ.
4. Mechanics For Engineers, statics - F.P.Beer & E.R.Johnston – 5th Edn Mc Graw Hill Publ.
5. Mechanics For Engineers, dynamics - F.P.Beer & E.R.Johnston – 5th Edn Mc Graw Hill Publ.
6. Theory & Problems of engineering mechanics, statics & dynamics – E.W.Nelson, C.L.Best & W.G. McLean, 5th Edn – Schaum's outline series - Mc Graw Hill Publ.
7. Singer's Engineering Mechanics: Statics And Dynamics, K. Vijay Kumar Reddy, J. Suresh Kumar, Bs Publications
8. Engineering Mechanics, Ferdinand . L. Singer, Harper – Collins.
9. Engineering Mechanics statics and dynamics , A Nelson , Mc Graw Hill publications

I Year - I Semester

L	T	P	C
4	0	0	3

COMPUTER PROGRAMMING

Learning objectives:

Formulating algorithmic solutions to problems and implementing algorithms in C.

- Notion of Operation of a CPU, Notion of an algorithm and computational procedure, editing and executing programs in Linux.
- Understanding branching, iteration and data representation using arrays.
- Modular programming and recursive solution formulation.
- Understanding pointers and dynamic memory allocation.
- Understanding miscellaneous aspects of C.
- Comprehension of file operations.

UNIT-I:

History and Hardware - Computer Hardware, Bits and Bytes, Components, Programming Languages - Machine Language, Assembly Language, Low- and High-Level Languages, Procedural and Object-Oriented Languages, Application and System Software, The Development of C Algorithms The Software Development Process.

UNIT-II:

Introduction to C Programming- Identifiers, The main () Function, The printf () Function
Programming Style - Indentation, Comments, Data Types, Arithmetic Operations, Expression Types, Variables and Declarations, Negation, Operator Precedence and Associativity, Declaration Statements, Initialization.

Assignment - Implicit Type Conversions, Explicit Type Conversions (Casts), Assignment Variations, Mathematical Library Functions, Interactive Input, Formatted Output, Format Modifiers.

UNIT -III:

Control Flow-Relational Expressions - Logical Operators:

Selection: if-else Statement, nested if, examples, Multi-way selection: switch, else-if, examples.

Repetition: Basic Loop Structures, Pretest and Posttest Loops, Counter-Controlled and Condition-Controlled Loops, The while Statement, The for Statement, Nested Loops, The do-while Statement.

UNIT-IV

Modular Programming: Function and Parameter Declarations, Returning a Value, Functions with Empty Parameter Lists, Variable Scope, Variable Storage Class, Local Variable Storage Classes, Global Variable Storage Classes, Pass by Reference, Passing Addresses to a Function, Storing Addresses, Using Addresses, Declaring and Using Pointers, Passing Addresses to a Function.

Case Study: Swapping Values, Recursion - Mathematical Recursion, Recursion versus Iteration.

UNIT-V:

Arrays & Strings

Arrays: One-Dimensional Arrays, Input and Output of Array Values, Array Initialization, Arrays as Function Arguments, Two-Dimensional Arrays, Larger Dimensional Arrays-Matrices

Strings: String Fundamentals, String Input and Output, String Processing, Library Functions

UNIT-VI:

Pointers, Structures, Files

Pointers: Concept of a Pointer, Initialisation of pointer variables, pointers as function arguments, passing by address, Dangling memory, address arithmetic, character pointers and functions, pointers to pointers, Dynamic memory management functions, command line arguments.

Structures: Derived types, Structures declaration, Initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self referential structures, unions, typedef, bit-fields.

Data Files: Declaring, Opening, and Closing File Streams, Reading from and Writing to Text Files, Random File Access

Outcomes:

- Understand the basic terminology used in computer programming
- Write, compile and debug programs in C language.
- Use different data types in a computer program.
- Design programs involving decision structures, loops and functions.
- Explain the difference between call by value and call by reference
- Understand the dynamics of memory by the use of pointers
- Use different data structures and create/update basic data files.

Text Books:

1. ANSIC Programming, Gary J. Bronson, Cengage Learning.
2. Programming in C, BI Juneja Anita Seth, Cengage Learning.
3. The C programming Language, Dennis Richie and Brian Kernighan, Pearson Education.

Reference Books:

1. C Programming-A Problem Solving Approach, Forouzan, Gilberg, Cengage.
2. Programming with C, Bichkar, Universities Press.
3. Programming in C, ReemaThareja, OXFORD.
4. C by Example, Noel Kalicharan, Cambridge.

I Year - I Semester

L	T	P	C
4	0	0	3

ENVIRONMENTAL STUDIES

Course Learning Objectives:

The objectives of the course is to impart

- Overall understanding of the natural resources
- Basic understanding of the ecosystem and its diversity
- Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities
- An understanding of the environmental impact of developmental activities
- Awareness on the social issues, environmental legislation and global treaties

Course Outcomes:

The student should have knowledge on

- The natural resources and their importance for the sustenance of the life and recognize the need to conserve the natural resources
- The concepts of the ecosystem and its function in the environment. The need for protecting the producers and consumers in various ecosystems and their role in the food web
- The biodiversity of India and the threats to biodiversity, and conservation practices to protect the biodiversity
- Various attributes of the pollution and their impacts and measures to reduce or control the pollution along with waste management practices
- Social issues both rural and urban environment and the possible means to combat the challenges
- The environmental legislations of India and the first global initiatives towards sustainable development.
- About environmental assessment and the stages involved in EIA and the environmental audit.
- Self Sustaining Green Campus with Environment Friendly aspect of – Energy, Water and Wastewater reuse Plantation, Rain water Harvesting, Parking Curriculum.

Syllabus:

UNIT – I

Multidisciplinary nature of Environmental Studies: Definition, Scope and Importance – Sustainability: Stockholm and Rio Summit–Global Environmental Challenges: Global warming and climate change, Carbon Credits, acid rains, ozone layer depletion, population growth and explosion, effects. Role of information Technology in Environment and human health.

Ecosystems: Concept of an ecosystem. - Structure and function of an ecosystem. - Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession. - Food chains, food webs and ecological pyramids. - Introduction, types, characteristic features, structure and function of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems.

UNIT – II

Natural Resources: Natural resources and associated problems

Forest resources – Use and over – exploitation, deforestation – Timber extraction – Mining, dams and other effects on forest and tribal people

Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems

Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, Sustainable mining of Granite, Lignite, Coal, Sea and River sands.

Food resources: World food problems, changes caused by non-agriculture activities-effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity

Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources Vs Oil and Natural Gas Extraction.

Land resources: Land as a resource, land degradation, Wasteland reclamation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

UNIT – III Biodiversity and its conservation:

Definition: genetic, species and ecosystem diversity- classification - Value of biodiversity: consumptive use, productive use, social-Biodiversity at national and local levels. India as a mega-diversity nation - Hot-spots of biodiversity - Threats to biodiversity: habitat loss, man-wildlife conflicts - Endangered and endemic species of India – Conservation of biodiversity: conservation of biodiversity.

UNIT – IV

Environmental Pollution: Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies, Sustainable Life Studies. Impact of Fire Crackers on Men and his well being.

Solid Waste Management: Sources, Classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products, Biomedical, Hazardous and e – waste management.

UNIT – V

Social Issues and the Environment: Urban problems related to energy -Water conservation, rain water harvesting-Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Environmental Protection Act -Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act - Wildlife Protection Act -Forest Conservation Act-Issues involved in enforcement of environmental legislation. -Public awareness.

UNIT – VI

Environmental Management: Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS, Environmental audit. Ecotourism, Green Campus – Green business and Green politics.

The student should Visit an Industry / Ecosystem and submit a report individually on any issues related to Environmental Studies course and make a power point presentation.

TEXT BOOKS:

1. Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers, Vijayawada
2. Environmental Studies, R. Rajagopalan, 2nd Edition, 2011, Oxford University Press.
3. Environmental Studies, P. N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; Pearson Education, Chennai

REFERENCE:

1. Text Book of Environmental Studies, Deeshita Dave & P. Udaya Bhaskar, Cengage Learning.
2. A Textbook of Environmental Studies, Shaashi Chawla, TMH, New Delhi
3. Environmental Studies, Benny Joseph, Tata McGraw Hill Co, New Delhi
4. Perspectives in Environment Studies, Anubha Kaushik, C P Kaushik, New Age International Publishers, 2014

APPLIED/ENGINEERING CHEMISTRY LABORATORY (*Common to all branches*)

1. Introduction to Chemistry laboratory – Molarity, Normality, Primary, secondary standard solutions, Volumetric titrations, Quantitative analysis, Qualitative analysis, etc.
2. Trial experiment - Determination of HCl using standard Na₂CO₃ solution.
3. Determination of alkalinity of a sample containing Na₂CO₃ and NaOH.
4. Determination of KMnO₄ using standard Oxalic acid solution.
5. Determination of Ferrous iron using standard K₂Cr₂O₇ solution.
6. Determination of Copper using standard K₂Cr₂O₇ solution.
7. Determination of temporary and permanent hardness of water using standard EDTA solution.
8. Determination of Copper using standard EDTA solution.
9. Determination of Iron by a Colorimetric method using thiocyanate as reagent.
10. Determination of pH of the given sample solution using pH meter.
11. Conductometric titration between strong acid and strong base.
12. Conductometric titration between strong acid and weak base.
13. Potentiometric titration between strong acid and strong base.
14. Potentiometric titration between strong acid and weak base.
15. Determination of Zinc using standard EDTA solution.
16. Determination of Vitamin – C.

Outcomes: The students entering into the professional course have practically very little exposure to lab classes. The experiments introduce volumetric analysis; redox titrations with different indicators; EDTA titrations; then they are exposed to a few instrumental methods of chemical analysis. Thus at the end of the lab course, the student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills.

Reference Books

1. A Textbook of Quantitative Analysis, Arthur J. Vogel.
2. Dr. Jyotsna Cherukuri (2012) *Laboratory Manual of engineering chemistry-II*, VGS Techno Series
3. Chemistry Practical Manual, Lorven Publications
4. K. Mukkanti (2009) *Practical Engineering Chemistry*, B.S. Publication

I Year - I Semester	L	T	P	C
	0	0	3	2

ENGLISH - COMMUNICATION SKILLS LAB- I

PRESCRIBED LAB MANUAL FOR SEMESTER I:

'INTERACT: English Lab Manual for Undergraduate Students' Published by **Orient Blackswan Pvt Ltd.**

OBJECTIVES:

To enable the students to learn through practice the communication skills of listening, speaking, reading and writing.

OUTCOME:

A study of the communicative items in the laboratory will help the students become successful in the competitive world.

The course content along with the study material is divided into six units.

UNIT 1:

1. WHY study Spoken English?
2. Making Inquiries on the phone, thanking and responding to Thanks
Practice work.

UNIT 2:

1. Responding to Requests and asking for Directions
Practice work.

UNIT 3:

1. Asking for Clarifications, Inviting, Expressing Sympathy, Congratulating
2. Apologising, Advising, Suggesting, Agreeing and Disagreeing
Practice work.

UNIT 4:

1. Letters and Sounds
Practice work.

UNIT 5:

1. The Sounds of English
Practice work.

UNIT 6:

1. Pronunciation
 2. Stress and Intonation
- Practice work.

Assessment Procedure: Laboratory

1. Every lab session (150 minutes) should be handled by not less than two teachers (three would be ideal) where each faculty has to conduct a speaking activity for 20/30 students.
2. The teachers are to assess each learner in the class for not less than 10 speaking activities, each one to be assessed for 10 marks or 10%. The average of 10 day-to-day activity assessments is to be calculated for 10 marks for internal assessment.

The rubric given below has to be filled in for all the students for all activities.

The rubric to assess the learners:

	Body language		Fluency & Audibility	Clarity in Speech	Neutralization of accent	Appropriate Language		Total 10 marks	Remarks
	Gestures & Postures	Eye Contact				Grammar	Vocabulary & expressions		

- **Lab Assessment: Internal (25 marks)**
 1. Day-to-Day activities: 10 marks
 2. Completing the exercises in the lab manual: 5 marks
 3. Internal test (5 marks written and 5 marks oral)
- **Lab Assessment: External (50 marks)**
 1. Written test: 20 marks (writing a dialogue, note-taking and answering questions on listening to an audio recording).
 2. Oral: Reading aloud a text or a dialogue- 10 marks
 3. Viva-Voce by the external examiner: 20 marks

Reference Books:

1. Strengthen your communication skills by Dr M Hari Prasad, Dr Salivendra Raju and Dr G Suvarna Lakshmi, Maruti Publications.
2. English for Professionals by Prof Eliah, B.S Publications, Hyderabad.
3. Unlock, Listening and speaking skills 2, Cambridge University Press
4. Spring Board to Success, Orient BlackSwan
5. A Practical Course in effective english speaking skills, PHI
6. Word power made handy, Dr shalini verma, Schand Company
7. Let us hear them speak, Jayashree Mohanraj, Sage texts
8. Professional Communication, Aruna Koneru, Mc Grawhill Education
9. Cornerstone, Developing soft skills, Pearson Education

COMPUTER PROGRAMMING LAB

OBJECTIVES:

- Understand the basic concept of C Programming, and its different modules that includes conditional and looping expressions, Arrays, Strings, Functions, Pointers, Structures and File programming.
- Acquire knowledge about the basic concept of writing a program.
- Role of constants, variables, identifiers, operators, type conversion and other building blocks of C Language.
- Use of conditional expressions and looping statements to solve problems associated with conditions and repetitions.
- Role of Functions involving the idea of modularity.

Programming

Exercise - 1 Basics

- a) What is an OS Command, Familiarization of Editors - vi, Emacs
- b) Using commands like mkdir, ls, cp, mv, cat, pwd, and man
- c) C Program to Perform Adding, Subtraction, Multiplication and Division of two numbers From Command line

Exercise - 2 Basic Math

- a) Write a C Program to Simulate 3 Laws at Motion
- b) Write a C Program to convert Celsius to Fahrenheit and vice versa

Exercise - 3 Control Flow - I

- a) Write a C Program to Find Whether the Given Year is a Leap Year or not.
- b) Write a C Program to Add Digits & Multiplication of a number

Exercise – 4 Control Flow - II

- a) Write a C Program to Find Whether the Given Number is
 - i) Prime Number
 - ii) Armstrong Number
- b) Write a C program to print Floyd Triangle
- c) Write a C Program to print Pascal Triangle

Exercise – 5 Functions

- a) Write a C Program demonstrating of parameter passing in Functions and returning values.
- b) Write a C Program illustrating Fibonacci, Factorial with Recursion without Recursion

Exercise – 6 Control Flow - III

- a) Write a C Program to make a simple Calculator to Add, Subtract, Multiply or Divide Using switch...case
- b) Write a C Program to convert decimal to binary and hex (using switch call function the function)

Exercise – 7 Functions - Continued

Write a C Program to compute the values of $\sin x$ and $\cos x$ and e^x values using Series expansion. (use factorial function)

Exercise – 8 Arrays

Demonstration of arrays

- a) Search-Linear.
- b) Sorting-Bubble, Selection.
- c) Operations on Matrix.

Exercises - 9 Structures

- a) Write a C Program to Store Information of a Movie Using Structure
- b) Write a C Program to Store Information Using Structures with Dynamically Memory Allocation
- c) Write a C Program to Add Two Complex Numbers by Passing Structure to a Function

Exercise - 10 Arrays and Pointers

- a) Write a C Program to Access Elements of an Array Using Pointer
- b) Write a C Program to find the sum of numbers with arrays and pointers.

Exercise – 11 Dynamic Memory Allocations

- a) Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc () function.
- b) Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc () function.

Understand the difference between the above two programs

Exercise – 12 Strings

- a) Implementation of string manipulation operations **with** library function.
 - i) copy
 - ii) concatenate
 - iii) length
 - iv) compare
- b) Implementation of string manipulation operations **without** library function.
 - i) copy
 - ii) concatenate
 - iii) length
 - iv) compare

Exercise -13 Files

- a) Write a C programming code to open a file and to print its contents on screen.
- b) Write a C program to copy files

Exercise - 14 Files Continued

- a) Write a C program that merges two files and stores their contents in another file.
- b) Write a C program to delete a file.

OUTCOMES:

- Apply and practice logical ability to solve the problems.
- Understand C programming development environment, compiling, debugging, and linking and executing a program using the development environment
- Analyzing the complexity of problems, Modularize the problems into small modules and then convert them into programs
- Understand and apply the in-built functions and customized functions for solving the problems.
- Understand and apply the pointers, memory allocation techniques and use of files for dealing with variety of problems.
- Document and present the algorithms, flowcharts and programs in form of user-manuals
- Identification of various computer components, Installation of software

Note:

- a) **All the Programs must be executed in the Linux Environment. (Mandatory)**
- b) **The Lab record must be a print of the LATEX (.tex) Format.**

ENGLISH -II**Introduction:**

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training the students to acquire communicative competence, the syllabus has been designed to develop linguistic and communicative competence of the students of Engineering.

As far as the detailed Textbooks are concerned, the focus should be on the skills of listening, speaking, reading and writing. The nondetailed Textbooks are meant for extensive reading for pleasure and profit.

Thus the stress in the syllabus is primarily on the development of communicative skills and fostering of ideas.

Objectives:

1. To improve the language proficiency of the students in English with emphasis on LSRW skills.
2. To enable the students to study and comprehend the prescribed lessons and subjects more effectively relating to their theoretical and practical components.
3. To develop the communication skills of the students in both formal and informal situations.

LISTENING SKILLS:**Objectives:**

1. To enable the students to appreciate the role of listening skill and improve their pronunciation.
2. To enable the students to comprehend the speech of people belonging to different backgrounds and regions.
3. To enable the students to listen for general content, to fill up information and for specific information.

SPEAKING SKILLS:**Objectives:**

1. To make the students aware of the importance of speaking for their personal and professional communication.
2. To enable the students to express themselves fluently and accurately in social and professional success.
3. To help the students describe objects, situations and people.
4. To make the students participate in group activities like roleplays, discussions and debates.
5. To make the students participate in Just a Minute talks.

READING SKILLS:

Objectives:

1. To enable the students to comprehend a text through silent reading.
2. To enable the students to guess the meanings of words, messages and inferences of texts in given contexts.
3. To enable the students to skim and scan a text.
4. To enable the students to identify the topic sentence.
5. To enable the students to identify discourse features.
6. To enable the students to make intensive and extensive reading.

WRITING SKILLS:

Objectives:

1. To make the students understand that writing is an exact formal skills.
2. To enable the students to write sentences and paragraphs.
3. To make the students identify and use appropriate vocabulary.
4. To enable the students to narrate and describe.
5. To enable the students capable of note-making.
6. To enable the students to write coherently and cohesively.
7. To make the students to write formal and informal letters.
8. To enable the students to describe graphs using expressions of comparison.
9. To enable the students to write technical reports.

Methodology:

1. The class are to be learner-centered where the learners are to read the texts to get a comprehensive idea of those texts on their own with the help of the peer group and the teacher.
2. Integrated skill development methodology has to be adopted with focus on individual language skills as per the tasks/exercise.
3. The tasks/exercises at the end of each unit should be completed by the learners only and the teacher intervention is permitted as per the complexity of the task/exercise.
4. The teacher is expected to use supplementary material wherever necessary and also generate activities/tasks as per the requirement.
5. The teacher is permitted to use lecture method when a completely new concept is introduced in the class.

Assessment Procedure: Theory

1. The formative and summative assessment procedures are to be adopted (mid exams and end semester examination).
2. Neither the formative nor summative assessment procedures should test the memory of the content of the texts given in the textbook. The themes and global comprehension of the units in the present day context with application of the language skills learnt in the unit are to be tested.
3. Only new unseen passages are to be given to test reading skills of the learners. Written skills are to be tested from sentence level to essay level. The communication formats—emails, letters and reports-- are to be tested along with appropriate language and expressions.
4. Examinations:

I mid exam + II mid exam (15% for descriptive tests+10% for online tests)= 25%

(80% for the best of two and 20% for the other)

Assignments= 5%

End semester exams=70%

5. Three take home assignments are to be given to the learners where they will have to read texts from the reference books list or other sources and write their gist in their own words.

The following text books are recommended for study in I B.Tech II Semester (Common for all branches)and I B.Pharma II Sem of JNTU Kakinada from the academic year 2016-17 (**R-16 Regulations**)

DETAILED TEXTBOOK: ENGLISH ENCOUNTERS Published by **Maruthi Publishers**.

DETAILED NON-DETAIL:THE GREAT INDIAN SCIENTISTS Published by **Cengage learning**

The course content along with the study material is divided into six units.

UNIT 1:

1. ' The Greatest Resource- Education' from English Encounters

OBJECTIVE:

Schumacher describes the education system by saying that it was mere training, something more than mere knowledge of facts.

OUTCOME:

The lesson underscores that the ultimate aim of Education is to enhance wisdom.

2. ' A P J Abdul Kalam' from The Great Indian Scientists.

OBJECTIVE:

The lesson highlights Abdul Kalam's contributions to Indian science and the awards he received.

OUTCOME:

Abdul Kalam's simple life and service to the nation inspires the readers to follow in his footsteps.

UNIT 2:

1. ' A Dilemma' from English Encounters

OBJECTIVE: The lesson centres on the pros and cons of the development of science and technology.

OUTCOME: The lesson enables the students to promote peaceful co-existence and universal harmony among people and society.

2. 'C V Raman' from The Great Indian Scientists.

OBJECTIVE:

The lesson highlights the dedicated research work of C V Raman and his achievements in Physics.

OUTCOME:

The Achievements of C V Raman are inspiring and exemplary to the readers and all scientists.

UNIT 3:

1. 'Cultural Shock': Adjustments to new Cultural Environments from English Encounters.

OBJECTIVE:

The lesson depicts of the symptoms of Cultural Shock and the aftermath consequences.

OUTCOME:

The lesson imparts the students to manage different cultural shocks due to globalization.

2. 'Homi Jehangir Bhabha' from The Great Indian Scientists.

OBJECTIVE:

The lesson highlights Homi Jehangir Bhabha's contributions to Indian nuclear programme as architect.

OUTCOME:

The seminal contributions of Homi Jehangir Bhabha to Indian nuclear programme provide an aspiration to the readers to serve the nation and strengthen it.

UNIT 4:

1. 'The Lottery' from English Encounters.

OBJECTIVE:

The lesson highlights insightful commentary on cultural traditions.

OUTCOME:

The theme projects society's need to re examine its traditions when they are outdated.

2. 'Jagadish Chandra Bose' from The Great Indian Scientists.

OBJECTIVE:

The lesson gives an account of the unique discoveries and inventions of Jagadish Chandra Bose in Science.

OUTCOME: The Scientific discoveries and inventions of Jagadish Chandra Bose provide inspiration to the readers to make their own contributions to science and technology, and strengthen the nation.

UNIT 5:

1. 'The Health Threats of Climate Change' from English Encounters.

OBJECTIVE:

The essay presents several health disorders that spring out due to environmental changes

OUTCOME:

The lesson offers several inputs to protect environment for the sustainability of the future generations.

2. 'Prafulla Chandra Ray' from The Great Indian Scientists.

OBJECTIVE:

The lesson given an account of the experiments and discoveries in Pharmaceuticals of Prafulla Chandra Ray.

OUTCOME:

Prafulla Chandra Ray's scientific achievements and patriotic fervour provide inspiration to the reader.

UNIT 6:

1. ' The Chief Software Architect' from English Encounters

OBJECTIVE:

The lesson supports the developments of technology for the betterment of human life.

OUTCOME:

Pupil get inspired by eminent personalities who toiled for the present day advancement of software development.

2. ' Srinivasa Ramanujan' from The Great Indian Scientists.

OBJECTIVE:

The lesson highlights the extraordinary achievements of Srinivasa Ramanujan, a great mathematician and the most romantic figure in mathematics.

OUTCOME:

The lesson provides inspiration to the readers to think and tap their innate talents.

NOTE:

All the exercises given in the prescribed lessons in both detailed and non-detailed textbooks relating to the theme and language skills must be covered

.

MODEL QUESTION PAPER FOR THEORY**PART- I**

Six short answer questions on 6 unit themes

One question on eliciting student's response to any of the themes

PART-II

Each question should be from one unit and the last question can be a combination of two or more units.

Each question should have 3 sub questions: A,B & C

A will be from the main text: 5 marks

B from non-detailed text: 3 marks

C on grammar and Vocabulary: 6 marks

MATHEMATICS-II (Mathematical Methods)**Course Objectives:**

1. The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course.
2. The skills derived from the course will help the student from a necessary base to develop analytic and design concepts.
3. Understand the most basic numerical methods to solve simultaneous linear equations.

Course Outcomes: At the end of the Course, Student will be able to:

1. Calculate a root of algebraic and transcendental equations. Explain relation between the finite difference operators.
2. Compute interpolating polynomial for the given data.
3. Solve ordinary differential equations numerically using Euler's and RK method.
4. Find Fourier series and Fourier transforms for certain functions.
5. Identify/classify and solve the different types of partial differential equations.

UNIT I: Solution of Algebraic and Transcendental Equations:

Introduction- Bisection method – Method of false position – Iteration method – Newton-Raphson method (One variable and simultaneous Equations).

UNIT II: Interpolation:

Introduction- Errors in polynomial interpolation – Finite differences- Forward differences- Backward differences – Central differences – Symbolic relations and separation of symbols - Differences of a polynomial-Newton's formulae for interpolation – Interpolation with unequal intervals - Lagrange's interpolation formula.

UNIT III: Numerical Integration and solution of Ordinary Differential equations:

Trapezoidal rule- Simpson's $1/3^{\text{rd}}$ and $3/8^{\text{th}}$ rule-Solution of ordinary differential equations by Taylor's series-Picard's method of successive approximations-Euler's method - Runge-Kutta method (second and fourth order).

UNIT IV: Fourier Series:

Introduction- Periodic functions – Fourier series of π -periodic function - Dirichlet's conditions – Even and odd functions – Change of interval– Half-range sine and cosine series.

UNIT V: Applications of PDE:

Method of separation of Variables- Solution of One dimensional Wave, Heat and two-dimensional Laplace equation.

UNIT VI: Fourier Transforms:

Fourier integral theorem (without proof) – Fourier sine and cosine integrals - sine and cosine transforms – properties – inverse transforms – Finite Fourier transforms.

Text Books:

1. **B.S.Grewal**, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. **N.P.Bali**, Engineering Mathematics, Lakshmi Publications.

Reference Books:

1. **Dean G. Duffy**, Advanced engineering mathematics with MATLAB, CRC Press
2. **V.Ravindranath and P.Vijayalakshmi**, Mathematical Methods, Himalaya Publishing House.
3. **Erwin Kreyszig**, Advanced Engineering Mathematics, 10th Edition, Wiley-India
4. **David Kincaid, Ward Cheney**, Numerical Analysis-Mathematics of Scientific Computing, 3rd Edition, Universities Press.
5. **Srimanta Pal, Subodh C.Bhunia**, Engineering Mathematics, Oxford University Press.
6. **Dass H.K., Rajnish Verma. Er.**, Higher Engineering Mathematics, S. Chand Co. Pvt. Ltd, Delhi.

MATHEMATICS-III

Course Objectives:

1. The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course.
2. The skills derived from the course will help the student from a necessary base to develop analytic and design concepts.
3. Understand the most basic numerical methods to solve simultaneous linear equations.

Course Outcomes: At the end of the Course, Student will be able to:

1. Determine rank, Eigenvalues and Eigen vectors of a given matrix and solve simultaneous linear equations.
2. Solve simultaneous linear equations numerically using various matrix methods.
3. Determine double integral over a region and triple integral over a volume.
4. Calculate gradient of a scalar function, divergence and curl of a vector function. Determine line, surface and volume integrals. Apply Green, Stokes and Gauss divergence theorems to calculate line, surface and volume integrals.

UNIT I: Linear systems of equations:

Rank-Echelon form-Normal form – Solution of linear systems – Gauss elimination - Gauss Jordan- Gauss Jacobi and Gauss Seidal methods.Applications: Finding the current in electrical circuits.

UNIT II: Eigen values - Eigen vectors and Quadratic forms:

Eigen values - Eigen vectors– Properties – Cayley-Hamilton theorem - Inverse and powers of a matrix by using Cayley-Hamilton theorem- Diagonalization- Quadratic forms- Reduction of quadratic form to canonical form – Rank - Positive, negative and semi definite - Index – Signature.

Applications: Free vibration of a two-mass system.

UNIT III: Multiple integrals:

Curve tracing: Cartesian, Polar and Parametric forms.

Multiple integrals: Double and triple integrals – Change of variables – Change of order of integration.

Applications: Finding Areas and Volumes.

UNIT IV: Special functions:

Beta and Gamma functions- Properties - Relation between Beta and Gamma functions- Evaluation of improper integrals.

Applications: Evaluation of integrals.

UNIT V: Vector Differentiation:

Gradient- Divergence- Curl - Laplacian and second order operators -Vector identities.

Applications: Equation of continuity, potential surfaces

UNIT VI: Vector Integration:

line integral – Work done – Potential function – Area- Surface and volume integrals Vector integral theorems: Greens, Stokes and Gauss Divergence theorems (without proof) and related problems.

Applications: Work done, Force.

Text Books:

1. **B.S.Grewal**, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. **N.P.Bali**, Engineering Mathematics, Lakshmi Publications.

Reference Books:

1. **Greenberg**, Advanced Engineering Mathematics, 2nd edition, Pearson edn
2. **Erwin Kreyszig**, Advanced Engineering Mathematics, 10th Edition, Wiley-India
3. **Peter O'Neil**, Advanced Engineering Mathematics, 7th edition, Cengage Learning.
4. **D.W. Jordan and T.Smith**, Mathematical Techniques, Oxford University Press.
5. **Srimanta Pal, Subodh C.Bhunia**, Engineering Mathematics, Oxford University Press.
6. **Dass H.K., Rajnish Verma. Er.**, Higher Engineering Mathematics, S. Chand Co. Pvt. Ltd, Delhi.

APPLIED PHYSICS
(CSE, ECE, EEE, IT, EIE, E.Com.E)

OBJECTIVES: Physics curriculum which is re-oriented to the needs of Circuital branches of graduate engineering courses offered by JNTUniv.Kkd. that serves as a transit to understand the branch specific advanced topics. The courses are designed to:

- Impart Knowledge of Physical Optics phenomena like Interference, Diffraction and Polarization involving required to design instruments with higher resolution.
- Teach Concepts of coherent sources, its realization and utility optical instrumentation.
- Study the concepts regarding the bulk response of materials to the EM fields and their analytically study in the back-drop of basic quantum mechanics.
- Understand the physics of Semiconductors and their working mechanism for their utility in sensors.

UNIT-I

INTERFERENCE: Principle of Superposition – Coherent Sources – Interference in thin films (reflection geometry) – Newton’s rings – construction and basic principle of Interferometers.

UNIT-II

DIFFRACTION: Fraunhofer diffraction at single slit - Cases of double slit, N-slits & Circular Aperture (Qualitative treatment only)-Grating equation - Resolving power of a grating, Telescope and Microscopes.

UNIT-III

POLARIZATION: Types of Polarization – Methods of production - Nicol Prism -Quarter wave plate and Half Wave plate – Working principle of Polarimeter (Sacharimeter).

LASERS: Characteristics– Stimulated emission – Einstein’s Transition Probabilities-Pumping schemes - Ruby laser – Helium Neon laser.

UNIT-IV

ELECTROMAGNETIC FIELDS: Scalar and Vector Fields – Electric Potential- Gradient, Divergence of fields – Gauss and Stokes theorems-Propagation of EM waves through dielectric medium.

UNIT-V

QUANTUM MECHANICS: Introduction - Matter waves – Schrödinger Time Independent and Time Dependent wave equations – Particle in a box.

FREE ELECTRON THEORY: Defects of Classical free electron theory –Quantum Free electron theory - concept of Fermi Energy.

UNIT-VI

BAND THEORY OF SOLIDS: Bloch's theorem (qualitative) – Kronig – Penney model – energy bands in crystalline solids – classification of crystalline solids– effective mass of electron & concept of hole.

SEMICONDUCTOR PHYSICS: Conduction – Density of carriers in Intrinsic and Extrinsic semiconductors – Drift & Diffusion – relevance of Einstein's equation- Hall effect in semiconductors

Outcome: Construction and working details of instruments, ie., Interferometer, Diffractometer and Polarimeter are learnt. Study EM-fields and semiconductors under the concepts of Quantum mechanics paves way for their optimal utility.

List of Text Books:

1. A Text book of Engineering Physics – by Dr. M.N.Avadhanulu and Dr.P.G.Kshira sagar, S.Chand & Company Ltd., (2014)
2. 'Solid State Physics' by A.J.Dekker, Mc Millan Publishers (2011)
3. Engineering Physics by D.K.Bhattacharya and Poonam Tandon, Oxford press (2015)

List of Reference Books:

1. Applied Physics by P.K.Palanisamy, Scitech publications (2014)
2. Lasers and Non-Linear optics by B.B.Laud, New Age International Publishers (2008).
3. Engineering Physics by M. Arumugam, Anuradha Publication (2014)

ELECTRICAL CIRCUIT ANALYSIS – I**Preamble:**

This course introduces the basic concepts of circuit analysis which is the foundation for all subjects of the Electrical Engineering discipline. The emphasis of this course is laid on the basic analysis of circuits which includes single phase circuits, magnetic circuits, network theorems, transient analysis and network topology.

Learning Objectives:

- To study the concepts of passive elements, types of sources and various network reduction techniques.
- To understand the applications of network topology to electrical circuits.
- To study the concept of magnetic coupled circuit.
- To understand the behaviour of RLC networks for sinusoidal excitations.
- To study the performance of R-L, R-C and R-L-C circuits with variation of one of the parameters and to understand the concept of resonance.
- To understand the applications of network theorems for analysis of electrical networks.

UNIT-I**Introduction to Electrical Circuits**

Passive components and their V-I relations. Sources (dependent and independent) -Kirchoff's laws, Network reduction techniques(series, parallel, series - parallel, star-to-delta and delta-to-star transformation). source transformation technique, nodal analysis and mesh analysis.

UNIT-II**Network topology**

Definitions of Graph and Tree, Basic cutset and tie set matrices for planar networks, Loop and nodal methods of analysis of networks with dependent and independent voltage and current sources, Duality and Dual networks.

UNIT-III**Magnetic Circuit**

Basic definition of MMF, flux and reluctance. Analogy between electrical and magnetic circuits. Faraday's laws of electromagnetic induction Concept of self and mutual inductance. Dot convention-coefficient of coupling and composite magnetic circuit. Analysis of series and parallel magnetic circuits.

UNIT-IV**Single Phase A.C Systems**

Periodic waveforms (determination of rms, average value and form factor). Concept of phase angle and phase difference – Waveforms and phasor diagrams for lagging, leading networks. Complex and polar forms of representations, steady state analysis of R, L and C circuits. Power Factor and its significance real, reactive power and apparent power, waveform of instantaneous power triangle and complex power

UNIT-V

Analysis of AC Networks

Extension of node and mesh analysis to AC networks, Numerical problems on sinusoidal steady state analysis, Series and parallel resonance, Selectively band width and Quasi factor, Introduction to locus diagram.

UNIT-VI

Network theorems (DC & AC Excitations)

Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem, Reciprocity theorem, Millman's theorem and compensation theorem.

Learning Outcomes:

Students are able to solve

- Various electrical networks in presence of active and passive elements.
- Electrical networks with network topology concepts.
- Any magnetic circuit with various dot conventions.
- Any R, L, C network with sinusoidal excitation.
- Any R, L, network with variation of any one of the parameters i.e R, L, C. and f.
- Electrical networks by using principles of network theorems.

Text Books:

1. Engineering Circuit Analysis by William Hayt and Jack E.Kemmerley,McGraw Hill Company,6 th edition
2. Network Analysis: Van Valkenburg; Prentice-Hall of India Private Ltd

Reference Books:

1. Fundamentals of Electrical Circuits by Charles K.Alexander and Mathew N.O.Sadiku, McGraw Hill Education (India)
2. Linear Circuit Analysis by De Carlo, Lin, Oxford publications
3. Electric Circuits– (Schaum's outlines) by MahmoodNahvi& Joseph Edminister, Adapted by KumaRao, 5th Edition – McGraw Hill.
4. Electric Circuits by David A. Bell, Oxford publications
5. Introductory Circuit Analysis by Robert L Boylestad, Pearson Publications
6. Circuit Theory(Analysis and Synthesis) by A.Chakrabarthy,DhanpatRai&Co.

ENGINEERING DRAWING

Objective: Engineering drawing being the principle method of communication for engineers, the objective to introduce the students, the techniques of constructing the various types of polygons, curves and scales. The objective is also to visualize and represent the 3D objects in 2D planes with proper dimensioning, scaling etc.

- To introduce the use and the application of drawing instruments and to make the students construct the polygons, curves and various types of scales. The student will be able to understand the need to enlarge or reduce the size of objects in representing them.
- To introduce orthographic projections and to project the points and lines parallel to one plane and inclined to other.
- To make the students draw the projections of the lines inclined to both the planes.
- To make the students draw the projections of the plane inclined to both the planes.
- To make the students draw the projections of the various types of solids in different positions inclined to one of the planes.
- To represent the object in 3D view through isometric views. The student will be able to represent and convert the isometric view to orthographic view and vice versa.

UNIT I Polygons, Construction of regular polygons using given length of a side; Ellipse, arcs of circles and Oblong methods; Scales – Vernier and Diagonal scales.

UNIT II Introduction to orthographic projections; projections of points; projections of straight lines parallel to both the planes; projections of straight lines – parallel to one plane and inclined to the other plane.

UNIT III Projections of straight lines inclined to both the planes, determination of true lengths, angle of inclinations and traces.

UNIT IV Projections of planes: regular planes perpendicular/parallel to one plane and inclined to the other reference plane; inclined to both the reference planes.

UNIT V Projections of Solids – Prisms, Pyramids, Cones and Cylinders with the axis inclined to one of the planes.

UNIT VI Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

TEXT BOOKS:

1. Engineering Drawing, N. D. Butt, Chariot Publications
2. Engineering Drawing, K. L. Narayana & P. Kanniah, Scitech Publishers.
3. Engineering Graphics, P.I. Varghese, McGraw Hill Publishers

REFERENCE BOOKS:

1. Engineering Graphics for Degree, K. C. John, PHI Publishers
2. Engineering Drawing, Agarwal & Agarwal, Tata McGraw Hill Publishers
3. Engineering Drawing + AutoCad – K Venugopal, V. Prabhu Raja, New Age

ENGLISH LANGUAGE COMMUNICATION SKILLS LAB- II

PRESCRIBED LAB MANUAL FOR SEMESTER II:

'**INTERACT:** English Lab Manual for Undergraduate Students' Published by **Orient Blackswan Pvt Ltd.**

OBJECTIVES:

To enable the students to learn demonstratively the communication skills of listening, speaking, reading and writing.

OUTCOME:

A study of the communicative items in the laboratory will help the students become successful in the competitive world.

The course content along with the study material is divided into six units.

UNIT 1:

1. Debating
Practice work

UNIT 2:

1. Group Discussions
Practice work

UNIT 3:

1. Presentation Skills
Practice work

UNIT 4:

1. Interview Skills
Practice work

UNIT 5:

1. Email,
2. Curriculum Vitae
Practice work

UNIT 6:

1. Idiomatic Expressions
2. Common Errors in English
Practice work

Reference Books:

1. Strengthen your communication skills by Dr M Hari Prasad, Dr Salivendra Raju and Dr G Suvarna Lakshmi, Maruti Publications.
2. English for Professionals by Prof Eliah, B.S Publications, Hyderabad.
3. Unlock, Listening and speaking skills 2, Cambridge University Press
4. Spring Board to Success, Orient BlackSwan
5. A Practical Course in effective english speaking skills, PHI
6. Word power made handy, Dr shalini verma, Schand Company
7. Let us hear them speak, Jayashree Mohanraj, Sage texts
8. Professional Communication, Aruna Koneru, Mc Grawhill Education
9. Cornerstone, Developing soft skills, Pearson Education

APPLIED/ENGINEERING PHYSICS LAB
(Any 10 of the following listed experiments)

Objective: *Training field oriented Engineering graduates to handle instruments and their design methods to improve the accuracy of measurements.*

LIST OF EXPERIMENTS:

1. Determination of wavelength of a source-Diffraction Grating-Normal incidence.
2. Newton's rings – Radius of Curvature of Plano - Convex Lens.
3. Determination of thickness of a spacer using wedge film and parallel interference fringes.
4. Determination of Rigidity modulus of a material- Torsional Pendulum.
5. Determination of Acceleration due to Gravity and Radius of Gyration- Compound Pendulum.
6. Melde's experiment – Transverse and Longitudinal modes.
7. Verification of laws of vibrations in stretched strings – Sonometer.
8. Determination of velocity of sound – Volume Resonator.
9. L- C- R Series Resonance Circuit.
10. Study of I/V Characteristics of Semiconductor diode.
11. I/V characteristics of Zener diode.
12. Characteristics of Thermistor – Temperature Coefficients.
13. Magnetic field along the axis of a current carrying coil – Stewart and Gee's apparatus.
14. Energy Band gap of a Semiconductor p - n junction.
15. Hall Effect in semiconductors.
16. Time constant of CR circuit.
17. Determination of wavelength of laser source using diffraction grating.
18. Determination of Young's modulus by method of single cantilever oscillations.
19. Determination of lattice constant – lattice dimensions kit.
20. Determination of Planck's constant using photocell.
21. Determination of surface tension of liquid by capillary rise method.

Outcome: *Physics lab curriculum gives fundamental understanding of design of an instrument with targeted accuracy for physical measurements.*

I Year - II Semester	L	T	P	C
	0	0	2	0

APPLIED/ENGINEERING PHYSICS - VIRTUAL LABS – ASSIGNMENTS
(Constitutes 5% marks of 30marks of Internal-component)

Objective: *Training Engineering students to prepare a technical document and improving their writing skills.*

LIST OF EXPERIMENTS

1. Hall Effect
2. Crystal Structure
3. Hysteresis
4. Brewster's angle
5. Magnetic Levitation / SQUID
6. Numerical Aperture of Optical fiber
7. Photoelectric Effect
8. Simple Harmonic Motion
9. Damped Harmonic Motion
10. LASER – Beam Divergence and Spot size
11. B-H curve
12. Michelson's interferometer
13. Black body radiation

URL: www.vlab.co.in

Outcome: *Physics Virtual laboratory curriculum in the form of assignment ensures an engineering graduate to prepare a /technical/mini-project/ experimental report with scientific temper.*

I Year - II Semester

L	T	P	C
0	0	3	2

ENGINEERING WORKSHOP & IT WORKSHOP

ENGINEERING WORKSHOP:

Course Objective: To impart hands-on practice on basic engineering trades and skills.

Note: At least two exercises to be done from each trade.

Trade:

- | | |
|---------------------|---|
| Carpentry | <ol style="list-style-type: none">1. T-Lap Joint2. Cross Lap Joint3. Dovetail Joint4. Mortise and Tennon Joint |
| Fitting | <ol style="list-style-type: none">1. Vee Fit2. Square Fit3. Half Round Fit4. Dovetail Fit |
| Black Smithy | <ol style="list-style-type: none">1. Round rod to Square2. S-Hook3. Round Rod to Flat Ring4. Round Rod to Square headed bolt |
| House Wiring | <ol style="list-style-type: none">1. Parallel / Series Connection of three bulbs2. Stair Case wiring3. Florescent Lamp Fitting4. Measurement of Earth Resistance |
| Tin Smithy | <ol style="list-style-type: none">1. Taper Tray2. Square Box without lid3. Open Scoop4. Funnel |

IT WORKSHOP:

Objectives: Enabling the student to understand basic hardware and software tools through practical exposure

PC Hardware:

Identification of basic peripherals, assembling a PC, installation of system software like MS Windows, device drivers. Troubleshooting Hardware and software _ some tips and tricks.

Internet & World Wide Web:

Different ways of hooking the PC on to the internet from home and workplace and effectively usage of the internet, web browsers, email, newsgroups and discussion forums .Awareness of cyber hygiene(protecting the personal computer from getting infected with the viruses), worms and other cyber attacks .

Productivity tools Crafting professional word documents; excel spread sheets, power point presentations and personal web sites using the Microsoft suite of office tools

(Note: Student should be thoroughly exposed to minimum of 12 Tasks)

PC Hardware

Task 1:Identification of the peripherals of a computer.

To prepare a report containing the block diagram of the CPU along with the configuration of each peripheral and its functions. Description of various I/O Devices

Task 2(Optional): A practice on disassembling the components of a PC and assembling them to back to working condition.

Task 3: Examples of Operating systems- DOS, MS Windows,Installation of MS windows on a PC.

Task 4: Introduction to Memory and Storage Devices , I/O Port, Device Drivers, Assemblers, Compilers, Interpreters , Linkers, Loaders.

Task 5:

Hardware Troubleshooting (Demonstration):

Identification of a problem and fixing a defective PC (improper assembly or defective peripherals).

Software Troubleshooting (Demonstration):. Identification of a problem and fixing the PC for any software issues

Internet & Networking Infrastructure

Task 6: Demonstrating Importance of Networking, Transmission Media, Networking Devices- Gateway, Routers, Hub, Bridge, NIC ,Bluetooth Technology, Wireless Technology, Modem, DSL, Dialup Connection.

Orientation & Connectivity Boot Camp and web browsing: Students are trained to configure the network settings to connect to the Internet. They are trained to demonstrate the same through web browsing (including all tool bar options) and email access.

Task 7: Search Engines & Netiquette:

Students are enabled to use search engines for simple search, academic search and any other context based search (Bing, Google etc). Students are acquainted to the principles of micro-blogging, wiki, collaboration using social networks, participating in online technology forums

Task 8: Cyber Hygiene (Demonstration): Awareness of various threats on the internet. Importance of security patch updates and anti-virus solutions. Ethical Hacking, Firewalls, Multi-factor authentication techniques including Smartcard, Biometrics are also practiced

Word

Task 9: MS Word Orientation:

Accessing, overview of toolbars, saving files, Using help and resources, rulers, formatting ,Drop Cap , Applying Text effects, Using Character Spacing, OLE in Word, using templates, Borders and Colors, Inserting Header and Footer, Using Date and Time option, security features in word, converting documents while saving

Task 10: Creating project : Abstract Features to be covered:-Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check , Track Changes, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes and Paragraphs.

Excel

Task 11: Using spread sheet features of EXCEL including the macros, formulae, pivot tables, graphical representations

Creating a Scheduler - Features to be covered:- Gridlines, Format Cells, Summation, auto fill, Formatting Text

LOOKUP/VLOOKUP

Task 12: Performance Analysis - Features to be covered:- Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting

Power Point

Task 13: Students will be working on basic power point utilities and tools which help them create basic power point presentation. Topic covered during this week includes :- PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows, Hyperlinks, Inserting –Images, Clip Art, Tables and Charts in Powerpoint.

Task 14: Focusing on the power and potential of Microsoft power point. Helps them learn best practices in designing and preparing power point presentation. Topic covered during this week includes: - Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), Inserting – Background, textures, Design Templates, Hidden slides, OLE in PPT.

TEXT BOOK:**Faculty to consolidate the workshop manuals using the following references**

1. Computer Fundamentals, Anita Goel, Pearson
2. Scott Mueller's Upgrading and Repairing PCs, 18/e, Scott. Mueller, QUE, Pearson,2008
3. Information Technology Workshop, 3e, G. Praveen Babu, M. V. Narayana BS Publications.
4. Comdex Information Technology , Vikas Gupta, dreamtech.

REFERENCE:

Essential Computer and IT Fundamentals for Engineering and Science Students, N. B. Venkateswarlu

ELECTRICAL CIRCUIT ANALYSIS-II

Preamble :

This course aims at study of three phase systems, transient analysis, network synthesis and fourier analysis for the future study and analysis of power systems.

Learning Objectives:

- To study the concepts of balanced and unbalanced three-phase circuits.
- To study the transient behaviour of electrical networks with DC, pulse and AC excitations.
- To study the performance of a network based on input and output excitation/response.
- To understand the realization of electrical network function into electrical equivalent passive elements.
- To understand the application of fourier series and fourier transforms for analysis of electrical circuits.

UNIT-I Balanced Three phase circuits

Phase sequence- star and delta connection - relation between line and phase voltages and currents - analysis of balanced three phase circuits - measurement of active and reactive power.

UNIT-II Unbalanced Three phase circuits

Analysis of three phase unbalanced circuits: Loop method – Star-Delta transformation technique, Two wattmeter methods for measurement of three phase power.

UNIT-III Transient Analysis in DC and AC circuits

Transient response of R-L, R-C, R-L-C circuits for DC and AC excitations, Solution using differential equations and Laplace transforms.

UNIT-IV Two Port Networks

Two port network parameters – Z, Y, ABCD and Hybrid parameters and their relations, Cascaded networks - Poles and zeros of network functions.

UNIT-V Network synthesis

Positive real function - basic synthesis procedure - LC immittance functions - RC impedance functions and RL admittance function - RL impedance function and RC admittance function - Foster and Cauer methods.

UNIT-VI Fourier analysis and Transforms

Fourier theorem- Trigonometric form and exponential form of Fourier series, Conditions of symmetry- line spectra and phase angle spectra, Analysis of electrical circuits to non sinusoidal periodic waveforms.

Fourier integrals and Fourier transforms – properties of Fourier transforms physical significance of the Fourier Transform and its application to electrical circuits.

Learning Outcomes:

- Students are able to solve three- phase circuits under balanced and unbalanced condition
- Students are able find the transient response of electrical networks for different types of excitations.
- Students are able to find parameters for different types of network.
- Students are able to realize electrical equivalent network for a given network transfer function.
- Students are able to extract different harmonics components from the response of a electrical network.

Text Books:

1. Engineering Circuit Analysis by William Hayt and Jack E.Kemmerley,McGraw Hill Company,6 th edition
2. Network synthesis: Van Valkenburg; Prentice-Hall of India Private Ltd

Reference Books:

1. Fundamentals of Electrical Circuits by Charles K.Alexander and Mathew N.O.Sadiku, McGraw Hill Education (India)
2. Introduction to circuit analysis and design by TildonGlisson. Jr, Springer Publications.
3. Circuits by A.Bruce Carlson , Cengage Learning Publications
4. Network Theory Analysis and Synthesis by SmarajitGhosh, PHI publications
5. Networks and Systems by D. Roy Choudhury, New Age International publishers
6. Electric Circuits by David A. Bell, Oxford publications
7. Circuit Theory (Analysis and Synthesis) by A.Chakrabarthy,DhanpatRai&Co.

II Year – I SEMESTER

L	T	P	C
4	0	0	3

ELECTRICAL MACHINES – I

Preamble:

This is a basic course on rotating electrical machines. This course covers the topics related to principles, performance, applications and design considerations of dc machines and transformers.

Learning objectives:

- Understand the unifying principles of electromagnetic energy conversion.
- Understand the construction, principle of operation and performance of DC machines.
- Learn the characteristics, performance, methods of speed control and testing methods of DC motors.
- To predetermine the performance of single phase transformers with equivalent circuit models.
- Understand the methods of testing of single-phase transformer.
- Analyze the three phase transformers and achieve three phase to two phase conversion.

UNIT-I:

Electromechanical Energy Conversion and introduction to DC machines

Principles of electromechanical energy conversion – singly excited and multi excited system – Calculation of force and torque using the concept of co-energy.

Construction and principle of operation of DC machine – EMF equation for generator – Classification of DC machines based on excitation – OCC of DC shunt generator.

UNIT-II:

Performance of D.C. Machines

Torque and back-emf equations of dc motors– Armature reaction and commutation – characteristics of separately-excited, shunt, series and compound motors - losses and efficiency- applications of dc motors.

UNIT-III:

Starting, Speed Control and Testing of D.C. Machines

Necessity of starter – Starting by 3 point and 4 point starters – Speed control by armature voltage and field control – testing of DC machines - brake test, Swinburne's method – principle of regenerative or Hopkinson's method - retardation test -- separation of losses.

UNIT-IV:

Single-phase Transformers

Types and constructional details - principle of operation - emf equation - operation on no load and on load – lagging, leading and unity power factors loads - phasor diagrams of transformers – equivalent circuit – regulation – losses and efficiency – effect of variation of frequency and supply voltage on losses – All day efficiency.

UNIT-V

Single-phase Transformers Testing

Tests on single phase transformers – open circuit and short circuit tests – Sumpner's test – separation of losses – parallel operation with equal voltage ratios – auto transformer - equivalent circuit – comparison with two winding transformers.

UNIT-VI

3-Phase Transformers

Polyphase connections - Y/Y, Y/ Δ , Δ /Y, Δ / Δ and open Δ -- Third harmonics in phase voltages - three winding transformers: determination of Z_p , Z_s and Z_t -- transients in switching - off load and on load tap changers -- Scott connection.

Learning outcomes:

- Able to assimilate the concepts of electromechanical energy conversion.
- Able to mitigate the ill-effects of armature reaction and improve commutation in dc machines.
- Able to understand the torque production mechanism and control the speed of dc motors.
- Able to analyze the performance of single phase transformers.
- Able to predetermine regulation, losses and efficiency of single phase transformers.
- Able to parallel transformers, control voltages with tap changing methods and achieve three-phase to two-phase transformation.

Text Books:

1. Electrical Machines – P.S. Bhimbra, Khanna Publishers
2. Electric Machinery by A.E.Fitzgerald, Charles Kingsley, Stephen D. Umans, TMH

Reference Books:

1. Electrical Machines by D. P. Kothari, I. J. Nagarth, McGraw Hill Publications, 4th edition
2. Electrical Machines by R.K. Rajput, Lakshmi publications, 5th edition.
3. Electrical Machinery by Abijith Chakrabarti and Sudhita Debnath, McGraw Hill education 2015
4. Electrical Machinery Fundamentals by Stephen J Chapman McGraw Hill education 2010
5. Electric Machines by Mulukutla S. Sarma & Mukesh K. Pathak, CENGAGE Learning.
6. Theory & Performance of Electrical Machines by J.B. Gupta. S.K. Kataria & Sons

BASIC ELECTRONICS AND DEVICES**Preamble:**

This course introduces the concepts of semi-conductor physics and operation of various semi-conductor devices. Realization of rectifiers, amplifiers and oscillators using semi-conductor devices and their analysis is also introduced in this course.

Unit-I:**Objective:**

To learn the basics of semiconductor physics.

Review of Semi Conductor Physics: Insulators, Semi conductors, and Metals classification using Energy Band Diagrams, Mobility and Conductivity, Electrons and holes in Intrinsic Semi conductors, Extrinsic Semi Conductor, (P and N Type semiconductor) Hall effect, Generation and Recombination of Charges, Diffusion, Continuity Equation, Injected Minority Carriers, Law of Junction, Introduction to fermi level in Intrinsic, Extrinsic semi conductors with necessary mathematics

Outcome:

Students are able to understand the basic concepts of semiconductor physics, which are useful to understand the operation of diodes and transistors.

Unit-II:**Objective:**

To study the construction details, operation and characteristics of various semiconductor diodes.

Junction Diode Characteristics

Operation and characteristics of p-n junction diode. Current components in p-n diode, diode equation. Temperature dependence on V–I characteristic, diffusion capacitance and diode resistance (static and dynamic), energy band diagram of p-n diode.

Special Diodes: Avalanche and Zener break down, Zener characteristics, tunnel diode, characteristics with the help of energy band diagrams, Varactor diode, LED, PIN diode, Photo diode

Outcome:

Students are able to explain the operation and characteristics of PN junction diode and special diodes.

Unit-III:**Objective:**

To understand the operation and analysis of rectifiers with and without filters. Further study the operation of series and shunt regulators using zener diodes.

Rectifiers and Regulators

Half wave rectifier, ripple factor, full wave rectifier (with and without transformer), harmonic components in a rectifier circuit, inductor filter, capacitor filter, L-section filter, Π - section filter, and comparison of various filter circuits in terms of ripple factors. Simple circuit of a regulator using Zener diode. Types of regulators-series and shunt voltage regulators, over load voltage protection.

Outcome:

Ability to understand operation and design aspects of rectifiers and regulators.

Unit-IV:**Objective:**

To study the characteristics of different bipolar junction transistors and their biasing stabilization and compensation techniques. To analyze transistor amplifiers using h-parameters.

Transistors

Junction transistor, transistor current components, transistor as an amplifier and switch. Characteristics of transistor (CE, CB and CC configurations). Transistor biasing and thermal stabilization (to fixed bias, collector to base bias, self bias). Compensation against variation in base emitter voltage and collector current. Thermal runaway. Hybrid model of transistor. Analysis of transistor amplifier using h-parameters

Outcome:

Students are able to understand the characteristics of various transistor configurations. They become familiar with different biasing, stabilization and compensation techniques used in transistor circuits.

Unit- V:**Objective:**

To understand the basics of FET,Thyristors, Power IGBTs and Power MOSFETs.

Power semiconductor devices

Principle of operation and characteristics of Thyristors, Silicon control rectifiers, power IGBT and power MOSFET their ratings. Comparison of power devices.

FET: JFET Characteristics (Qualitative explanation), MOFET Characteristics–static and Transfer (enhancement and depletion mode), low frequency model of FET, FET as an amplifier.

Outcome:

Students are able to understand the operation and characteristics of FET, Thyristors, Power IGBTs and Power MOSFETs.

Unit VI :**Objective:**

To understand the concepts of positive and negative feedbacks and their role in amplifiers and oscillators.

Amplifiers and oscillators

Feedback Amplifiers -classification, feedback concept, transfer gain and general characteristics of negative feedback amplifiers, effect of feedback on input and output resistances. Methods of analysis of feedback amplifiers.

Power Amplifiers – Classification, push-pull amplifiers, Introduction to harmonics (distortion factor).

Oscillators – Condition for oscillation, RC-phase shift oscillator. Wein bridge oscillator, Crystal oscillator. Frequency and amplitude stability of oscillators.

Outcome:

Students are able to understand the merits and demerits of positive and negative feedback and the role of feedback in oscillators and amplifiers.

TEXT BOOKS:

1. Electronic Devices and Circuits – J. Millman, C.C. Halkias, Tata Mc-Graw Hill

REFERENCE BOOKS:

1. Electronic Devices and Circuits by David A. Bell, Oxford University Press
2. Electronic Devices and Circuits – Salivahanan, Kumar, Vallavaraj, TATA McGraw Hill, Second Edition
3. Electronic Devices and Circuits – R.L. Boylestad and Louis Nashelsky, Pearson/Prentice Hall, 9th Edition, 2006

ELECTROMAGNETIC FIELDS

Preamble:

Electromagnetic fields are the pre-requisite for most of the subjects in the gamut of electrical engineering. The study of this subject enables students to understand and interpret the phenomenon pertinent to electrical engineering using microscopic quantities such as electric and magnetic field intensities, scalar and vector potentials.

Learning objectives:

- To study the production of electric field and potentials due to different configurations of static charges.
- To study the properties of conductors and dielectrics, calculate the capacitance of various configurations and understand the concept of conduction and convection current densities.
- To study the magnetic fields produced by currents in different configurations, application of ampere's law and the Maxwell's second and third equations.
- To study the magnetic force and torque through Lorentz force equation in magnetic field environment like conductors and other current loops.
- To develop the concept of self and mutual inductances and the energy stored.
- To study time varying and Maxwell's equations in different forms and Maxwell's fourth equation for the induced e.m.f.

UNIT – I Electrostatics:

Electrostatic Fields – Coulomb's Law – Electric Field Intensity (EFI) – EFI due to a line and a surface charge – Work done in moving a point charge in an electrostatic field – Electric Potential – Properties of potential function – Potential gradient – Gauss's law – Maxwell's first law, $\text{div}(\mathbf{D}) = \rho_v$ Laplace's and Poisson's equations and Solution of Laplace's equation in one variable.

UNIT – II Conductors – Dielectrics and Capacitance:

Electric dipole – Dipole moment – potential and EFI due to an electric dipole – Torque on an Electric dipole in an electric field – Behaviour of conductors in an electric field – Conductors and Insulators

Polarization – Boundary conditions between conduction to Dielectric and dielectric to dielectrics capacitance – capacitance of parallel plates, spherical and coaxial cables with composite dielectrics –Energy stored and energy density in a static electric field – Current density – conduction and Convection current densities – Ohm's law in point form – Equation of continuity

UNIT – III Magneto statics and Ampere's Law:

Static magnetic fields – Biot-Savart's law – Oesterd's experiment - Magnetic field intensity (MFI) – MFI due to a straight current carrying filament – MFI due to circular, square and solenoid current – Carrying wire – Relation between magnetic flux, magnetic flux density and MFI – Maxwell's second Equation, $\text{div}(\mathbf{B})=0$ –Ampere's circuital law and its applications viz. MFI due to an infinite sheet of current and a long filament carrying conductor – Point form of Ampere's circuital law –Field due to a circular loop, rectangular and square loops, Maxwell's third equation, $\text{Curl}(\mathbf{H})=\mathbf{J}$.

UNIT – IV Force in Magnetic fields:

Magnetic force - Moving charges in a Magnetic field – Lorentz force equation – force on a current element in a magnetic field – Force on a straight and a long current carrying conductor in a magnetic field – Force between two straight long and parallel current carrying conductors – Magnetic dipole and dipole moment – a differential current loop as a magnetic dipole – Torque on a current loop placed in a magnetic field.

UNIT – V Self and Mutual inductance:

Self and Mutual inductance – determination of self-inductance of a solenoid and toroid and mutual inductance between a straight long wire and a square loop wire in the same plane – energy stored and density in a magnetic field.

UNIT – VI Time Varying Fields:

Time varying fields – Faraday’s laws of electromagnetic induction – Its integral and point forms – Maxwell’s fourth equation, $\text{Curl}(\mathbf{E}) = -\partial\mathbf{B}/\partial t$ – Statically and Dynamically induced EMFs – Simple problems -Modification of Maxwell’s equations for time varying fields – Displacement current – Poynting Theorem and Poynting vector.

Learning outcomes:

- To Determine electric fields and potentials using Gauss’s law or solving Laplace’s or Poisson’s equations, for various electric charge distributions.
- To Calculate and design capacitance, energy stored in dielectrics.
- To Calculate the magnetic field intensity due to current, the application of Ampere’s law and the Maxwell’s second and third equations.
- To determine the magnetic forces and torque produced by currents in magnetic field
- To determine self and mutual inductances and the energy stored in the magnetic field.
- To calculate induced e.m.f., understand the concepts of displacement current and Poynting vector.

Text Books:

1. “Engineering Electromagnetics” by William H. Hayt & John. A. Buck Mc. Graw-Hill Companies, 7th Edition. 2006.

Reference Books:

1. “Principles of Electro Magnetics” by Sadiku, Oxford Publications, 4th edition
2. “Introduction to Electro Dynamics” by D J Griffiths, Prentice-Hall of India Pvt.Ltd, 2nd edition
3. “Electromagnetic Field Theory” by Yaduvir Singh, Pearson.
4. Fundamentals of Engineering Electromagnetics by Sunil Bhooshan, Oxford higher Education.

THERMAL AND HYDRO PRIME MOVERS

Part-A: Thermal prime movers

Course Objectives: To make the student understand the types of prime movers, which can be connected to generators for power production and should obtain the skills of performing the necessary calculations with respect to the functioning of the prime movers.

UNIT I:

Objectives: To make the student learn about the constructional features, operational details of various types of internal combustion engines through the details of several engine systems and the basic air standard cycles, that govern the engines. Further, the student shall be able to calculate the performance of different types of internal combustion engines.

I.C Engines: Classification, working principles – valve and port timing diagrams – air standard cycles – Engine systems line fuel injection, carburetion, ignition, cooling and lubrication – Engine performance evaluation.

UNIT II:

Objectives: To train the student in the aspects of steam formation and its utilities through the standard steam data tables and charts. To make the student correlate between the air standard cycles and the actual cycles that govern the steam turbines. To train the student to calculate the performance of steam turbines using velocity diagrams.

Properties of Steam and use of Steam Tables- T-S and H-S Diagrams. Analysis of Various Thermodynamic Processes undergone by Steam.

Vapor Power Cycles: Carnot Cycle-Rankine Cycle- Thermodynamic Variables Effecting Efficiency and output of Rankine Cycle-. Analysis of simple Rankine Cycle and Re-heat cycle

Steam Turbines: Schematic layout of steam power plant Classification of Steam Turbines- Impulse Turbine and Reaction Turbine- Compounding in Turbines- Velocity Diagrams for simple Impulse and Reaction Turbines- Work done & efficiency

UNIT III:

Objectives: To impart the knowledge of gas turbine fundamentals, the governing cycles and the methods to improve the efficiency of gas turbines.

Gas Turbines: Simple gas turbine plant-ideal cycle, closed cycle -open cycle-. Efficiency, Work ratio and optimum pressure ratio for simple gas turbine cycle. Actual cycle, analysis of simple cycles & cycles with inter cooling, reheating and Regeneration

Part-B: Hydro prime movers

UNIT IV:

Objectives: To teach the student about the fundamental of fluid dynamic equations and its applications fluid jets. To impart the knowledge of various types of pumps, their constructional features, working and performance.

IMPACT OF JETS AND PUMPS: Impulse momentum equation, Impact of Jet on stationary and moving vanes (flat and curved). Pumps: Types of pumps, Centrifugal pumps: Main components, Working principle, Multi stage pumps, Performance and characteristic curves

UNIT V:

Objectives: To make the student learn about the constructional features, operational details of various types of hydraulic turbines. Further, the student shall be able to calculate the performance of hydraulic turbines.

HYDRAULIC TURBINES: Classification of turbines; Working principle, Efficiency calculation and Design principles for Pelton Wheel, Francis and for Kaplan turbines; Governing of turbines; Performance and characteristic curves.

UNIT VI:

Objectives: To train the student in the areas of types of hydro electric power plants, estimation and calculation of different loads by considering various factors.

HYDRO POWER: Components of Hydro electric power plant: pumped storage systems, Estimation of water power potential; Estimation of load on turbines: load curve, load factor, capacity factor, utilization factor, diversity factor, load – duration curve, firm power, secondary power, prediction of load.

Text Books:

1. Thermal Engineering by Rajput, Lakshmi publications
2. Thermal engineering by M.L.Mathur and F.S.Mehta, Jain Brothers.
3. “Hydraulics & Fluid Mechanics”, P.N. Modi and S.M. Seth, TEXT BOOKS House, Delhi
4. “Fluid Mechanics & Hydraulic Machinery” A.K.Jain, , Khanna Publishers, Delhi.

Reference Books:

1. “Fluid Mechanics” by Victor.L.Streeter
2. “Introduction to Fluid Mechanics” Edward .J. Shaughnessy Jr.
3. “Fluid Mechanics & Its Applications”, Vijay Gupta, Santhosh.k.Gupta
4. “Fluid Mechanics & Fluid power Engineering, Dr D.S.Kumar
5. “Water Power Engineering” M.M Desumukh

II Year - I Semester

L	T	P	C
4	0	0	3

MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

(Common to all Branches)

Course Objectives:

- The Learning objectives of this paper is to understand the concept and nature of Managerial Economics and its relationship with other disciplines and also to understand the Concept of Demand and Demand forecasting, Production function, Input Output relationship, Cost-Output relationship and Cost-Volume-Profit Analysis.
- To understand the nature of markets, Methods of Pricing in the different market structures and to know the different forms of Business organization and the concept of Business Cycles.
- To learn different Accounting Systems, preparation of Financial Statement and uses of different tools for performance evaluation. Finally, it is also to understand the concept of Capital, Capital Budgeting and the techniques used to evaluate Capital Budgeting proposals.

Unit-I

Introduction to Managerial Economics and demand Analysis:

Definition of Managerial Economics –Scope of Managerial Economics and its relationship with other subjects –Concept of Demand, Types of Demand, Determinants of Demand-Demand schedule, Demand curve, Law of Demand and its limitations- Elasticity of Demand, Types of Elasticity of Demand and Measurement- Demand forecasting and Methods of forecasting, Concept of Supply and Law of Supply.

Unit – II:

Production and Cost Analyses:

Concept of Production function- Cobb-Douglas Production function- Leontief production function - Law of Variable proportions-Isoquants and Isocosts and choice of least cost factor combination-Concepts of Returns to scale and Economies of scale-Different cost concepts: opportunity costs, explicit and implicit costs- Fixed costs, Variable Costs and Total costs – Cost –Volume-Profit analysis-Determination of Breakeven point(simple problems)- Managerial significance and limitations of Breakeven point.

Unit – III:

Introduction to Markets, Theories of the Firm & Pricing Policies:

Market Structures: Perfect Competition, Monopoly, Monopolistic competition and Oligopoly – Features – Price and Output Determination – Managerial Theories of firm: Marris and Williamson’s models – other Methods of Pricing: Average cost pricing, Limit Pricing, Market Skimming Pricing, Internet Pricing: (Flat Rate Pricing, Usage sensitive pricing) and Priority Pricing.

Unit – IV:

Types of Business Organization and Business Cycles:

Features and Evaluation of Sole Trader, Partnership, Joint Stock Company – State/Public Enterprises and their forms – Business Cycles : Meaning and Features – Phases of a Business Cycle.

Unit – V:

Introduction to Accounting & Financing Analysis:

Introduction to Double Entry Systems – Preparation of Financial Statements-Analysis and Interpretation of Financial Statements-Ratio Analysis – Preparation of Funds flow and cash flow statements (Simple Problems)

Unit – VI:

Capital and Capital Budgeting: Capital Budgeting: Meaning of Capital-Capitalization-Meaning of Capital Budgeting-Time value of money- Methods of appraising Project profitability: Traditional Methods(pay back period, accounting rate of return) and modern methods(Discounted cash flow method, Net Present Value method, Internal Rate of Return Method and Profitability Index)

Course Outcome:

- *The Learner is equipped with the knowledge of estimating the Demand and demand elasticities for a product and the knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs.
- *One is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units.
- *The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis and to evaluate various investment project proposals with the help of capital budgeting techniques for decision making.

TEXT BOOKS

1. Dr. N. AppaRao, Dr. P. Vijay Kumar: ‘Managerial Economics and Financial Analysis’, Cengage Publications, New Delhi – 2011
2. Dr. A. R. Aryasri – Managerial Economics and Financial Analysis, TMH 2011
3. Prof. J.V.Prabhakararao, Prof. P. Venkatarao. ‘Managerial Economics and Financial Analysis’, Ravindra Publication.

REFERENCES:

1. Dr. B. Kuberudu and Dr. T. V. Ramana: Managerial Economics & Financial Analysis, Himalaya Publishing House, 2014.
2. V. Maheswari: Managerial Economics, Sultan Chand.2014
3. Suma Damodaran: Managerial Economics, Oxford 2011.
4. Vanitha Agarwal: Managerial Economics, Pearson Publications 2011.
5. Sanjay Dhameja: Financial Accounting for Managers, Pearson.
6. Maheswari: Financial Accounting, Vikas Publications.
7. S. A. Siddiqui & A. S. Siddiqui: Managerial Economics and Financial Analysis, New Age International Publishers, 2012
8. Ramesh Singh, Indian Economy, 7th Edn., TMH 2015
9. Pankaj Tandon A Text Book of Microeconomic Theory, Sage Publishers, 2015
10. Shailaja Gajjala and Usha Munipalle, Universities press, 2015

II Year – I SEMESTER

L	T	P	C
0	0	3	2

THERMAL AND HYDRO LAB

Course Objective: To impart practical knowledge on the performance evaluation methods of various internal combustion engines, flow measuring equipment and hydraulic turbines and pumps.

NOTE: TO CONDUCT A MINIMUM OF 12 EXPERIMENTS BY CONDUCTING A MINIMUM OF SIX FROM EACH SECTION.

SECTION A - THERMAL ENGINEERING LAB

1. I.C. Engines valve / port timing diagrams.
2. I.C. Engines performance test on 4 -stroke Diesel engine.
3. I.C. Engines performance test on 2-stroke petrol engine.
4. Evaluation of engine friction by conducting Morse test on 4-stroke multi cylinder petrol engine
5. Determination of FHP by retardation and motoring test on IC engine
6. I.C. Engines heat balance on petrol / Diesel engines.
7. Economical speed test of an IC engine
8. Study of boilers

SECTION B – HYDRAULIC MACHINES LAB

1. Impact of jets on Vanes.
2. Performance Test on Pelton Wheel.
3. Performance Test on Francis Turbine.
4. Performance Test on Kaplan Turbine.
5. Performance Test on Single Stage Centrifugal Pump.
6. Performance Test on Reciprocating Pump.
7. Calibration of Venturimeter.
8. Calibration of Orifice meter.
9. Determination of loss of head due to sudden contraction in a pipeline.

II Year – I SEMESTER

L	T	P	C
0	0	3	2

ELECTRICAL CIRCUITS LAB

Learning objectives:

To verify and demonstrate various theorems, locus diagrams, resonance and two port networks. To determine self and mutual inductance of a magnetic circuit, parameters of a given coil and measurement of 3-phase power.

Any 10 of the following experiments are to be conducted:

- 1) Verification of Thevenin's and Norton's Theorems
- 2) Verification of Superposition theorem and Maximum Power Transfer Theorem
- 3) Verification of Compensation Theorem
- 4) Verification of Reciprocity, Millmann's Theorems
- 5) Locus Diagrams of RL and RC Series Circuits
- 6) Series and Parallel Resonance
- 7) Determination of Self, Mutual Inductances and Coefficient of coupling
- 8) Z and Y Parameters
- 9) Transmission and hybrid parameters
- 10) Parameters of a choke coil.
- 11) Determination of cold and hot resistance of an electric lamp.
- 12) Measurement of 3-phase Power by two Wattmeter Method for unbalanced loads

Learning outcomes:

Able to apply various theorems, determination of self and mutual inductances, two port parameters of a given electric circuits. Able to draw locus diagrams. Waveforms and phasor diagram for lagging and leading networks.

ELECTRICAL MEASUREMENTS**Preamble:**

This course introduces principle of operation of basic analog and digital measuring instruments for measurement of current, voltage, power, energy etc. Measurement of resistance, inductance and capacitance by using bridge circuits will be discussed in detail. It is expected that student will be thorough with various measuring techniques that are required for an electrical engineer.

Learning Objectives:

- To study the principle of operation and working of different types of instruments. Measurement of voltage and current.
- To study the working principle of operation of different types of instruments for measurement of power and energy
- To understand the principle of operation and working of dc and ac potentiometers.
- To understand the principle of operation and working of various types of bridges for measurement of parameters –resistance, inductance, capacitance and frequency.
- To study the principle of operation and working of various types of magnetic measuring instruments.
- To study the applications of CRO for measurement of frequency, phase difference and hysteresis loop using Lissajous patterns

UNIT-I:**Measuring Instruments**

Classification – Deflecting, control and damping torques – Ammeters and Voltmeters – PMMC, moving iron type, dynamometer and electrostatic instruments – Expression for the deflecting torque and control torque – Errors and compensations– Extension of range using shunts and series resistance –CT and PT: Ratio and phase angle errors – Numerical problems..

UNIT –II:**Measurement of Power and Energy**

Single phase and three phase dynamometer wattmeter – LPF and UPF – Expression for deflecting and control torques – Extension of range of wattmeter using instrument transformers – Measurement of active and reactive powers in balanced and unbalanced systems – Type of P.F. Meters – Single phase and three phase dynamometer and moving iron type Single phase induction type energy meter – Driving and braking torques – errors and compensations –Testing by phantom loading using R.S.S. meter– Three phase energy meter – Maximum demand meters– Electrical resonance type frequency meter and Weston type synchro-scope.

UNIT – III:**Potentiometers**

Principle and operation of D.C. Crompton's potentiometer – Standardization – Measurement of unknown resistance – Current – Voltage.AC Potentiometers: polar and coordinate types – Standardization – Applications.

UNIT – IV:

Measurements of Parameters

Method of measuring low, medium and high resistance – Sensitivity of Wheat stone's bridge – Carey Foster's bridge– Kelvin's double bridge for measuring low resistance– Loss of charge method for measurement of high resistance – Megger– Measurement of earth resistance – Measurement of inductance – Quality Factor – Maxwell's bridge–Hay's bridge – Anderson's bridge–Measurement of capacitance and loss angle – DesautyBridge – Schering Bridge–Wagner's earthing device–Wien's bridge.

UNIT – V:

Magnetic Measurements

Ballistic galvanometer – Equation of motion – Flux meter – Constructional details– Determination of B–H Loop methods of reversals six point method – AC testing – Iron loss of bar samples– Core loss measurements by bridges and potentiometers.

UNIT – VI:

Digital Meters

Digital Voltmeter–Successive approximation – Measurement of phase difference – Frequency – Hysteresis loop using lissajious patterns in CRO – Ramp and integrating type– Digital frequency meter–Digital multimeter–Digital Tachometer.

Learning Outcomes:

- Able to choose right type of instrument for measurement of voltage and current for ac and dc.
- Able to choose right type of instrument for measurement of power and energy – able to calibrate energy meter by suitable method
- Able to calibrate ammeter and potentiometer.
- Able to select suitable bridge for measurement of electrical parameters
- Able to use the ballistic galvanometer and flux meter for magnetic measuring instruments
- Able to measure frequency and phase difference between signals using CRO. Able to use digital instruments in electrical measurements.

Text Books:

1. Electrical Measurements and measuring Instruments – by E.W. Golding and F.C.Widdis, fifth Edition, Wheeler Publishing.
2. Modern Electronic Instrumentation and Measurement Techniques – A.D. Helfrick and W.D. Cooper, PHI, 5th Edition, 2002.

Reference Books:

1. Electrical & Electronic Measurement & Instruments by A.K.Sawhney DhanpatRai & Co.Publications.
2. Electrical and Electronic Measurements and instrumentation by R.K.Rajput, S.Chand.
3. Electrical Measurements – by Buckingham and Price, Prentice – Hall
4. Electrical Measurements by Forest K. Harris. John Wiley and Sons
5. Electrical Measurements: Fundamentals, Concepts, Applications – by Reissland, M.U, New Age International (P) Limited, Publishers.
6. Electrical and Electronic Measurements –by G.K.Banerjee, PHI Learning Private Ltd, New Delhi–2012.

ELECTRICAL MACHINES – II

Preamble:

This course covers the topics on 3-phase induction motor, 1-phase induction motor and synchronous machines which have wide application in power systems. The main aim of the course is to provide a detailed analysis of operation and performance of 3-phase induction motor, 1-phase induction motor and synchronous machines. In addition, it also covers voltage regulation and parallel operation of synchronous generators.

Learning objectives:

- Understand the principle of operation and performance of 3-phase induction motor.
- Quantify the performance of induction motor and induction generator in terms of torque and slip.
- To understand the torque producing mechanism of a single phase induction motor.
- To understand the principle of emf generation, the effect of armature reaction and predetermination of voltage regulation in synchronous generators.
- To study parallel operation and control of real and reactive powers for synchronous generators.
- To understand the operation, performance and starting methods of synchronous motors.

UNIT-I

3-phase Induction Motors

Construction details of cage and wound rotor machines - production of rotating magnetic field - principle of operation - rotor emf and rotor frequency - rotor current and pf at standstill and during running conditions - rotor power input, rotor copper loss and mechanical power developed and their interrelationship – equivalent circuit – phasor diagram

UNIT-II

Characteristics, starting and testing methods of Induction Motors

Torque equation - expressions for maximum torque and starting torque - torque slip characteristic - double cage and deep bar rotors - crawling and cogging – speed control of induction motor with V/f method – no load and blocked rotor tests - circle diagram for predetermination of performance– methods of starting – starting current and torque calculations – induction generator operation (Qualitative treatment only)

UNIT – III:

Single Phase Motors

Single phase induction motors – Constructional features and equivalent circuit Problem of starting–Double revolving field theory–Starting methods, shaded pole motors, AC Series motor.

UNIT-IV:

Construction, Operation and Voltage Regulation of Synchronous generator

Constructional features of non-salient and salient pole type – Armature windings – Distributed and concentrated windings – Distribution– Pitch and winding factors –E.M.F equation–Improvements of waveform and armature reaction–Voltage regulation by synchronous impedance method– MMF method and Potier triangle method–Phasor diagrams– Two reaction analysis of salient pole machines and phasor diagram.

UNIT –V:

Parallel operation of synchronous generators

Parallel operation with infinite bus and other alternators – Synchronizing power – Load sharing – Control of real and reactive power– Numerical problems.

UNIT–VI:

Synchronous motor – operation, starting and performance

Synchronous Motor principle and theory of operation– Phasor diagram – Starting torque– Variation of current and power factor with excitation –Synchronous condenser – Mathematical analysis for power developed– Hunting and its suppression – Methods of starting – Applications.

Learning outcomes:

- Able to explain the operation and performance of three phase induction motor.
- Able to analyze the torque-speed relation, performance of induction motor and induction generator.
- Able to explain design procedure for transformers and three phase induction motors.
- Implement the starting of single phase induction motors.
- To perform winding design and predetermine the regulation of synchronous generators.
- Avoid hunting phenomenon, implement methods of starting and correction of power factor with synchronous motor.

Text Books:

1. Electrical Machines – P.S. Bhimbra, Khanna Publishers
2. Electric Machinery by A.E.Fitzgerald, Charles Kingsley, Stephen D. Umans, TMH

Reference Books:

1. Electrical Machines by D. P. Kothari, I. J. Nagrath, McGraw Hill Publications, 4th edition
2. Electrical Machines by R.K. Rajput, Lakshmi publications, 5th edition
3. Electrical Machinery by Abijith Chakrabarti and Sudhita Debnath, McGraw Hill education 2015
4. Electrical Machinery Fundamentals by Stephen J Chapman McGraw Hill education 2010
5. Electric Machines by Mulukutla S. Sarma & Mukesh K. Pathak, CENGAGE Learning.
6. Theory & Performance of Electrical Machines by J.B. Gupta. S.K. Kataria & Sons

SWITCHING THEORY AND LOGIC DESIGN**UNIT – I****REVIEW OF NUMBER SYSTEMS & CODES:**

- i) Representation of numbers of different radix, conversion from one radix to another radix, $r-1$'s complements and r 's complements of signed members, problem solving.
- ii) 4 bit codes, BCD, Excess-3, 2421, 84-2-1 9 's complement code etc.,
- iii) Logic operations and error detection & correction codes; Basic logic operations - NOT, OR, AND, Universal building blocks, EX-OR, EX-NOR - Gates, Standard SOP and POS, Forms, Gray code, error detection, error correction codes (parity checking, even parity, odd parity, Hamming code) NAND-NAND and NOR-NOR realizations.

UNIT – II**MINIMIZATION TECHNIQUES:**

Boolean theorems, principle of complementation & duality, De-morgan theorems, minimization of logic functions using Boolean theorems, minimization of switching functions using K-Map up to 6 variables, tabular minimization, problem solving (code-converters using K-Map etc..).

UNIT – III**COMBINATIONAL LOGIC CIRCUITS DESIGN :**

Design of Half adder, full adder, half subtractor, full subtractor, applications of full adders, 4-bit binary subtractor, adder-subtractor circuit, BCD adder circuit, Excess 3 adder circuit, look-a-head adder circuit, Design of decoder, demultiplexer, 7 segment decoder, higher order demultiplexing, encoder, multiplexer, higher order multiplexing, realization of Boolean functions using decoders and multiplexers, priority encoder, 4-bit digital comparator.

UNIT – IV**INTRODUCTION OF PLD's :**

PROM, PAL, PLA-Basics structures, realization of Boolean function with PLDs, programming tables of PLDs, merits & demerits of PROM, PAL, PLA comparison, realization of Boolean functions using PROM, PAL, PLA, programming tables of PROM, PAL, PLA.

UNIT – V**SEQUENTIAL CIRCUITS I:**

Classification of sequential circuits (synchronous and asynchronous); basic flip-flops, truth tables and excitation tables (nand RS latch, nor RS latch, RS flip-flop, JK flip-flop, T flip-flop, D flip-flop with reset and clear terminals). Conversion from one flip-flop to flip-flop. Design of ripple counters, design of synchronous counters, Johnson counter, ring counter. Design of registers - Buffer register, control buffer register, shift register, bi-directional shift register, universal shift register.

UNIT – VI

SEQUENTIAL CIRCUITS II :

Finite state machine; Analysis of clocked sequential circuits, state diagrams, state tables, reduction of state tables and state assignment, design procedures. Realization of circuits using various flip-flops. Meelay to Moore conversion and vice-versa.

TEXT BOOKS:

1. Switching Theory and Logic Design by Hill and Peterson Mc-Graw Hill TMH edition.
2. Switching Theory and Logic Design by A. Anand Kumar
3. Digital Design by Mano PHI.

REFERENCE BOOKS:

1. Modern Digital Electronics by RP Jain, TMH
2. Fundamentals of Logic Design by Charles H. Roth Jr, Jaico Publishers
3. Micro electronics by Milliman MH edition.

CONTROL SYSTEMS

Preamble :

This course introduces the elements of linear control systems and their analysis. Classical methods of design using frequency response. The state space approach for design, modeling and analysis of simple PD, PID controllers.

Learning Objectives:

- To learn the mathematical modeling of physical systems and to use block diagram algebra and signal flow graph to determine overall transfer function
- To analyze the time response of first and second order systems and improvement of performance by proportional plus derivative and proportional plus integral controllers
- To investigate the stability of closed loop systems using Routh's stability criterion and the analysis by root locus method.
- To present the Frequency Response approaches for the analysis of linear time invariant (LTI) systems using Bode plots, polar plots and Nyquist stability criterion.
- To discuss basic aspects of design and compensation of linear control systems using Bode plots.
- Ability to formulate state models and analyze the systems. To present the concepts of Controllability and Observability.

UNIT – I:

Mathematical Modeling Of Control Systems

Classification of control systems, Open Loop and closed loop control systems and their differences, Feed-Back Characteristics, transfer function of linear system, Differential equations of electrical networks, Translational and Rotational mechanical systems, Transfer Function of DC Servo motor - AC Servo motor- Synchro, transmitter and receiver - Block diagram algebra – Representation by Signal flow graph - Reduction using Mason's gain formula.

UNIT-II:

Time Response Analysis

Standard test signals - Time response of first and second order systems - Time domain specifications - Steady state errors and error constants – Effects of proportional derivative, proportional integral systems.

UNIT – III:

Stability and Rootlocus Technique

The concept of stability – Routh's stability criterion –limitations of Routh's stability –Root locus concept - construction of root loci (Simple problems)

UNIT-IV:

Frequency Response Analysis

Introduction to Frequency domain specifications-Bode diagrams- transfer function from the Bode Diagram-Phase margin and Gain margin-Stability Analysis from Bode Plots, Polar Plots, Nyquist Stability criterion.

UNIT–V:**Classical Control Design Techniques**

Lag, Lead, Lag-Lead compensators, design of compensators – using Bode plots.

UNIT–VI:**State Space Analysis Of LTI Systems**

Concepts of state, state variables and state model, state space representation of transfer function, Diagonalization- Solving the time invariant state equations- State Transition Matrix and it's Properties – Concepts of Controllability and Observability.

Learning Outcome:

- Ability to derive the transfer function of physical systems and determination of overall transfer function using block diagram algebra and signal flow graphs.
- Capability to determine time response specifications of second order systems and to determine error constants.
- Acquires the skill to analyze absolute and relative stability of LTI systems using Routh's stability criterion and the root locus method.
- Capable to analyze the stability of LTI systems using frequency response methods.
- Able to design Lag, Lead, Lag-Lead compensators to improve system performance from Bode diagrams.
- Ability to represent physical systems as state models and determine the response. Understanding the concepts of controllability and observability.

Text Books:

1. Control Systems principles and design, M.Gopal, Tata McGraw Hill education Pvt Ltd., 4th Edition.
2. Automatic control systems, Benjamin C.Kuo, Prentice Hall of India, 2nd Edition.

Reference Books:

1. Modern Control Engineering, Kotsuhiko Ogata, Prentice Hall of India.
2. Control Systems, ManikDhanesh N, Cengage publications.
3. Control Systems Engineering, I.J.Nagarath and M.Gopal, Newage International Publications, 5th Edition.
4. Control Systems Engineering, S.Palani, Tata McGraw Hill Publications.

POWER SYSTEMS-I**Preamble:**

Electrical Power plays significant role in day to day life of entire mankind. The aim of this course is to allow the students to understand the concepts of the generation and distribution of power along with economic aspects.

Learning objectives :

- To study the principle of operation of different components of a thermal power stations.
- To study the principle of operation of different components of a Nuclear power stations.
- To study the concepts of DC/AC distribution systems and voltage drop calculations.
- To study the constructional and operation of different components of an Air and Gas Insulated substations.
- To study the constructional details of different types of cables.
- To study different types of load curves and tariffs applicable to consumers.

UNIT-I Thermal Power Stations

Selection of site, general layout of a thermal power plant showing paths of coal, steam, water, air, ash and flue gasses, ash handling system, Brief description of components: Boilers, Super heaters, Economizers, electrostatic precipitators steam Turbines : Impulse and reaction turbines, Condensers, feed water circuit, Cooling towers and Chimney.

UNIT-II Nuclear Power Stations

Location of nuclear power plant, Working principle, Nuclear fission, Nuclear fuels, Nuclear chain reaction, nuclear reactor Components : Moderators, Control rods, Reflectors and Coolants. Types of Nuclear reactors and brief description of PWR, BWR and FBR. Radiation: Radiation hazards and Shielding, nuclear waste disposal.

UNIT-III Distribution Systems

Classification of distribution systems, design features of distribution systems, radial distribution, ring main distribution, voltage drop calculations: DC distributors for following cases - radial DC distributor fed at one end and at both ends (equal / unequal voltages), ring main distributor, stepped distributor and AC distribution, comparison of DC and AC distribution.

UNIT-IV Substations

Classification of substations:

Air Insulated Substations - Indoor & Outdoor substations, Substations layouts of 33/11 kV showing the location of all the substation equipment.

Bus bar arrangements in the Sub-Stations: Simple arrangements like single bus bar, sectionalized single bus bar, double bus bar with one and two circuit breakers, main and transfer bus bar system with relevant diagrams.

Gas Insulated Substations (GIS) – Advantages of Gas insulated substations, different types of gas insulated substations, single line diagram of gas insulated substations, constructional aspects of GIS, Installation and maintenance of GIS, Comparison of Air insulated substations and Gas insulated substations.

UNIT-V Underground Cables

Types of Cables, Construction, Types of insulating materials, Calculation of insulation resistance, stress in insulation and power factor of cable.

Capacitance of single and 3-Core belted Cables: Grading of Cables-Capacitance grading and Inter sheath grading.

UNIT-VI Economic Aspects of Power Generation & Tariff

Economic Aspects - Load curve, load duration and integrated load duration curves, discussion on economic aspects: connected load, maximum demand, demand factor, load factor, diversity factor, power capacity factor and plant use factor, Base and peak load plants.

Tariff Methods- Costs of Generation and their division into Fixed, Semi-fixed and Running Costs, Desirable Characteristics of a Tariff Method, Tariff Methods: Simple rate, Flat Rate, Block-Rate, two-part, three-part, and power factor tariff methods.

Learning Outcomes:

- Students are able to identify the different components of thermal power plants.
- Students are able to identify the different components of nuclear Power plants.
- Students are able to distinguish between AC/DC distribution systems and also estimate voltage drops of distribution systems.
- Students are able to identify the different components of air and gas insulated substations.
- Students are able to identify single core and multi core cables with different insulating materials.
- Students are able to analyze the different economic factors of power generation and tariffs.

Text Books:

1. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S.Bhatnagar and A. Chakrabarti, Dhanpat Rai & Co. Pvt. Ltd.
2. Generation, Distribution and Utilization of Electric Energy by C.L.Wadhawa New age International (P) Limited, Publishers.

Reference Books:

1. Electrical Power Distribution Systems by - V. Kamaraju, Tata McGraw Hill, New Delhi.
2. Elements of Electrical Power Station Design by – M V Deshpande, PHI, New Delhi.

MANAGEMENT SCIENCE

Course Objectives:

***To familiarize with the process of management and to provide basic insight into select contemporary management practices**

***To provide conceptual knowledge on functional management and strategic management.**

Unit I

Introduction to Management: Concept –nature and importance of Management –Generic Functions of Management – Evaluation of Management thought- Theories of Motivation – Decision making process-Designing organization structure- Principles of organization – Organizational typology- International Management: Global Leadership and Organizational behavior Effectiveness(GLOBE) structure

Unit II

Operations Management: Principles and Types of Management – Work study- Statistical Quality Control- Control charts (P-chart, R-chart, and C-chart) Simple problems- Material Management: Need for Inventory control- EOQ, ABC analysis (simple problems) and Types of ABC analysis (HML, SDE, VED, and FSN analysis).

Unit III

Functional Management: Concept of HRM, HRD and PMIR- Functions of HR Manager- Wage payment plans(Simple Problems) – Job Evaluation and Merit Rating - Marketing Management- Functions of Marketing – Marketing strategies based on product Life Cycle, Channels of distributions. Operationlizing change through performance management.

Unit IV

Project Management: (PERT/CPM): Development of Network – Difference between PERT and CPM Identifying Critical Path- Probability- Project Crashing (Simple Problems)

Unit V

Strategic Management: Vision, Mission, Goals, Strategy – Elements of Corporate Planning Process – Environmental Scanning – SWOT analysis- Steps in Strategy Formulation and Implementation, Generic Strategy Alternatives. Global strategies, theories of Multinational Companies.

Unit VI

Contemporary Management Practice: Basic concepts of MIS, MRP, Justin- Time(JIT) system, Total Quality Management(TQM), Six sigma and Capability Maturity Model(CMM) Levies, Supply Chain Management , Enterprise Resource Planning (ERP), Business Process outsourcing (BPO), Business process Re-engineering and Bench Marking, Balanced Score Card.

Course Outcome:

- *After completion of the Course the student will acquire the knowledge on management functions, global leadership and organizational behavior.
- *Will familiarize with the concepts of functional management project management and strategic management.

References:**Text Books**

1. Dr. P. Vijaya Kumar & Dr. N. Appa Rao, '*Management Science*' Cengage, Delhi, 2012.
2. Dr. A. R. Aryasri, '*Management Science*' TMH 2011.

References

1. Koontz & Weihrich: '*Essentials of management*' TMH 2011
2. Seth & Rastogi: *Global Management Systems*, Cengage learning , Delhi, 2011
3. Robbins: *Organizational Behaviour*, Pearson publications, 2011
4. Kanishka Bedi: *Production & Operations Management*, Oxford Publications, 2011
5. Philip Kotler & Armstrong: *Principles of Marketing*, Pearson publications
6. Biswajit Patnaik: *Human Resource Management*, PHI, 2011
7. Hitt and Vijaya Kumar: *Starategic Management*, Cengage learning
8. Prem Chadha: *Performance Management*, Trinity Press(An imprint of Laxmi Publications Pvt. Ltd.) Delhi 2015.
9. Anil Bhat& Arya Kumar : *Principles of Management*, Oxford University Press, New Delhi, 2015.

ELECTRICAL MACHINES – I LABORATORY

Learning objectives:

- To plot the magnetizing characteristics of DC shunt generator and understand the mechanism of self-excitation.
- To control the speed of the DC motors.
- Determine and predetermine the performance of DC machines.
- To predetermine the efficiency and regulation of transformers and assess their performance.

Any 10 of the following experiments are to be conducted

1. Magnetization characteristics of DC shunt generator. Determination of critical field resistance and critical speed.
2. Brake test on DC shunt motor. Determination of performance curves.
3. Hopkinson's test on DC shunt machines. Predetermination of efficiency.
4. Swinburne's test and Predetermination of efficiencies as Generator and Motor.
5. Speed control of DC shunt motor by Field and armature Control.
6. Retardation test on DC shunt motor. Determination of losses at rated speed.
7. Separation of losses in DC shunts motor.
8. Oc& SC test on single phase transformer.
9. Sumpner's test on single phase transformer.
10. Scott connection of transformers
11. Parallel operation of Single phase Transformers
12. Separation of core losses of a single phase transformer
13. Heat run test on a bank of 3 Nos. of single phase Delta connected transformers

Learning outcomes:

- To determine and predetermine the performance of DC machines and Transformers.
- To control the speed of DC motor.
- To achieve three phase to two phase transformation.

ELECTRONIC DEVICES AND CIRCUITS LAB

Note: The students are required to perform the experiment to obtain the V-I characteristics and to determine the relevant parameters from the obtained graphs.

Electronic Workshop Practice:

1. Identification, Specifications, Testing of R, L, C Components (Colour Codes), Potentiometers, Coils, Gang Condensers, Relays, Bread Boards.
2. Identification, Specifications and Testing of active devices, Diodes, BJTs, JFETs, LEDs, LCDs, SCR, UJT.
3. Soldering Practice- Simple circuits using active and passive components.
4. Study and operation of Ammeters, Voltmeters, Transformers, Analog and Digital Multimeter, Function Generator, Regulated Power Supply and CRO.

List of Experiments: (Minimum of Ten Experiments has to be performed)

1. P-N Junction Diode Characteristics
Part A: Germanium Diode (Forward bias & Reverse bias)
Part B: Silicon Diode (Forward Bias only)
2. Zener Diode Characteristics
Part A: V-I Characteristics
Part B: Zener Diode as Voltage Regulator
3. Rectifiers (without and with c-filter)
Part A: Half-wave Rectifier
Part B: Full-wave Rectifier
4. BJT Characteristics (CE Configuration)
Part A: Input Characteristics
Part B: Output Characteristics
5. FET Characteristics (CS Configuration)
Part A: Drain Characteristics
Part B: Transfer Characteristics
6. SCR Characteristics
7. UJT Characteristics
8. Transistor Biasing
9. CRO Operation and its Measurements
10. BJT-CE Amplifier
11. Emitter Follower-CC Amplifier

12. FET-CS Amplifier

Equipment required:

1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. Analog/Digital Function Generators
4. Digital Multimeters
5. Decade Résistance Boxes/Rheostats
6. Decade Capacitance Boxes
7. Ammeters (Analog or Digital)
8. Voltmeters (Analog or Digital)
9. Active & Passive Electronic Components

POWER SYSTEMS-II**Preamble:**

This course is an extension of power systems-I course. It deals with basic theory of transmission lines modeling and their performance analysis. Transient in power system, improvement of power factor and voltage control are discussed in detail. It is important for the student to understand the mechanical design aspects of transmission lines, cables, insulators. These aspects are also covered in detail in this course.

Learning Objectives:

- To compute inductance/capacitance of transmission lines and to understand the concepts of GMD/GMR.
- To study the short and medium length transmission lines, their models and performance.
- To study the performance and modeling of long transmission lines.
- To study the effect of travelling waves on transmission lines.
- To study the factors affecting the performance of transmission lines and power factor improvement methods.
- To discuss sag and tension computation of transmission lines as well as to study the performance of overhead insulators.

UNIT-I:**Transmission Line Parameters**

Conductor materials - Types of conductors – Calculation of resistance for solid conductors – Calculation of inductance for single phase and three phase– Single and double circuit lines– Concept of GMR and GMD–Symmetrical and asymmetrical conductor configuration with and without transposition–Bundled conductors-Numerical Problems–Calculation of capacitance for 2 wire and 3 wire systems – Effect of ground on capacitance – Capacitance calculations for symmetrical and asymmetrical single and three phase–Single and double circuit lines- Bundled conductors–Numerical Problems.

UNIT-II:**Performance of Short and Medium Length Transmission Lines**

Classification of Transmission Lines – Short, medium, long line and their model representations –Nominal-T–Nominal-Pie and A, B, C, D Constants for symmetrical and Asymmetrical Networks– Numerical Problems– Mathematical Solutions to estimate regulation and efficiency of all types of lines – Numerical Problems.

UNIT-III:**Performance of Long Transmission Lines**

Long Transmission Line–Rigorous Solution – Evaluation of A,B,C,D Constants– Interpretation of the Long Line Equations, regulation and efficiency– Incident, Reflected and Refracted Waves –Surge Impedance and SIL of Long Lines–Wave Length and Velocity of Propagation of Waves – Representation of Long Lines – Equivalent-T and Equivalent Pie network models (Numerical Problems).

UNIT – IV:

Power System Transients

Types of System Transients – Travelling or Propagation of Surges – Attenuation–Distortion– Reflection and Refraction Coefficients – Termination of lines with different types of conditions – Open Circuited Line–Short Circuited Line – T-Junction– Lumped Reactive Junctions.

UNIT–V:

Various Factors governing the Performance of Transmission line

Skin and Proximity effects – Description and effect on Resistance of Solid Conductors – Ferranti effect – Charging Current –Shunt Compensation –Corona – Description of the phenomenon–Factors affecting corona–Critical voltages and power loss – Radio Interference.

UNIT–VI:

Sag and Tension Calculations and Overhead Line Insulators

Sag and Tension calculations with equal and unequal heights of towers–Effect of Wind and Ice on weight of Conductor–Numerical Problems – Stringing chart and sag template and its applications–Types of Insulators – String efficiency and Methods for improvement– Numerical Problems – Voltage distribution–Calculation of string efficiency–Capacitance grading and Static Shielding.

Learning Outcomes:

- Able to understand parameters of various types of transmission lines during different operating conditions.
- Able to understand the performance of short and medium transmission lines.
- Student will be able to understand travelling waves on transmission lines.
- Will be able to understand various factors related to charged transmission lines.
- Will be able to understand sag/tension of transmission lines and performance of line insulators.

Text Books:

1. Electrical power systems – by C.L.Wadhwa, New Age International (P) Limited, Publishers, 1998.
2. Modern Power System Analysis by I.J.Nagarath and D.P.Kothari, Tata McGraw Hill, 2nd Edition

Reference Books:

1. Power system Analysis–by John J Grainger William D Stevenson, TMC Companies, 4th edition
2. Power System Analysis and Design by B.R.Gupta, Wheeler Publishing.
3. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S.BhatnagarA.Chakrabarthy, DhanpatRai& Co Pvt. Ltd.
4. Electrical Power Systems by P.S.R. Murthy, B.S.Publications.

RENEWABLE ENERGY SOURCES

Preamble:

This course gives a flavor of renewable sources and systems to the students. It introduces solar energy its radiation, collection, storage and its applications. This covers generation, design, efficiency and characteristics of various renewable energy sources including solar, wind, hydro, biomass, fuel cells and geothermal systems.

Learning Objectives:

- To study the solar radiation data, extraterrestrial radiation, radiation on earth's surface.
- To study solar thermal collections.
- To study solar photo voltaic systems.
- To study maximum power point techniques in solar pv and wind energy.
- To study wind energy conversion systems, Betz coefficient, tip speed ratio.
- To study basic principle and working of hydro, tidal, biomass, fuel cell and geothermal systems.

UNIT-I:

Fundamentals of Energy Systems and Solar energy

Energy conservation principle – Energy scenario (world and India) – various forms of renewable energy - Solar radiation: Outside earth's atmosphere – Earth surface – Analysis of solar radiation data – Geometry – Radiation on tilted surfaces – Numerical problems.

UNIT-II:

Solar Thermal Systems

Liquid flat plate collectors: Performance analysis –Transmissivity– Absorptivity product collector efficiency factor – Collector heat removal factor – Numerical problems. Introduction to solar air heaters – Concentrating collectors, solar pond and solar still – solar thermal plants.

UNIT-III:

Solar Photovoltaic Systems

Solar photovoltaic cell, module, array – construction – Efficiency of solar cells – Developing technologies – Cell I-V characteristics – Equivalent circuit of solar cell – Series resistance – Shunt resistance – Applications and systems – Balance of system components - System design: storage sizing – PV system sizing – Maximum power point techniques: Perturb and observe (P&O) technique – Hill climbing technique.

UNIT-IV:

Wind Energy

Sources of wind energy - Wind patterns – Types of turbines –Horizontal axis and vertical axis machines - Kinetic energy of wind – Betz coefficient – Tip-speed ratio – Efficiency – Power output of wind turbine – Selection of generator(synchronous, induction) – Maximum power point tracking – wind farms – Power generation for utility grids.

UNIT-V:

Hydro and Tidal power systems

Basic working principle – Classification of hydro systems: Large, small, micro – measurement of head and flow – Energy equation – Types of turbines – Numerical problems. Tidal power – Basics – Kinetic energy equation – Turbines for tidal power - Numerical problems – Wave power – Basics – Kinetic energy equation – Wave power devices – Linear generators.

UNIT-VI:

Biomass, fuel cells and geothermal systems

Biomass Energy: Fuel classification – Pyrolysis – Direct combustion of heat – Different digesters and sizing.

Fuel cell: Classification of fuel for fuel cells – Fuel cell voltage– Efficiency – V-I characteristics.

Geothermal: Classification – Dry rock and hot aquifer – Energy analysis – Geothermal based electric power generation

Learning Outcomes:

Student should be able to

- Analyze solar radiation data, extraterrestrial radiation, and radiation on earth's surface.
- Design solar thermal collectors, solar thermal plants.
- Design solar photo voltaic systems.
- Develop maximum power point techniques in solar PV and wind energy systems.
- Explain wind energy conversion systems, wind generators, power generation.
- Explain basic principle and working of hydro, tidal, biomass, fuel cell and geothermal systems.

Text Books:

1. Solar Energy: Principles of Thermal Collection and Storage, S. P. Sukhatme and J. K. Nayak, TMH, New Delhi, 3rd Edition.
2. Renewable Energy Resources, John Twidell and Tony Weir, Taylor and Francis - second edition,2013.

Reference Books:

1. Energy Science: Principles, Technologies and Impacts, John Andrews and Nick Jelly, Oxford University Press.
2. Renewable Energy- Edited by Godfrey Boyle-oxford university.press,3rd edition,2013.
3. Handbook of renewable technology Ahmed and Zobaa, Ramesh C Bansal, World scientific, Singapore.
4. Renewable Energy Technologies /Ramesh & Kumar /Narosa.
5. Renewable energy technologies – A practical guide for beginners – Chetong Singh Solanki, PHI.
6. Non conventional energy source –B.H.khan- TMH-2nd edition.

SIGNALS & SYSTEMS

OBJECTIVES:

The main objectives of this course are given below:

- To introduce the terminology of signals and systems.
- To introduce Fourier tools through the analogy between vectors and signals.
- To introduce the concept of sampling and reconstruction of signals.
- To analyze the linear systems in time and frequency domains.
- To study z-transform as mathematical tool to analyze discrete-time signals and systems.

UNIT- I: INTRODUCTION: Definition of Signals and Systems, Classification of Signals, Classification of Systems, Operations on signals: time-shifting, time-scaling, amplitude-shifting, amplitude-scaling. Problems on classification and characteristics of Signals and Systems. Complex exponential and sinusoidal signals, Singularity functions and related functions: impulse function, step function signum function and ramp function. Analogy between vectors and signals, orthogonal signal space, Signal approximation using orthogonal functions, Mean square error, closed or complete set of orthogonal functions, Orthogonality in complex functions.

UNIT –II: FOURIER SERIES AND FOURIER TRANSFORM:

Fourier series representation of continuous time periodic signals, properties of Fourier series, Dirichlet's conditions, Trigonometric Fourier series and Exponential Fourier series, Complex Fourier spectrum. Deriving Fourier transform from Fourier series, Fourier transform of arbitrary signal, Fourier transform of standard signals, Fourier transform of periodic signals, properties of Fourier transforms, Fourier transforms involving impulse function and Signum function. Introduction to Hilbert Transform.

UNIT –III: SAMPLING THEOREM – Graphical and analytical proof for Band Limited Signals, impulse sampling, Natural and Flat top Sampling, Reconstruction of signal from its samples, effect of under sampling – Aliasing, Introduction to Band Pass sampling.

UNIT-IV: ANALYSIS OF LINEAR SYSTEMS: Linear system, impulse response, Response of a linear system, Linear time invariant (LTI) system, Linear time variant (LTV) system, Concept of convolution in time domain and frequency domain, Graphical representation of convolution, Transfer function of a LTI system. Filter characteristics of linear systems. Distortion less transmission through a system, Signal bandwidth, system bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Poly-Wiener criterion for physical realization, relationship between bandwidth and rise time.

Cross-correlation and auto-correlation of functions, properties of correlation function, Energy density spectrum, Parseval's theorem, Power density spectrum, Relation between auto correlation function and energy/power spectral density function. Relation between convolution and correlation, Detection of periodic signals in the presence of noise by correlation, Extraction of signal from noise by filtering.

UNIT –V: LAPLACE TRANSFORMS : Review of Laplace transforms, Partial fraction expansion, Inverse Laplace transform, Concept of region of convergence (ROC) for Laplace transforms, constraints on ROC for various classes of signals, Properties of L.T's, Relation

between L.T's, and F.T. of a signal. Laplace transform of certain signals using waveform synthesis.

UNIT –VI: Z–TRANSFORMS : Fundamental difference between continuous-time and discrete-time signals, discrete time signal representation using complex exponential and sinusoidal components, Periodicity of discrete time using complex exponential signal, Concept of Z- Transform of a discrete sequence. Distinction between Laplace, Fourier and Z transforms. Region of convergence in Z-Transform, constraints on ROC for various classes of signals, Inverse Z-transform, properties of Z-transforms.

TEXT BOOKS:

1. Signals, Systems & Communications - B.P. Lathi, BS Publications, 2003.
2. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawab, PHI, 2nd Edn.
3. Signals & Systems- Narayan Iyer and K Satya Prasad, Cenage Pub.

REFERENCE BOOKS:

1. Signals & Systems - Simon Haykin and Van Veen, Wiley, 2nd Edition.
2. Principles of Linear Systems and Signals – BP Lathi, Oxford University Press, 2015
3. Signals and Systems – K Raja Rajeswari, B VisweswaraRao, PHI, 2009
4. Fundamentals of Signals and Systems- Michel J. Robert, MGH International Edition, 2008.
5. Signals and Systems – T K Rawat , Oxford University press, 2011

OUTCOMES:

At the end of this course the student will able to:

- Characterize the signals and systems and principles of vector spaces, Concept of orthogonality.
- Analyze the continuous-time signals and continuous-time systems using Fourier series, Fourier transform and Laplace transform.
- Apply sampling theorem to convert continuous-time signals to discrete-time signal and reconstruct back.
- Understand the relationships among the various representations of LTI systems
- Understand the Concepts of convolution, correlation, Energy and Power density spectrum and their relationships.
- Apply z-transform to analyze discrete-time signals and systems.

PULSE AND DIGITAL CIRCUITS OBJECTIVES

The student will be made

- To understand the concept of wave shaping circuits, Switching Characteristics of diode and transistor.
- To study the design and analysis of various Multivibrators.
- To understand the functioning of different types of time-base Generators.
- To learn the working of logic families & Sampling Gates.

UNIT I

LINEAR WAVESHAPING: High pass, low pass RC circuits, their response for sinusoidal, step, pulse, square, ramp and exponential inputs. RC network as differentiator and integrator; Attenuators, its applications in CRO probe, RL and RLC circuits and their response for step input, Ringing circuit.

UNIT II

NON-LINEAR WAVE SHAPING : Diode clippers, Transistor clippers, clipping at two independent levels, Transfer characteristics of clippers, Emitter coupled clipper; Clamping operation, clamping circuits using diode with different inputs, Clamping circuit theorem, practical clamping circuits, effect of diode characteristics on clamping voltage, Transfer characteristics of clampers.

UNIT III

SWITCHING CHARACTERISTICS OF DEVICES : Diode as a switch, piecewise linear diode characteristics, Design and analysis of Transistor as a switch, Break down voltage consideration of transistor, saturation parameters of Transistor and their variation with temperature, Design of transistor switch, transistor-switching times.

Bistable Multivibrator: Analysis And Design of Fixed Bias, Self Bias Bistable Multi Vibrator, Collector Catching Diodes, Commutating Capacitors, Triggering of Binary Circuits, Emitter Coupled Bistable Multivibrator (Schmitt Trigger).

UNIT IV

Monostable Multivibrator: Analysis and Design of Collector Coupled Monostable Multi vibrator, Triggering of Monostable Multivibrator, Applications of Monostable Multivibrator.

Astable Multivibrator: Analysis and Design of Collector Coupled Astable Multivibrator, Application of Astable Multivibrator as a Voltage to Frequency Converter.

UNIT V

VOLTAGE TIME BASE GENERATORS:

General features of a time base signal, Methods of generating time base waveform Exponential Sweep Circuits, Negative Resistance Switches, basic principles in Miller and Bootstrap time base generators, Transistor Miller time base generator, Transistor Bootstrap time base generator.

UNIT VI

LOGIC FAMILIES & SAMPLING GATES:

LOGIC FAMILIES: Diode Logic, Transistor Logic, Diode-Transistor Logic, Transistor-Transistor Logic, Emitter Coupled Logic, AOI Logic, Comparison of Logic Families.

SAMPLING GATES: Basic Operating Principles of Sampling Gates, Diode Unidirectional Sampling Gate and Two-Diode Bi-Directional Sampling Gate, Four-Diode gates, Six-Diode Gates, Reduction of Pedestal in Sampling Gates, Applications of Sampling Gates.

TEXT BOOKS:

1. Pulse, Digital and Switching Waveforms - J. Millman and H. Taub, McGraw-Hill
2. Pulse and Digital Circuits – A. Anand Kumar, PHI, 2005

REFERENCES :

1. Pulse, Digital and Switching Waveforms - J. Millman and H. Taub, Mothiki S Prakash Rao McGraw-Hill, Second Edition, 2007.
2. Solid State Pulse circuits - David A. Bell, PHI, 4th Edn., 2002
3. Pulse & Digital Circuits by Venkata Rao, K, Ramasudha K, Manmadha Rao, G., Pearson, 2010

OUTCOMES

After going through this course the student will be able to

- Design linear and non-linear wave shaping circuits.
- Apply the fundamental concepts of wave shaping for various switching and signal generating circuits.
- Design different multivibrators and time base generators.
- Utilize the non sinusoidal signals in many experimental research areas.

POWER ELECTRONICS**Preamble:**

The usage of power electronics in day to day life has increased in recent years. It is important for student to understand the fundamental principles behind all these converters. This course covers characteristics of semiconductor devices, ac/dc, dc/dc, ac/ac and dc/ac converters. The importance of using pulse width modulated techniques to obtain high quality power supply (dc/ac converter) is also discussed in detail in this course.

Learning Objectives:

- To study the characteristics of various power semiconductor devices and to design firing circuits for SCR.
- To understand the operation of single phase full-wave converters and analyze harmonics in the input current.
- To study the operation of three phase full-wave converters.
- To understand the operation of different types of DC-DC converters.
- To understand the operation of inverters and application of PWM techniques for voltage control and harmonic mitigation.
- To analyze the operation of AC-AC regulators.

UNIT-I:**Power Semi-Conductor Devices**

Thyristors–Silicon controlled rectifiers (SCR's) –Characteristics of power MOSFET and power IGBT– Basic theory of operation of SCR–Static characteristics– Turn on and turn off methods–Dynamic characteristics of SCR– Snubber circuit design– Basic requirements of gating circuits for SCR, IGBT and MOSFET.

UNIT-II:**AC-DC Single-Phase Converters**

1-phase half wave controlled rectifiers – R load and RL load with and without freewheeling diode – 1-phase full wave controlled rectifiers – center tapped configuration and bridge configuration- R load and RL load with and without freewheeling diode – continuous and discontinuous conduction – Effect of source inductance in 1-phase fully controlled bridge rectifier with continuous conduction.

UNIT-III:**AC-DC 3-Phase Converters**

3-phase half wave and Full wave uncontrolled rectifier – 3-phase half wave controlled rectifier with R and RL load – 3-phase fully controlled rectifier with R and RL load – 3-phase semi controlled rectifier with R and RL load.

UNIT-IV:**DC-DC Converters**

Analysis of Buck, boost and buck, buck-boost converters in Continuous Conduction Mode (CCM) and Discontinuous Conduction Modes (DCM) – Output voltage equations using volt-sec balance in CCM & DCM output voltage ripple & inductor current, ripple for CCM only – Principle operation of forward and fly back converters in CCM.

UNIT – V:

DC–AC Converters

1- phase halfbridge and full bridge inverters with R and RL loads – 3-phase square wave inverters – 120° conduction and 180° conduction modes of operation – PWM inverters – Quasi-square wave pulse width modulation – Sinusoidal pulse width modulation – Prevention of shoot through fault in Voltage Source Inverter (VSI) – Current Source Inverter (CSI) – Introduction to Auto Sequential Commutated Current Source Inverter (ASCCSI) .

UNIT – VI:

AC – AC Regulators.

Static V-I characteristics of TRIAC and modes of operation – 1-phase AC-AC regulator phase angle control and integrated cycle control with R and RL load – For continuous and discontinuous conduction- 3-Phase AC-AC regulators with R load only – Transformer tap changing using antiparallel Thyristors.

Learning Outcomes:

Student should be able to

- Explain the characteristics of various power semiconductor devices and analyze the static and dynamic characteristics of SCR's.
- Design firing circuits for SCR.
- Explain the operation of single phase full-wave converters and analyze harmonics in the input current.
- Explain the operation of three phase full-wave converters.
- Analyze the operation of different types of DC-DC converters.
- Explain the operation of inverters and application of PWM techniques for voltage control and harmonic mitigation.
- Analyze the operation of AC-AC regulators.

Text Books:

1. Power Electronics: Circuits, Devices and Applications – by M. H. Rashid, Prentice Hall of India, 2nd edition, 1998
2. Power Electronics: Essentials & Applications by L.Umanand, Wiley, Pvt. Limited, India, 2009

Reference Books:

1. Elements of Power Electronics–Philip T.Krein.oxford.
2. Power Electronics – by P.S.Bhimbra, Khanna Publishers.
3. Thyristorised Power Controllers – by G. K. Dubey, S. R. Doradla, A. Joshi and R. M. K.Sinha, New Age International (P) Limited Publishers, 1996.
4. Power Electronics handbook by Muhammad H.Rashid, Elsevier.
5. Power Electronics: converters, applications & design -by Nedmohan, Tore M. Undeland, Robbins by Wiley India Pvt. Ltd.
6. Power Converter Circuits -by William Shepherd, Li zhang, CRC Taylor & Francis Group.

ELECTRICAL MACHINES – II LABORATORY

Learning objectives:

- To control the speed of three phase induction motors.
- To determine /predetermine the performance three phase and single phase induction motors.
- To improve the power factor of single phase induction motor .
- To predetermine the regulation of three–phase alternator by various methods, find X_d/X_q ratio of alternator and asses the performance of three–phase synchronous motor.

The following experiments are required to be conducted as compulsory experiments:

1. Brake test on three phase Induction Motor
2. No–load & Blocked rotor tests on three phase Induction motor
3. Regulation of a three –phase alternator by synchronous impedance & m.m.f. Methods
4. Regulation of three–phase alternator by Potier triangle method
5. V and Inverted V curves of a three—phase synchronous motor.
6. Determination of X_d and X_q of a salient pole synchronous machine
7. Equivalent circuit of single phase induction motor
8. Speed control of induction motor by V/f method.
9. Determination of efficiency of three phase alternator by loading with three phase induction motor.
10. Power factor improvement of single phase induction motor by using capacitors and load test on single phase induction motor.

Learning outcomes:

- Able to assess the performance of single phase and three phase induction motors.
- Able to control the speed of three phase induction motor.
- Able to predetermine the regulation of three–phase alternator by various methods.
- Able to find the X_d/X_q ratio of alternator and asses the performance of three–phase synchronous motor.

CONTROL SYSTEMS LAB

Learning Objectives:

- To impart hands on experience to understand the performance of basic control system components such as magnetic amplifiers, D.C. servo motors, A.C. Servo motors, stepper motor and potentiometer.
- To understand time and frequency responses of control system with and without controllers and compensators.

Any 10 of the following experiments are to be conducted:

1. Time response of Second order system
2. Characteristics of Synchronos
3. Programmable logic controller – characteristics of stepper motor
4. Effect of feedback on DC servo motor
5. Effect of P, PD, PI, PID Controller on a second order systems
6. Lag and lead compensation – Magnitude and phase plot
7. DC position control system
8. Transfer function of DC motor
9. Temperature controller using PID
10. Characteristics of magnetic amplifiers
11. Characteristics of AC servo motor
12. Characteristics of DC servo motor
13. Potentiometer as an error detector

Learning Outcomes

- Able to analyze the performance and working Magnetic amplifier, D.C and A.C. servo motors and synchronous motors.
- Able to design P,PI,PD and PID controllers
- Able to design lag, lead and lag–lead compensators
- Able to control the temperature using PID controller
- Able to determine the transfer function of D.C.motor
- Able to control the position of D.C servo motor performance

**ELECTRICAL MEASUREMENTS
LABORATORY**

Learning Objectives:

- To understand the correct function of electrical parameters and calibration of voltage, current, single phase and three phase power and energy, and measurement of electrical characteristics of resistance, inductance and capacitance of a circuits through appropriate methods.
- To understand testing of transformer oil.

Any 10 of the following experiments are to be conducted

1. Calibration and Testing of single phase energy Meter
2. Calibration of dynamometer wattmeter using phantom loading
3. Calibration of PMMC ammeter and voltmeter using Crompton D.C. Potentiometer
4. Measurement of resistance and Determination of Tolerance using Kelvin's double Bridge.
5. Capacitance Measurement using Schering bridge.
6. Inductance Measurement using Anderson bridge.
7. Measurement of 3 phase reactive power with single phase wattmeter for balanced loading.
8. Calibration of LPF wattmeter by direct loading.
9. Measurement of 3 phase power with single watt meter and using two C.Ts.
10. Testing of C.T. using mutual inductance method.
11. Testing of P.T. using absolute null method.
12. Dielectric oil testing using H.T test Kit.
13. Calibration of AC voltmeter and measurement of choke parameters using AC Potentiometer in polarform.
14. Measurement of Power by 3 Voltmeter and 3 Ammeter method.

Learning Outcomes:

- To be able to measure the electrical parameters voltage, current, power, energy and electrical characteristics of resistance, inductance and capacitance.
- To be able to test transformer oil for its effectiveness.
- To be able to measure the parameters of inductive coil.

INTELLECTUAL PROPERTY RIGHTS AND PATENTS

Objectives:

***To know the importance of Intellectual property rights, which plays a vital role in advanced Technical and Scientific disciplines.**

***Imparting IPR protections and regulations for further advancement, so that the students can familiarize with the latest developments.**

Unit I: Introduction to Intellectual Property Rights (IPR)

Concept of Property - Introduction to IPR – International Instruments and IPR - WIPO - TRIPS – WTO -Laws Relating to IPR - IPR Tool Kit - Protection and Regulation - Copyrights and Neighboring Rights – Industrial Property – Patents - Agencies for IPR Registration – Traditional Knowledge –Emerging Areas of IPR - Layout Designs and Integrated Circuits – Use and Misuse of Intellectual Property Rights.

Unit II: Copyrights and Neighboring Rights

Introduction to Copyrights – Principles of Copyright Protection – Law Relating to Copyrights - Subject Matters of Copyright – Copyright Ownership – Transfer and Duration – Right to Prepare Derivative Works –Rights of Distribution – Rights of Performers – Copyright Registration – Limitations – Infringement of Copyright – Relief and Remedy – Case Law - Semiconductor Chip Protection Act.

Unit III: Patents

Introduction to Patents - Laws Relating to Patents in India – Patent Requirements – Product Patent and Process Patent - Patent Search - Patent Registration and Granting of Patent - Exclusive Rights – Limitations - Ownership and Transfer — Revocation of Patent – Patent Appellate Board - Infringement of Patent – Compulsory Licensing — Patent Cooperation Treaty – New developments in Patents – Software Protection and Computer related Innovations.

Unit IV: Trademarks

Introduction to Trademarks – Laws Relating to Trademarks – Functions of Trademark – Distinction between Trademark and Property Mark – Marks Covered under Trademark Law - Trade Mark Registration – Trade Mark Maintenance – Transfer of rights - Deceptive Similarities - Likelihood of Confusion - Dilution of Ownership – Trademarks Claims and Infringement – Remedies – Passing Off Action.

Unit V: Trade Secrets

Introduction to Trade Secrets – General Principles - Laws Relating to Trade Secrets - Maintaining Trade Secret – Physical Security – Employee Access Limitation – Employee Confidentiality Agreements – Breach of Contract –Law of Unfair Competition – Trade Secret Litigation – Applying State Law.

Unit VI: Cyber Law and Cyber Crime

Introduction to Cyber Law – Information Technology Act 2000 - Protection of Online and Computer Transactions - E-commerce - Data Security – Authentication and Confidentiality - Privacy - Digital Signatures – Certifying Authorities - Cyber Crimes - Prevention and Punishment – Liability of Network Providers.

- Relevant Cases Shall be dealt where ever necessary.

Outcome:

*** IPR Laws and patents pave the way for innovative ideas which are instrumental for inventions to seek Patents.**

***Student get an insight on Copyrights, Patents and Software patents which are instrumental for further advancements.**

References:

1. Intellectual Property Rights (Patents & Cyber Law), Dr. A. Srinivas. Oxford University Press, New Delhi.
2. Deborah E.Bouchoux: Intellectual Property, Cengage Learning, New Delhi.
3. PrabhuddhaGanguli: Intellectual Property Rights, Tata Mc-Graw –Hill, New Delhi
4. Richard Stim: Intellectual Property, Cengage Learning, New Delhi.
5. Kompal Bansal &Parishit Bansal Fundamentals of IPR for Engineers, B. S. Publications (Press).
6. Cyber Law - Texts & Cases, South-Western's Special Topics Collections.
7. R.Radha Krishnan, S.Balasubramanian: Intellectual Property Rights, Excel Books. New Delhi.
8. M.Ashok Kumar and MohdIqbal Ali: Intellectual Property Rights, Serials Pub.

POWER ELECTRONIC CONTROLLERS & DRIVES

Preamble:

This course is an extension of power electronics applications to electric drives. This course covers in detail the basic and advanced speed control techniques using power electronic converters that are used in industry. It is equally important to understand the four quadrant operation of electric drives and slip power recovery schemes in induction motors.

Learning Objectives:

- To learn the fundamentals of electric drive and different electric braking methods.
- To analyze the operation of three phase converter controlled dc motors and four quadrant operation of dc motors using dual converters.
- To discuss the converter control of dc motors in various quadrants.
- To understand the concept of speed control of induction motor by using AC voltage controllers and voltage source inverters.
- To learn the principles of static rotor resistance control and various slip power recovery schemes.
- To understand the speed control mechanism of synchronous motors

UNIT-I:

Fundamentals of Electric Drives

Electric drive – Fundamental torque equation – Load torque components – Nature and classification of load torques – Steady state stability – Load equalization– Four quadrant operation of drive (hoist control) – Braking methods: Dynamic – Plugging – Regenerative methods.

UNIT-II:

Controlled Converter Fed DC Motor Drives

1-phase half and fully controlled converter fed separately and self-excited DC motor drive – Output voltage and current waveforms – Speed-torque expressions – Speed-torque characteristics — Principle of operation of dual converters and dual converter fed DC motor drives -Numerical problems.

UNIT-III:

DC-DC Converters Fed DC Motor Drives

Single quadrant – Two quadrant and four quadrant DC-DC converter fed separately excited and self-excited DC motors – Continuous current operation– Output voltage and current waveforms – Speed–torque expressions – Speed–torque characteristics –Four quadrant operation – Closed loop operation (qualitative treatment only).

UNIT-IV:

Stator side control of 3-phase Induction motor Drive

Stator voltage control using 3-phase AC voltage regulators – Waveforms –Speed torque characteristics– Variable Voltage Variable Frequency control of induction motor byPWMvoltage source inverter – Closed loop v/f control of induction motor drives (qualitative treatment only).

UNIT-V:

Rotor side control of 3-phase Induction motor Drive

Static rotor resistance control – Slip power recovery schemes – Static Scherbius drive – Static Kramer drive – Performance and speed torque characteristics – Advantages –Applications.

UNIT-VI:

Control of Synchronous Motor Drives

Separate control & self-control of synchronous motors – Operation of self-controlled synchronous motors by VSI– Closed Loop control operation of synchronous motor drives (qualitative treatment only).–Variable frequency control–Pulse width modulation.

Learning Outcomes:

After completion of the course, students will be able to:

- Explain the fundamentals of electric drive and different electric braking methods.
- Analyze the operation of three phase converter fed dc motors and four quadrant operations of dc motors using dual converters.
- Describe the converter control of dc motors in various quadrants of operation
- Know the concept of speed control of induction motor by using AC voltage controllers and voltage source inverters.
- Differentiate the stator side control and rotor side control of three phase induction motor..
- Explain the speed control mechanism of synchronous motors

Text Books:

1. Fundamentals of Electric Drives – by G K Dubey Narosa Publications
2. Power Semiconductor Drives, by S.B.Dewan, G.R.Slemon, A.Straughen, Wiley-India Edition.

Reference Books:

1. Electric Motors and Drives Fundamentals, Types and Applications, by Austin Hughes and Bill Drury, Newnes.
2. Thyristor Control of Electric drives – Vedam Subramanyam Tata McGraw Hill Publications.
3. Power Electronic Circuits, Devices and applications by M.H.Rashid, PHI
4. Power Electronics handbook by Muhammad H.Rashid, Elsevier.

POWER SYSTEM ANALYSIS**Preamble:**

The course is designed to give students the required knowledge for the design and analysis of electrical power grids. Calculation of power flow in a power system network using various techniques, formation of Z_{bus} and its importance are covered in this course. It also deals with short circuit analysis and analysis of power system for steady state and transient stability.

Learning Objectives:

- To development the impedance diagram (p.u) and formation of Y_{bus}
- To study the different load flow methods.
- To study the concept of the Z_{bus} building algorithm.
- To study short circuit calculation for symmetrical faults
- To study the effect of unsymmetrical faults and their effects.
- To study the rotor angle stability of power systems.

UNIT –I:**Per Unit Representation & Topology**

Per Unit Quantities–Single line diagram– Impedance diagram of a power system–Graph theory definition – Formation of element node incidence and bus incidence matrices – Primitive network representation – Formation of Y–bus matrix by singular transformation and direct inspection methods.

UNIT –II:**Power Flow Studies**

Necessity of power flow studies – Derivation of static power flow equations – Power flow solution using Gauss-Seidel Method – Newton Raphson Method (Rectangular and polar coordinates form) –Decoupled and Fast Decoupled methods – Algorithmic approach – Problems on 3–bus system only.

UNIT –III:**Z–Bus formulation**

Formation of Z–Bus: Partial network– Algorithm for the Modification of Z_{bus} Matrix for addition element for the following cases: Addition of element from a new bus to reference– Addition of element from a new bus to an old bus– Addition of element between an old bus to reference and Addition of element between two old busses (Derivations and Numerical Problems).– Modification of Z–Bus for the changes in network (Problems).

UNIT – IV:**Symmetrical Fault Analysis**

Transients on a Transmission line-Short circuit of synchronous machine(on no-load) - 3–Phase short circuit currents and reactances of synchronous machine–Short circuit MVA calculations -Series reactors – selection of reactors.

UNIT –V:

Symmetrical Components & Fault analysis

Definition of symmetrical components - symmetrical components of unbalanced three phase systems – Power in symmetrical components – Sequence impedances – Synchronous generator – Transmission line and transformers – Sequence networks –Various types of faults LG– LL– LLG and LLL on unloaded alternator–unsymmetrical faults on power system.

UNIT – VI:

Power System Stability Analysis

Elementary concepts of Steady state– Dynamic and Transient Stabilities– Description of Steady State Stability Power Limit–Transfer Reactance–Synchronizing Power Coefficient – Power Angle Curve and Determination of Steady State Stability –Derivation of Swing Equation–Determination of Transient Stability by Equal Area Criterion–Applications of Equal Area Criterion–Methods to improve steady state and transient stability.

Learning Outcomes:

- Able to draw impedance diagram for a power system network and to understand per unit quantities.
- Able to form a Y_{bus} and Z_{bus} for a power system networks.
- Able to understand the load flow solution of a power system using different methods.
- Able to find the fault currents for all types faults to provide data for the design of protective devices.
- Able to find the sequence components of currents for unbalanced power system network.
- Able to analyze the steady state, transient and dynamic stability concepts of a power system.

Text Books:

1. Power System Analysis by Grainger and Stevenson, Tata McGraw Hill.
2. Modern Power system Analysis – by I.J.Nagrath & D.P.Kothari: Tata McGraw–Hill Publishing Company, 2nd edition.

Reference Books:

1. Power System Analysis – by A.R.Bergen, Prentice Hall, Inc.
2. Power System Analysis by Hadi Saadat – TMH Edition.
3. Power System Analysis by B.R.Gupta, Wheeler Publications.
4. Power System Analysis and Design by J.Duncan Glover, M.S.Sarma, T.J.Overbye – Cengage Learning publications.

MICROPROCESSORS AND MICROCONTROLLERS

Preamble:

Microprocessor and microcontroller have become important building blocks in digital electronics design. It is important for student to understand the architecture of a microprocessor and its interfacing with various modules. 8086 microprocessor architecture, programming, and interfacing is dealt in detail in this course. Interfacing, PIC, architecture, programming in C.

Learning objectives:

- To understand the organization and architecture of Micro Processor
- To understand addressing modes to access memory
- To understand 8051 micro controller architecture
- To understand the programming principles for 8086 and 8051
- To understand the interfacing of MP with IO as well as other devices
- To understand how to develop cyber physical systems

UNIT-I:

Introduction to Microprocessor Architecture

Introduction and evolution of Microprocessors– Architecture of 8086–Register Organization of 8086–Memory organization of 8086– General bus operation of 8086–Introduction to 80286–80386 and 80486 and Pentium.

UNIT-II:

Minimum and Maximum Mode Operations

Instruction set, Addressing modes– Minimum and Maximum mode operations of 8086–8086 Control signal interfacing–Read and write cycle timing diagrams.

UNIT-III:

I/O Interface

8255 PPI– Architecture of 8255–Modes of operation– Interfacing I/O devices to 8086 using 8255–Interfacing A to D converters– Interfacing D to A converters– Stepper motor interfacing– Static memory interfacing with 8086–DMA controller (8257)–Architecture– Interfacing 8257 DMA controller– Programmable Interrupt Controller (8259)–Command words and operating modes of 8259– Interfacing of 8259–Keyboard/display controller (8279)–Architecture–Modes of operation–Command words of 8279– Interfacing of 8279.

UNIT-IV:

Introduction to 8051 Micro Controller

Overview of 8051 Micro Controller– Architecture– Register set–I/O ports and Memory Organization– Interrupts–Timers and Counters–Serial Communication.

UNIT- V:

PIC Architecture

Block diagram of basic PIC 18 micro controller, registers I/O ports.

UNIT– VI:

Programming in C for PIC

Data types, I/O programming, logical operations, data conversion

Learning Outcomes:

- To be able to understand the microprocessor capability in general and explore the evaluation of microprocessors.
- To be able to understand the addressing modes of microprocessors
- To be able to understand the micro controller capability
- To be able to program mp and mc
- To be able to interface mp and mc with other electronic devices
- To be able to develop cyber physical systems

Text Books:

1. Kenneth J Ayala, “The 8051 Micro Controller Architecture, Programming and Applications”, Thomson Publishers, 2nd Edition.
2. PIC Microcontroller and Embedded Systems using Assembly and C for PIC 18, - Muhammad Ali Mazidi, RolindD.Mckinay , Danny causey -Pearson Publisher 21st Impression.

Reference Books:

1. R.S. Kaler, “ A Text book of Microprocessors and Micro Controllers”, I.K. International Publishing House Pvt. Ltd.
2. Ajay V. Deshmukh, “Microcontrollers – Theory and Applications”, Tata McGraw–Hill Companies –2005.
3. Ajit Pal, “Microcontrollers – Principles and Applications”, PHI Learning Pvt Ltd, 2011.
4. Microprocessors and Interfacing, Douglas V Hall, Mc–Graw Hill, 2nd Edition.
5. Ray and Burchandi, “Advanced Micro Processors and Interfacing”, Tata McGraw–Hill.

DATA STRUCTURES THROUGH C++**OBJECTIVES:**

- To be familiar with basic techniques of object oriented principles and exception handling using C++
- To be familiar with the concepts like Inheritance, Polymorphism
- Solve problems using data structures such as linear lists, stacks, queues, hash tables
- Be familiar with advanced data structures such as balanced search trees, AVL Trees, and B Trees.

UNIT-I: ARRAYS

Abstract Data Types and the C++ Class, An Introduction to C++ Class- Data Abstraction and Encapsulation in C++- Declaring Class Objects and Invoking Member Functions- Special Class Operations- Miscellaneous Topics- ADTs and C++Classes, The Array as an Abstract Data Type, The Polynomial Abstract Data type- Polynomial Representation- Polynomial Addition. Sparse Matrices, Introduction- Sparse Matrix Representation- Transposing a Matrix- Matrix Multiplication, Representation of Arrays.

UNIT-II: STACKS AND QUEUES

Templates in C++, Template Functions- Using Templates to Represent Container Classes, The Stack Abstract Data Type, The Queue Abstract Data Type, Subtyping and Inheritance in C++, Evaluation of Expressions, Expression- Postfix Notation- Infix to Postfix.

UNIT-III: LINKED LISTS

Single Linked List and Chains, Representing Chains in C++, Defining a Node in C++- Designing a Chain Class in C++- Pointer manipulation in C++- Chain Manipulation Operations, The Template Class Chain, Implementing Chains with Templates- Chain Iterators- Chain Operations- Reusing a Class, Circular Lists, Available Space Lists, Linked Stacks and Queues, Polynomials, Polynomial Representation- Adding Polynomials- Circular List Representation of Polynomials, Equivalence Classes, Sparse Matrices, Sparse Matrix Representation- Sparse Matrix Input- Deleting a Sparse Matrix, Doubly Linked Lists, Generalized Lists, Representation of Generalized Lists- Recursive Algorithms for Lists- Reference Counts, Shared and Recursive Lists

UNIT-IV: TREES

Introduction, Terminology, Representation of Trees, Binary Trees, The Abstract Data Type, Properties of Binary Trees, Binary Tree Representations, Binary Tree Traversal and Tree Iterators, Introduction, Inorder Traversal Preorder Traversal, Postorder Traversal, Threaded Binary Trees, Threads, Inorder Traversal of a Threaded Binary Tree, Inserting a Node into a Threaded Binary Tree, Heaps, Priority Queues, Definition of a Max Heap, Insertion into a Max Heap, Deletion from a Max Heap, Binary Search Trees, Definition, Searching a Binary Search Tree, Insertion into a Binary Search Tree, Deletion from a Binary Search Tree, Height of Binary Search Tree.

UNIT-V: GRAPHS

The Graph Abstract Data Type, Introduction, Definition, Graph Representation, Elementary Graph Operation, Depth First Search, Breadth First Search, Connected Components, Spanning Trees, Biconnected Components, Minimum Cost Spanning Trees, Kruskal S Algorithm, Prim s Algorithm Sollin' s Algorithm, Shortest Paths and Transitive Closure, Single Source/All Destination: Nonnegative Edge Cost, Single Source/All Destination: General Weights, All-Pairs Shortest Path, Transitive Closure.

UNIT-VI: SORTING

Insertion Sort, Quick Sort, Merge Sort Merging, Iterative Merge Sort, Recursive Merge Sort, Heap Sort.

OUTCOMES:

- Distinguish between procedures and object oriented programming.
- Apply advanced data structure strategies for exploring complex data structures.
- Compare and contrast various data structures and design techniques in the area of Performance.
- Implement data structure algorithms through C++. • Incorporate data structures into the applications such as binary search trees, AVL and B Trees
- Implement all data structures like stacks, queues, trees, lists and graphs and compare their Performance and trade offs

TEXT BOOKS:

1. Data structures, Algorithms and Applications in C++, S.Sahni, University Press (India) Pvt.Ltd, 2nd edition, Universities Press, Pvt. Ltd.
2. Data structures and Algorithm Analysis in C++, Mark Allen Weiss, Pearson Education. Ltd.Second, Edition.
3. Data structures and Algorithms in C++, Michael T.Goodrich, R.Tamassia and .Mount, Wiley student edition, John Wiley and Sons.

REFERENCE BOOKS:

- 1.Data structures and algorithms in C++, 3rd Edition, Adam Drozdek, Thomson
- 2.Data structures using C and C++, Langsam, Augenstein and Tanenbaum, PHI.
3. Problem solving with C++, The OOP, Fourth edition, W.Savitch, Pearson education.

UNIX AND SHELL PROGRAMMIN OPEN ELECTIVE

OBJECTIVES:

- Written technical communication and effective use of concepts and terminology.
- Facility with UNIX command syntax and semantics.
- Ability to read and understand specifications, scripts and programs.
- Individual capability in problem solving using the tools presented within the class. Students will demonstrate a mastery of the course materials and concepts within in class discussions.

UNIT-I

Introduction to unix-Brief History-What is Unix-Unix Components-Using Unix-Commands in Unix-Some Basic Commands-Command Substitution-Giving Multiple Commands.

UNIT-II

The File system –The Basics of Files-What’s in a File-Directories and File Names-Permissions-I Nodes-The Directory Hierarchy, File Attributes and Permissions-The File Command knowing the File Type-The Chmod Command Changing File Permissions-The Chown Command Changing the Owner of a File-The Chgrp Command Changing the Group of a File.

UNIT-III

Using the Shell-Command Line Structure-Met characters-Creating New Commands-Command Arguments and Parameters-Program Output as Arguments-Shell Variables- -More on I/O Redirection-Looping in Shell Programs.

UNIT-IV

Filters-The Grep Family-Other Filters-The Stream Editor Sed-The AWK Pattern Scanning and processing Language-Good Files and Good Filters.

UNIT-V

Shell Programming-Shell Variables-The Export Command-The Profile File a Script Run During Starting-The First Shell Script-The read Command-Positional parameters-The \$? Variable knowing the exit Status-More about the Set Command-The Exit Command-Branching Control Structures-Loop Control Structures-The Continue and Break Statement-The Expr Command: Performing Integer Arithmetic-Real Arithmetic in Shell Programs-The here Document(<<)-The Sleep Command-Debugging Scripts-The Script Command-The Eval Command-The Exec Command.

UNIT-VI

The Process-The Meaning-Parent and Child Processes-Types of Processes-More about Foreground and Background processes-Internal and External Commands-Process Creation-The Trap Command-The Stty Command-The Kill Command-Job Control.

OUTCOMES:

- Documentation will demonstrate good organization and readability.
- File processing projects will require data organization, problem solving and research.
- Scripts and programs will demonstrate simple effective user interfaces.
- Scripts and programs will demonstrate effective use of structured programming.
- Scripts and programs will be accompanied by printed output demonstrating completion of a test plan.
- Testing will demonstrate both black and glass box testing strategies.
- Project work will involve group participation.

TEXT BOOKS:

1. Introduction to Unix Shell Programming by M.G.Venkateshmurthy, Parson.
2. Unix programming environment by Brian W. Kernighan & Rob Pike, Pearson.

REFERENCE BOOKS:

1. Unix and shell programming by B.M. Harwani, OXFORD university press.

OOPs through Java

OBJECTIVE:

- To strengthen their problem solving ability by applying the characteristics of an object-oriented approach.
- To introduce object-oriented concepts in C++ and Java.

Programming:

1. Write a Programme that computes the simple interest and compound interest payable on principal amount (in Rs.) of loan borrowed by the customer from a bank for a given period of time (in years) at specific rate of interest. Further determine whether the bank will benefit by charging simple interest or compound interest
2. Write a Programme to calculate the fare for the passengers traveling in a bus. When a Passenger enters the bus, the conductor asks "What distance will you travel?" On knowing distance from passenger (as an approximate integer), the conductor mentions the fare to the passenger according to following criteria.
3. Write a C++ Program to illustrate Enumeration and Function Overloading
4. Write a C++ Program to illustrate Scope and Storage class
5. Implementation of ADT such as Stack and Queues
6. Write a C++ Program to illustrate the use of Constructors and Destructors and Constructor Overloading
7. Write a Program to illustrate Static member and methods
8. Write a Program to illustrate Bit fields
9. Write a Program to overload as binary operator, friend and member function
10. Write a Program to overload unary operator in Postfix and Prefix form as member and friend function
11. Write a C++ Program to illustrate Iterators and Containers
12. Write a C++ Program to illustrate function templates
13. Write a C++ Program to illustrate template class
14. Write C++ Programs and incorporating various forms of Inheritance
15. Write a C++ Program to illustrate Virtual functions
16. To write a C++ program to find the sum for the given variables using function with default arguments.
17. To write a C++ program to find the value of a number raised to its power that demonstrates a function using call by value.
18. To write a C++ program and to implement the concept of Call by Address

19. To write a program in C++ to prepare a student Record using class and object
20. To implement the concept of unary operator overloading by creating a C++ program.
21. Write a C++ program for swapping two values using function templates
22. Write a C++ program to implement a file handling concept using sequential access.

OUTCOMES:

- Explain what constitutes an object-oriented approach to programming and identify potential benefits of object-oriented programming over other approaches.
- Apply an object-oriented approach to developing applications of varying complexities

VLSI DESIGN

Objectives:

The main objectives of this course are:

- Basic characteristics of MOS transistor and examines various possibilities for configuring inverter circuits and aspects of latch-up are considered.
- Design processes are aided by simple concepts such as stick and symbolic diagrams but the key element is a set of design rules, which are explained clearly.
- Basic circuit concepts are introduced for MOS processes we can set out approximate circuit parameters which greatly ease the design process.

Outcomes:

At the end of this course the student can able to:

- Understand the properties of MOS active devices and simple circuits configured when using them and the reason for such encumbrances as ratio rules by which circuits can be interconnected in silicon.
- Know three sets of design rules with which nMOS and CMOS designs may be fabricated.
- Understand the scaling factors determining the characteristics and performance of MOS circuits in silicon.

Syllabus:

Unit-I:

Introduction and Basic Electrical Properties of MOS Circuits: Introduction to IC technology, Fabrication process: nMOS, pMOS and CMOS. I_{ds} versus V_{ds} Relationships, Aspects of MOS transistor Threshold Voltage, MOS transistor Trans, Output Conductance and Figure of Merit. nMOS Inverter, Pull-up to Pull-down Ratio for nMOS inverter driven by another nMOS inverter, and through one or more pass transistors. Alternative forms of pull-up, The CMOS Inverter, Latch-up in CMOS circuits, Bi-CMOS Inverter, Comparison between CMOS and BiCMOS technology. **(Text Book-1)**

Unit-II:

MOS and Bi-CMOS Circuit Design Processes: MOS Layers, Stick Diagrams, Design Rules and Layout, General observations on the Design rules, $2\mu\text{m}$ Double Metal, Double Poly, CMOS/BiCMOS rules, $1.2\mu\text{m}$ Double Metal, Double Poly CMOS rules, Layout Diagrams of NAND and NOR gates and CMOS inverter, Symbolic Diagrams-Translation to Mask Form.

(Text Book-1)

Unit-III:

Basic Circuit Concepts: Sheet Resistance, Sheet Resistance concept applied to MOS transistors and Inverters, Area Capacitance of Layers, Standard unit of capacitance, Some area Capacitance Calculations, The Delay Unit, Inverter Delays, Driving large capacitive loads, Propagation Delays, Wiring Capacitances, Choice of layers.

Scaling of MOS Circuits: Scaling models and scaling factors, Scaling factors for device parameters, Limitations of scaling, Limits due to sub threshold currents, Limits on logic levels and supply voltage due to noise and current density. Switch logic, Gate logic.

(Text Book-1)

Unit-IV:

Chip Input and Output circuits: ESD Protection, Input Circuits, Output Circuits and L(di/dt) Noise, On-Chip clock Generation and Distribution.

Design for Testability: Fault types and Models, Controllability and Observability, Ad Hoc Testable Design Techniques, Scan Based Techniques and Built-In Self Test techniques.

(Text Book-2)

Unit-V:

FPGA Design: FPGA design flow, Basic FPGA architecture, FPGA Technologies, FPGA families- Altera Flex 8000FPGA, Altera Flex 10FPGA, Xilinx XC4000 series FPGA, Xilinx Spartan XL FPGA, Xilinx Spartan II FPGAs, Xilinx Vertex FPGA. Case studies: FPGA Implementation of Half adder and full adder.

Introduction to synthesis: Logic synthesis, RTL synthesis, High level Synthesis.

(Reference Text Book-1)

Unit-VI:

Introduction to Low Power VLSI Design: Introduction to Deep submicron digital IC design, Low Power CMOS Logic Circuits: Overview of power consumption, Low –power design through voltage scaling, Estimation and optimisation of switching activity, Reduction of switching capacitance. Interconnect Design, Power Grid and Clock Design.

(Text Book-2)

Text Books:

1. Essentials of VLSI Circuits and Systems - Kamran Eshraghian, Douglas and A. Pucknell and Sholeh Eshraghian, Prentice-Hall of India Private Limited, 2005 Edition.
2. CMOS Digital Integrated Circuits Analysis and Design- [Sung-Mo Kang](#), [Yusuf Leblebici](#), Tata McGraw-Hill Education, 2003.

References:

1. Advanced Digital Design with the Verilog HDL, Michael D.Ciletti, Xilinx Design Series, Pearson Education
2. Analysis and Design of Digital Integrated Circuits in Deep submicron Technology, 3rd edition, David Hodges.

ROBOTICS

(Open Elective)

OBJECTIVES:

- To introduce the basic concepts, parts of robots and types of robots.
- To make the student familiar with the various drive systems for robot, sensors and their applications in robots and programming of robots.
- To discuss about the various applications of robots, justification and implementation of robot.

UNIT- I:

Introduction

Specifications of Robots- Classifications of robots – Work envelope - Flexible automation versus Robotic technology – Applications of Robots **ROBOT KINEMATICS AND DYNAMICS** Positions,

UNIT-II:

Orientations and frames, Mappings

Changing descriptions from frame to frame, Operators: Translations, Rotations and Transformations - Transformation Arithmetic - D-H Representation - Forward and inverse Kinematics Of Six Degree of Freedom Robot Arm – Robot Arm dynamics

UNIT- III:

Robot Drives and Power Transmission Systems

Robot drive mechanisms, hydraulic – electric – servomotor- stepper motor - pneumatic drives, Mechanical transmission method - Gear transmission, Belt drives, cables, Roller chains, Link - Rod systems - Rotary-to-Rotary motion conversion, Rotary-to-Linear motion conversion, Rack and Pinion drives, Lead screws, Ball Bearing screws,

UNIT -IV:

Manipulators

Construction of Manipulators, Manipulator Dynamic and Force Control, Electronic and Pneumatic manipulators

UNIT- V:

Robot End Effectors

Classification of End effectors – Tools as end effectors. Drive system for grippers- Mechanical adhesive-vacuum-magnetic-grippers. Hooks&scoops. Gripper force analysis and gripper design. Active and passive grippers.

UNIT -VI:

Path planning & Programming

Trajectory planning and avoidance of obstacles, path planning, skew motion, joint integrated motion – straight line motion-Robot languages-computer control and Robot software.

OUTCOMES:

- The Student must be able to design automatic manufacturing cells with robotic control using
- The principle behind robotic drive system, end effectors, sensor, machine vision robot Kinematics and programming.

TEXT BOOKS:

1. Deb S. R. and Deb S., "Robotics Technology and Flexible Automation", Tata McGraw Hill Education Pvt. Ltd, 2010.
2. John J. Craig, "Introduction to Robotics", Pearson, 2009.
3. Mikell P. Groover et al., "Industrial Robots - Technology, Programming and Applications", McGraw Hill, New York, 2008.

REFERENCE BOOKS:

- 1. Richard D Klafter, Thomas A Chmielewski, Michael Negin, "Robotics Engineering An Integrated Approach", Eastern Economy Edition, Prentice Hall of India Pvt. Ltd., 2006.
2. Fu K S, Gonzalez R C, Lee C.S.G, "Robotics: Control, Sensing, Vision and Intelligence", McGraw Hill, 1987

NEURAL NETWORKS AND FUZZY LOGIC

(Open Elective)

Preamble:

This course introduces the basics of Neural Networks and essentials of Artificial Neural Networks with Single Layer and Multilayer Feed Forward Networks. Also deals with Associate Memories and introduces Fuzzy sets and Fuzzy Logic system components. The Neural Network and Fuzzy Network system application to Electrical Engineering is also presented. This subject is very important and useful for doing Project Work.

Learning Objectives:

- To understand artificial neuron models.
- To understand learning methods of ANN.
- To utilize different algorithms of ANN.
- To distinguish between classical and fuzzy sets.
- To understand different modules of fuzzy controller.
- To understand applications of neural networks and fuzzy logic.

Unit – I: Introduction to Neural Networks

Introduction, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models, Hodgkin-Huxley Neuron Model, Integrate-and-Fire Neuron Model, Spiking Neuron Model, Characteristics of ANN, McCulloch-Pitts Model, Historical Developments, Potential, Applications of ANN.

Unit- II: Essentials of Artificial Neural Networks

Artificial Neuron Model, Operations of Artificial Neuron, Types of Neuron Activation Function, ANN Architectures, Classification Taxonomy of ANN – Connectivity, Neural Dynamics (Activation and Synaptic), Learning Strategy (Supervised, Unsupervised, Reinforcement), Learning Rules, Types of Application

Unit–III:

Multilayer feed forward Neural Networks

Credit Assignment Problem, Generalized Delta Rule, Derivation of Back propagation (BP) Training, Summary of Backpropagation Algorithm, Kolmogorov Theorem, Learning Difficulties and Improvements, Radial Basis Function (RBF) Neural Network – Kohonen Self Organising feature Map (KSOM).

Associative Memories

Bidirectional Associative Memories (BAM)-Architecture of Hopfield Network: Discrete and Continuous versions, Storage and Recall Algorithm, Stability Analysis, Capacity of the Hopfield Network, Summary and Discussion of Instance/Memory Based Learning Algorithms, Applications.

Unit – IV: Classical & Fuzzy Sets

Introduction to classical sets - properties, Operations and relations; Fuzzy sets, Membership, Uncertainty, Operations, properties, fuzzy relations, cardinalities, membership functions.

UNIT V: Fuzzy Logic Modules

Fuzzification, Membership value assignment, development of rule base and decision making system, Defuzzification to crisp sets, Defuzzification methods.

UNIT VI: Applications

Neural network applications: Process identification, control, fault diagnosis and load forecasting.

Fuzzy logic applications: Load frequency control and Fuzzy classification.

Learning Outcomes:

Students should able to:

- Know different models of artificial neuron.
- Use learning methods of ANN.
- Use different paradigms of ANN.
- Classify between classical and fuzzy sets.
- Use different modules of Fuzzy logic controller.
- Apply Neural Networks and fuzzy logic for real-time applications.

Text Book:

1. Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by RajasekharanandRai – PHI Publication.
2. Introduction to Neural Networks using MATLAB 6.0 - S.N.Sivanandam, S.Sumathi, S.N.Deepa, TMH,2006

Reference Book:

1. Neural Networks – James A Freeman and Davis Skapura, Pearson Education, 2002.
2. Neural Networks – Simon Hakens , Pearson Education
3. Neural Engineering by C.Eliasmith and CH.Anderson, PHI
4. Neural Networks and Fuzzy Logic System by Bart Kosko, PHI Publications.

ENERGY AUDIT, CONSERVATION & MANAGEMENT (Open Elective)

Preamble:

This is an open elective course developed to cater the current needs of the industry. This course covers topics such as energy conservation act and energy conservation. It also covers energy efficient lighting design. The student will learn power factor improvement techniques, energy efficiency in HVAC systems. In addition The economic aspects such as payback period calculations, life cycle costing analysis is covered in this course.

Learning Objectives:

- To understand energy efficiency, scope, conservation and technologies.
- To design energy efficient lighting systems.
- To estimate/calculate power factor of systems and propose suitable compensation techniques.
- To understand energy conservation in HVAC systems.
- To calculate life cycle costing analysis and return on investment on energy efficient technologies.

Unit-I:

Basic Principles of Energy Audit and management

Energy audit – Definitions – Concept – Types of audit – Energy index – Cost index – Pie charts – Sankey diagrams – Load profiles – Energy conservation schemes and energy saving potential – Numerical problems – Principles of energy management – Initiating, planning, controlling, promoting, monitoring, reporting – Energy manager – Qualities and functions – Language – Questionnaire – Check list for top management.

Unit-II:

Lighting

Modification of existing systems – Replacement of existing systems – Priorities: Definition of terms and units – Luminous efficiency – Polar curve – Calculation of illumination level – Illumination of inclined surface to beam – Luminance or brightness – Types of lamps – Types of lighting – Electric lighting fittings (luminaries) – Flood lighting – White light LED and conducting Polymers – Energy conservation measures.

Unit-III:

Power Factor and energy instruments

Power factor – Methods of improvement – Location of capacitors – Power factor with non linear loads – Effect of harmonics on Power factor – Numerical problems. Energy Instruments – Watt-hour meter – Data loggers – Thermocouples – Pyrometers – Lux meters – Tong testers – Power analyzer.

Unit-IV:

Space Heating and Ventilation

Ventilation – Air-Conditioning (HVAC) and Water Heating: Introduction – Heating of buildings – Transfer of Heat-Space heating methods – Ventilation and air-conditioning – Insulation-Cooling load – Electric water heating systems – Energy conservation methods.

Unit-V

Economic Aspects and Financial Analysis

Understanding energy cost - Economics Analysis – Depreciation Methods – Time value of money – Rate of return – Present worth method – Replacement analysis – Life cycle costing analysis – Energy efficient motors (basic concepts) – Economics of energy efficient motors and systems.

Unit–VI:

Computation of Economic Aspects

Need of investment, appraisal and criteria - Calculation of simple payback period–Return on investment – Net present value – Internal rate of return – numerical examples – Power factor correction – Lighting – Applications of life cycle costing analysis – Return on investment – Numerical examples.

Learning Outcomes:

Student will be able to

- Explain energy efficiency, conservation and various technologies.
- Design energy efficient lighting systems.
- Calculate power factor of systems and propose suitable compensation techniques.
- Explain energy conservation in HVAC systems.
- Calculate life cycle costing analysis and return on investment on energy efficient technologies.

Text Books:

1. Hand Book of Energy Audit by Sonal Desai- Tata McGraw hill
2. Energy efficient electric motors by John .C. Andreas, Marcel Dekker Inc Ltd–2nd edition, 1995

Reference Books:

1. Energy management by W.R. Murphy & G. McKay Butter worth, Elsevier publications. 2012
2. Electric Energy Utilization and Conservation by S C Tripathy, Tata McGraw hill publishing company Ltd. New Delhi.
3. Energy management by Paul o' Callaghan, Mc–Graw Hill Book company–1st edition, 1998.
4. Energy management hand book by W.C.Turner, John wiley and sons.
5. Energy management and conservation –k v Sharma and pvenkataseshaiiah-I K International Publishing House pvt.ltd,2011.
6. http://www.energymanagertraining.com/download/Gazette_of_IndiaPartIIsecI-37_25-08-2010.pdf

III Year – II SEMESTER

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POWER ELECTRONICS LAB

Learning objectives:

- To study the characteristics of various power electronic devices and analyze firing circuits and commutation circuits of SCR.
- To analyze the performance of single-phase and three-phase full-wave bridge converters with both resistive and inductive loads.
- To understand the operation of AC voltage regulator with resistive and inductive loads.
- To understand the working of Buck converter, Boost converter and inverters.

Any 10 of the Following Experiments are to be conducted

1. Study of Characteristics of Thyristor, MOSFET & IGBT.
2. Design and development of a firing circuit for Thyristor.
3. Design and development of gate drive circuits for IGBT.
4. Single -Phase Half controlled converter with R and RL load
5. Single -Phase fully controlled bridge converter with R and RL loads
6. Single -Phase AC Voltage Regulator with R and RL Loads
7. Single -Phase square wave bridge inverter with R and RL Loads
8. Three- Phase fully controlled converter with RL-load.
9. Design and verification of voltages gain of Boost converter in Continuous Conduction Mode(CCM) and Discontinuous Conduction Mode(DCM).
10. Design and verification of voltages ripple in buck converter in CCM operation.
11. Single -phase PWM inverter with sine triangle PWM technique.
12. 3-phase AC-AC voltage regulator with R-load.

Learning outcomes:

- Able to study the characteristics of various power electronic devices and analyze gate drive circuits of IGBT.
- Able to analyze the performance of single-phase and three-phase full-wave bridge converters with both resistive and inductive loads.
- Able to understand the operation of single phase AC voltage regulator with resistive and inductive loads.
- Able to understand the working of Buck converter, Boost converter, single-phase square wave inverter and PWM inverter.

MICRO MPROCESSORS AND MICRO CONTROLLERS LAB

Learning Objectives:

- To study programming based on 8086 microprocessor and 8051 microcontroller.
- To study 8086 microprocessor based ALP using arithmetic, logical and shift operations.
- To study to interface 8086 with I/O and other devices.
- To study parallel and serial communication using 8051 & PIC 18 micro controllers.

Any 10 of the following experiments are to be conducted:

I. Microprocessor 8086 & Microcontroller 8051

Introduction to MASM/TASM.

1. Arithmetic operation – Multi byte addition and subtraction, multiplication and division – Signed and unsigned arithmetic operation, ASCII – Arithmetic operation.
2. Logic operations – Shift and rotate – Converting packed BCD to unpacked BCD, BCD to ASCII conversion.
3. By using string operation and Instruction prefix: Move block, Reverse string Sorting, Inserting, Deleting, Length of the string, String comparison.
4. Interfacing 8255–PPI
5. Interfacing 8259 – Interrupt Controller.
6. Interfacing 8279 – Keyboard Display.
7. Stepper motor control using 8253/8255.
8. Reading and Writing on a parallel port using 8051
9. Timer in different modes using 8051
10. Serial communication implementation using 8051
11. Understanding three memory areas of 00 – FF Using 8051 external interrupts.
12. Interface PIC 18 with an optoisolator
13. Interface PIC 18 with a DC motor

Learning Outcomes:

- Will be able to write assembly language program using 8086 micro based on arithmetic, logical, and shift operations.
- Will be able to interface 8086 with I/O and other devices.
- Will be able to do parallel and serial communication using 8051 & PIC 18 micro controllers.

DATASTRUCTURES THROUGH C LAB

OBJECTIVES:

- To develop skills to design and analyze simple linear and non linear data structures
- To Strengthen the ability to identify and apply the suitable data structure for the given real world problem
- To Gain knowledge in practical applications of data structures

List of Experiments:

1. Implementation of Singly linked list.
2. Implementation of Doubly linked list.
3. Implementation of Multistack in a Single Array.
4. Implementation of Circular Queue
5. Implementation of Binary Search trees.
6. Implementation of Hash table.
7. Implementation of Heaps.
8. Implementation of Breadth First Search Techniques.
9. Implementation of Depth First Search Techniques.
10. Implementation of Prim's Algorithm.
11. Implementation of Dijkstra's Algorithm.
12. Implementation of Kruskal's Algorithm
13. Implementation of MergeSort
14. Implementation of Quick Sort
15. Implementation of Data Searching using divides and conquers technique

OUTCOMES:

At the end of this lab session, the student will

- Be able to design and analyze the time and space efficiency of the data structure
- Be capable to identify the appropriate data structure for given problem
- Have practical knowledge on the application of data structures

III Year - II Semester

L	T	P	C
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PROFESSIONAL ETHICS AND HUMAN VALUES

Course Objectives:

***To give basic insights and inputs to the student to inculcate Human values to grow as a responsible human beings with proper personality.**

***Professional Ethics instills the student to maintain ethical conduct and discharge their professional duties.**

UNIT I: Human Values:

Morals, Values and Ethics – Integrity – Trustworthiness - Work Ethics – Service Learning – Civic Virtue – Respect for others – Living Peacefully – Caring – Sharing – Honesty – Courage – Value Time – Co-operation – Commitment – Empathy – Self-confidence – Spirituality- Character.

UNIT II: Principles for Harmony:

Truthfulness – Customs and Traditions -Value Education – Human Dignity – Human Rights – Fundamental Duties - Aspirations and Harmony (I, We & Nature) – Gender Bias - Emotional Intelligence – Salovey – Mayer Model – Emotional Competencies – Conscientiousness.

UNIT III: Engineering Ethics and Social Experimentation:

History of Ethics - Need of Engineering Ethics - Senses of Engineering Ethics- Profession and Professionalism —Self Interest - Moral Autonomy – Utilitarianism – Virtue Theory - Uses of Ethical Theories - Deontology- Types of Inquiry –Kohlberg’s Theory - Gilligan’s Argument –Heinz’s Dilemma - Comparison with Standard Experiments — Learning from the Past –Engineers as Managers – Consultants and Leaders – Balanced Outlook on Law - Role of Codes – Codes and Experimental Nature of Engineering.

UNIT IV: Engineers’ Responsibilities towards Safety and Risk:

Concept of Safety - Safety and Risk – Types of Risks – Voluntary v/sInvoluntary Risk – Consequences - Risk Assessment – Accountability – Liability - Reversible Effects - Threshold Levels of Risk - Delayed v/sImmediate Risk - Safety and the Engineer – Designing for Safety – Risk-Benefit Analysis-Accidents.

UNIT V: Engineers’ Duties and Rights:

Concept of Duty - Professional Duties – Collegiality - Techniques for Achieving Collegiality – Senses of Loyalty - Consensus and Controversy - Professional and Individual Rights – Confidential and Proprietary Information - Conflict of Interest-Ethical egoism - Collective Bargaining – Confidentiality - Gifts and Bribes - Problem solving-Occupational Crimes-Industrial Espionage- Price Fixing-Whistle Blowing.

UNIT VI: Global Issues:

Globalization and MNCs –Cross Culture Issues - Business Ethics – Media Ethics - Environmental Ethics – Endangering Lives - Bio Ethics - Computer Ethics - War Ethics – Research Ethics -Intellectual Property Rights.

- Related Cases Shall be dealt where ever necessary.

Outcome:

***It gives a comprehensive understanding of a variety issues that are encountered by every professional in discharging professional duties.**

***It provides the student the sensitivity and global outlook in the contemporary world to fulfill the professional obligations effectively.**

References:

1. Professional Ethics by R. Subramaniam – Oxford Publications, New Delhi.
2. Ethics in Engineering by Mike W. Martin and Roland Schinzinger - Tata McGraw-Hill – 2003.
3. Professional Ethics and Morals by Prof.A.R.Aryasri, DharanikotaSuyodhana - Maruthi Publications.
4. Engineering Ethics by Harris, Pritchard and Rabins, Cengage Learning, New Delhi.
5. Human Values & Professional Ethics by S. B. Gogate, Vikas Publishing House Pvt. Ltd., Noida.
6. Engineering Ethics & Human Values by M.Govindarajan, S.Natarajan and V.S.SenthilKumar-PHI Learning Pvt. Ltd – 2009.
7. Professional Ethics and Human Values by A. Alavudeen, R.Kalil Rahman and M. Jayakumaran – University Science Press.
8. Professional Ethics and Human Values by Prof.D.R.Kiran-Tata McGraw-Hill - 2013
9. Human Values And Professional Ethics by Jayshree Suresh and B. S. Raghavan, S.Chand Publications

UTILIZATION OF ELECTRICAL ENERGY

Preamble:

This course primarily deals with utilization of electrical energy generated from various sources. It is important to understand the technical reasons behind selection of motors for electric drives based on the characteristics of loads. Electric heating, welding and illumination are some important loads in the industry in addition to motor/drives. Another major share of loads is taken by Electric Traction. Utilization of electrical energy in all the above loads is discussed in detail in this course. Demand side management concepts are also introduced as a part of this course.

Learning objectives:

- To understand the operating principles and characteristics of traction motors with respect to speed, temperature, loading conditions.
- To acquaint with the different types of heating and welding techniques.
- To study the basic principles of illumination and its measurement.
- To understand different types of lightning system including design.
- To understand the basic principle of electric traction including speed–time curves of different traction services.
- To understand the method of calculation of various traction system for braking, acceleration and other related parameters, including demand side management of energy.

UNIT – I:

Selection of Motors

Choice of motor, type of electric drives, starting and running characteristics–Speed control–Temperature rise–Applications of electric drives–Types of industrial loads–continuous–Intermittent and variable loads–Load equalization.

UNIT – II:

Electric Heating

Advantages and methods of electric heating–Resistance heating induction heating and dielectric heating – Arc furnaces – Direct and indirect arc furnaces

Electric Welding

Electric welding–Resistance and arc welding–Electric welding equipment–Comparison between AC and DC Welding

UNIT – III:

Illumination fundamentals

Introduction, terms used in illumination–Laws of illumination–Polar curves–Integrating sphere–Lux meter–Discharge lamps, MV and SV lamps – Lumen or flux method of calculation - Sources of light.

UNIT – IV:

Various Illumination Methods

Comparison between tungsten filament lamps and fluorescent tubes–Basic principles of light control– Types and design of lighting and flood lighting–LED lighting, principle of operation, street lighting and domestic lighting – Conservation of energy.

UNIT – V:

Electric Traction – I

System of electric traction and track electrification– Review of existing electric traction systems in India– Special features of traction motor– Mechanics of train movement–Speed–time curves for different services – Trapezoidal and quadrilateral speed time curves–High speed transportation trains.

UNIT – VI:

Electric Traction – II

Calculations of tractive effort– power –Specific energy consumption for given run–Effect of varying acceleration and braking retardation–Adhesive weight and braking, retardation adhesive weight and coefficient of adhesion–Principles of energy efficient motors–Modern traction motors.

Learning Outcomes:

- Able to identify a suitable motor for electric drives and industrial applications
- Able to identify most appropriate heating or welding techniques for suitable applications.
- Able to understand various level of illuminosity produced by different illuminating sources.
- Able to estimate the illumination levels produced by various sources and recommend the most efficient illuminating sources and should be able to design different lighting systems by taking inputs and constraints in view.
- Able to determine the speed/time characteristics of different types of traction motors.
- Able to estimate energy consumption levels at various modes of operation.

Text Books:

1. Utilization of Electric Energy – by E. Openshaw Taylor, Orient Longman.
2. Art & Science of Utilization of electrical Energy – by Partab, Dhanpat Rai & Sons.

Reference Books:

1. Utilization of Electrical Power including Electric drives and Electric traction – by N.V.Suryanarayana, New Age International (P) Limited, Publishers, 1996.
2. Generation, Distribution and Utilization of electrical Energy – by C.L. Wadhwa, New Age International (P) Limited, Publishers, 1997.

LINEAR IC APPLICATIONS**OBJECTIVES**

- To understand the basic operation & performance parameters of differential amplifiers.
- To understand & learn the measuring techniques of performance parameters of OP-AMP
- To learn the linear and non-linear applications of operational amplifiers.
- To understand the analysis & design of different types of active filters using opamps
- To learn the internal structure, operation and applications of different analog ICs
- To Acquire skills required for designing and testing integrated circuits

UNIT I

INTEGRATED CIRCUITS: Differential Amplifier- DC and AC analysis of Dual input Balanced output Configuration, Properties of other differential amplifier configuration (Dual Input Unbalanced Output, Single Ended Input – Balanced/ Unbalanced Output), DC Coupling and Cascade Differential Amplifier Stages, Level translator.

UNIT II

Characteristics of OP-Amps, Integrated circuits-Types, Classification, Package Types and Temperature ranges, Power supplies, Op-amp Block Diagram, ideal and practical Op-amp Specifications, DC and AC characteristics, 741 op-amp & its features, Op-Amp parameters & Measurement, Input & Out put Off set voltages & currents, slew rate, CMRR, PSRR, drift, Frequency Compensation techniques.

UNIT III

LINEAR and NON-LINEAR APPLICATIONS OF OP-AMPS: Inverting and Non-inverting amplifier, Integrator and differentiator, Difference amplifier, Instrumentation amplifier, AC amplifier, V to I, I to V converters, Buffers. Non- Linear function generation, Comparators, Multivibrators, Triangular and Square wave generators, Log and Anti log Amplifiers, Precision rectifiers.

UNIT IV

ACTIVE FILTERS, ANALOG MULTIPLIERS AND MODULATORS: Design & Analysis of Butterworth active filters – 1st order, 2nd order LPF, HPF filters. Band pass, Band reject and all pass filters.
Four Quadrant Multiplier, IC 1496, Sample & Hold circuits.

UNIT V

TIMERS & PHASE LOCKED LOOPS: Introduction to 555 timer, functional diagram, Monostable and Astable operations and applications, Schmitt Trigger; PLL - introduction, block schematic, principles and description of individual blocks, 565 PLL, Applications of PLL – frequency multiplication, frequency translation, AM, FM & FSK demodulators. Applications of VCO (566).

UNIT VI

DIGITAL TO ANALOG AND ANALOG TO DIGITAL CONVERTERS: Introduction, basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, and IC 1408 DAC, Different types of ADCs – parallel Comparator type ADC, counter type ADC, successive approximation ADC and dual slope ADC. DAC and ADC Specifications, Specifications AD 574 (12 bit ADC).

TEXT BOOKS:

1. Linear Integrated Circuits – D. Roy Choudhury, New Age International (p) Ltd, 2nd Edition,2003.
2. Op-Amps & Linear ICs - Ramakanth A. Gayakwad, PHI,1987.
- 3.Operational Amplifiers–C.G. Clayton, Butterworth & Company Publ. Ltd./Elsevier, 1971

REFERENCES :

1. Operational Amplifiers & Linear Integrated Circuits –Sanjay Sharma ;SK Kataria &Sons;2nd Edition,2010
2. Design with Operational Amplifiers & Analog Integrated Circuits – Sergio Franco, McGraw Hill, 1988.
3. OP AMPS and Linear Integrated Circuits concepts and Applications, James M Fiore, Cenage Learning India Ltd.
4. Operational Amplifiers & Linear Integrated Circuits–R.F.Coughlin & Fredrick Driscoll, PHI, 6th Edition.
5. Operational Amplifiers & Linear ICs – David A Bell, Oxford Uni. Press, 3rd Edition

OUTCOMES

- Design circuits using operational amplifiers for various applications.
- Analyze and design amplifiers and active filters using Op-amp.
- Diagnose and trouble-shoot linear electronic circuits.
- Understand the gain-bandwidth concept and frequency response of the amplifier configurations.
- Understand thoroughly the operational amplifiers with linear integrated circuits.

POWER SYSTEM OPERATION AND CONTROL**Preamble:**

This subject deals with Economic operation of Power Systems, Hydrothermal scheduling and modeling of turbines, generators and automatic controllers. It emphasizes on single area and two area load frequency control and reactive power control.

Learning Objectives:

- To understand optimal dispatch of generation with and without losses.
- To study the optimal scheduling of hydro thermal systems.
- To study the optimal unit commitment problem.
- To study the load frequency control for single area system with and without controllers
- .To study the load frequency control for two area system with and without controllers
- To understand the reactive power control and compensation of transmission lines.

UNIT-I:**Economic Operation of Power Systems**

Optimal operation of Generators in Thermal power stations, – Heat rate curve – Cost Curve – Incremental fuel and Production costs – Input–output characteristics – Optimum generation allocation with line losses neglected – Optimum generation allocation including the effect of transmission line losses – Loss Coefficients – General transmission line loss formula.

UNIT-II:**Hydrothermal Scheduling**

Optimal scheduling of Hydrothermal System: Hydroelectric power plant models – Scheduling problems – Short term hydrothermal scheduling problem.

UNIT-III:**Unit Commitment**

Optimal unit commitment problem – Need for unit commitment – Constraints in unit commitment – Cost function formulation – Solution methods – Priority ordering – Dynamic programming.

UNIT-IV:**Load Frequency Control-I**

Modeling of steam turbine – Generator – Mathematical modeling of speed governing system – Transfer function – Modeling of Hydro turbine –Necessity of keeping frequency constant – Definitions of Control area – Single area control system – Block diagram representation of an isolated power system – Steady state analysis – Dynamic response – Uncontrolled case. Proportional plus Integral control of single area and its block diagram representation – Steady state response.

UNIT-V:**Load Frequency Control-II**

Block diagram development of Load Frequency Control of two area system uncontrolled case and controlled case. Tie-line bias control. Load Frequency Control and Economic dispatch control.

UNIT–VI:

Reactive Power Control

Overview of Reactive Power control – Reactive Power compensation in transmission systems – Advantages and disadvantages of different types of compensating equipment for transmission systems – Load compensation – Specifications of load compensator – Uncompensated and compensated transmission lines: Shunt and series compensation – Need for FACTS controllers.

Learning Outcomes:

- Able to compute optimal scheduling of Generators.
- Able to understand hydrothermal scheduling.
- Understand the unit commitment problem.
- Able to understand importance of the frequency.
- Understand importance of PID controllers in single area and two area systems.
- Will understand reactive power control and compensation for transmission line.

Text Books:

1. Electric Energy systems Theory – by O.I.Elgerd, Tata McGraw–hill Publishing Company Ltd., Second edition.
2. Modern Power System Analysis – by I.J.Nagrath&D.P.Kothari Tata McGraw Hill Publishing Company Ltd, 2nd edition.

Reference Books:

1. Power System Analysis and Design by J.Duncan Glover and M.S.Sarma., Thompson, 3rdEdition.
2. Power System Analysis by Grainger and Stevenson, Tata McGraw Hill.
3. Power System Analysis by HadiSaadat – TMH Edition.
4. Power System stability & control, PrabhaKundur, TMH

SWITCHGEAR AND PROTECTION

Preamble:

In order to supply power from generating end to receiving end several equipments are connected in to the system. In order to protect the equipments and components against various operating conditions and over voltages protective devices are required to be installed in the system. Topics specified in this subject deal with various types of protective equipments and their working principle including limitations etc.

Learning objectives:

- To provide the basic principles and operation of various types of circuit breakers.
- To study the classification, operation and application of different types of electromagnetic protective relays.
- To explain protective schemes, for generator and transformers.
- To impart knowledge of various protective schemes used for feeders and bus bars.
- To explain the principle and operation of different types of static relays.
- To study different types of over voltages in a power system and principles of different protective schemes for insulation co-ordination.

UNIT-I:

Circuit Breakers

Miniature Circuit Breaker(MCB)– Elementary principles of arc interruption– Restriking Voltage and Recovery voltages– Restriking phenomenon - RRRV– Average and Max. RRRV– Current chopping and Resistance switching– Introduction to oil circuit breakers– Description and operation of Air Blast– Vacuum and SF₆ circuit breakers– CB ratings and specifications– Concept of Auto reclosing.

UNIT-II:

Electromagnetic Protection

Relay connection – Balanced beam type attracted armature relay - induction disc and induction cup relays–Torque equation - Relays classification–Instantaneous– DMT and IDMT types– Applications of relays: Over current and under voltage relays– Directional relays– Differential relays and percentage differential relays– Universal torque equation– Distance relays: Impedance– Reactance– Mho and offset mho relays– Characteristics of distance relays and comparison.

UNIT-III:

Generator Protection

Protection of generators against stator faults– Rotor faults and abnormal conditions– restricted earth fault and inter turn fault protection– Numerical examples.

Transformer Protection

Protection of transformers: Percentage differential protection– Design of CT's ratio– Buchholz relay protection–Numerical examples.

UNIT-IV:

Feeder and Bus bar Protection

Protection of lines: Over current Protection schemes – PSM,TMS - Numerical examples - Carrier current and three zone distance relay using impedance relays–Protection of bus bars by using Differential protection.

UNIT-V:**Static and Digital Relays**

Static relays: Static relay components– Static over current relays– Static distance relay– Micro processor based digital relays

UNIT-VI:**Protection against over voltage and grounding**

Generation of over voltages in power systems– Protection against lightning over voltages– Valve type and zinc oxide lightning arresters– Insulation coordination– BIL– impulse ratio– Standard impulse test wave– volt-time characteristics– Grounded and ungrounded neutral systems–Effects of ungrounded neutral on system performance– Methods of neutral grounding: Solid–resistance–Reactance–Arcing grounds and grounding Practices.

Learning Outcomes:

- Able to understand the principles of arc interruption for application to high voltage circuit breakers of air, oil, vacuum, SF₆ gas type.
- Ability to understand the working principle and operation of different types of electromagnetic protective relays.
- Students acquire knowledge of faults and protective schemes for high power generator and transformers.
- Improves the ability to understand various types of protective schemes used for feeders and bus bar protection.
- Able to understand different types of static relays and their applications.
- Able to understand different types of over voltages and protective schemes required for insulation co-ordination.

Text Books:

1. Power System Protection and Switchgear by Badari Ram and D.N Viswakarma, TMH Publications
2. Power system protection- Static Relays with microprocessor applications.by T.S.MadhavaRao, TMH

Reference Books:

1. Fundamentals of Power System Protection by Paithankar and S.R. Bhide., PHI, 2003.
2. Art & Science of Protective Relaying – by C R Mason, Wiley Eastern Ltd.
3. Protection and SwitchGear by Bhavesh Bhalja, R.P. Maheshwari, Nilesh G. Chothani, Oxford University Press, 2013

IV Year – I SEMESTER

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**ELECTRICAL MACHINE MODELING
& ANALYSIS
(Elective-I)**

Preamble:

Electrical Motor is one of the main components of electrical drive. So, in order to develop control strategies for electrical motor drives, it is very essential to have complete knowledge on modeling of electrical machines.

Learning Objectives

- Establish unified theory of rotating machines.
- To understand the concept of phase transformation.
- Analyze different electrical machines for improved performance through modification of their characteristics.
- Develop concepts on mathematical modeling of electrical machines.

UNIT – I

Basic concepts of Modeling

Basic Two-pole Machine representation of Commutator machines, 3-phase synchronous machine with and without damper bars and 3-phase induction machine, Kron's primitive Machine-voltage, current and Torque equations.

UNIT – II

DC Machine Modeling

Mathematical model of separately excited D.C motor – Steady State analysis-Transient State analysis-Sudden application of Inertia Load-Transfer function of Separately excited D.C Motor- Mathematical model of D.C Series motor, Shunt motor-Linearization Techniques for small perturbations.

UNIT- III

Reference frame theory & Modeling of single phase Induction Machines

Linear transformation-Phase transformation - three phase to two phase transformation (abc to dq0) and two phase to three phase transformation dq0 to abc -Power equivalence- Mathematical modeling of single phase induction machines.

UNIT – IV

Modeling of three phase Induction Machine

Generalized model in arbitrary reference frame-Electromagnetic torque-Derivation of commonly used Induction machine models- Stator reference frame model-Rotor reference frame model-Synchronously rotating reference frame model-state space model with flux linkages as variables.

UNIT – V

Modeling of Synchronous Machine

Synchronous machine inductances-voltage equations in the rotor's dq0 reference frame-electromagnetic torque-current in terms of flux linkages-three synchronous machine model.

UNIT –IV

Modeling of Special Machines

Modeling of PM Synchronous motor, modeling of BLDC motor, modeling of Switched Reluctance motor.

Learning Outcomes:

After completion of this course, students will be able to

- Develop modeling of dc machine
- Apply mathematical modeling concepts to 3-phase Induction machines
- Design control strategies based on dynamic modeling of 3-ph Induction machines and 3-phase synchronous machine.
- Analyze BLDC Machine and switched reluctance machine based on mathematical modeling of BLDCM and SRM.

Text Books:

1. Generalized theory of Electrical Machinery –P.S.Bimbra- Khanna Publishers.
2. Electric Motor Drives - Modeling, Analysis& control -R.Krishnan- Pearson Publications- 1st edition -2002.

Reference Books:

1. Analysis of Electrical Machinery and Drive systems – P.C.Krause, OlegWasynczuk, Scott D.Sudhoff – Second Edition-IEEE Press.
2. Dynamic simulation of Electric machinery using Matlab / Simulink –CheeMunOng-PHI.
3. Modern Power Electronics and AC Drives-B.K. Bose - PHI

ADVANCED CONTROL SYSTEMS

Preamble:

This subject aims to study state space, describing function, phase plane and stability analysis including controllability and observability. It also deals with modern control and optimal control systems.

Learning Objectives:

- Review of the state space representation of a control system: Formulation of different models from the signal flow graph, diagonalization.
- To introduce the concept of controllability and observability. Design by pole placement technique.
- Analysis of a nonlinear system using Describing function approach and Phase plane analysis.
- The Lyapunov's method of stability analysis of a system.
- Formulation of Euler Lagrange equation for the optimization of typical functionals and solutions.
- Formulation of linear quadratic optimal regulator (LQR) problem by parameter adjustment and solving Riccati equation.

UNIT – I:

State space analysis

State Space Representation – Solution of state equation – State transition matrix, –Canonical forms – Controllable canonical form – Observable canonical form, Jordan Canonical Form.

UNIT – II:

Controllability, observability and design of pole placement

Tests for controllability and observability for continuous time systems – Time varying case – Minimum energy control – Time invariant case – Principle of duality – Controllability and observability form Jordan canonical form and other canonical forms – Effect of state feedback on controllability and observability – Design of state feedback control through pole placement.

UNIT – III:

Describing function analysis

Introduction to nonlinear systems, Types of nonlinearities, describing functions, Introduction to phase–plane analysis.

UNIT–IV:

Stability analysis

Stability in the sense of Lyapunov – Lyapunov's stability and Lyapunov's instability theorems – Direct method of Lyapunov for the linear and nonlinear continuous time autonomous systems.

UNIT–V:

Calculus of variations

Minimization of functional of single function – Constrained minimization – Minimum principle – Control variable inequality constraints – Control and state variable inequality constraints – Euler Lagrange equation.

UNIT –VI:

Optimal control

Linear Quadratic Optimal Regulator (LQR) problem formulation – Optimal regulator design by parameter adjustment (Lyapunov method) – Optimal regulator design by Continuous Time Algebraic Riccati equation (CARE) - Optimal controller design using LQG framework.

Learning Outcomes:

- State space representation of control system and formulation of different state models are reviewed.
- Able to design of control system using the pole placement technique is given after introducing the concept of controllability and observability.
- Able to analyse of nonlinear system using the describing function technique and phase plane analysis.
- Able to analyse the stability analysis using Lyapunov method.
- Minimization of functionals using calculus of variation studied.
- Able to formulate and solve the LQR problem and Riccati equation.

Text Books:

1. Modern Control Engineering – by K. Ogata, Prentice Hall of India, 3rd edition, 1998
2. Automatic Control Systems by B.C. Kuo, Prentice Hall Publication

Reference Books:

1. Modern Control System Theory – by M. Gopal, New Age International Publishers, 2nd edition, 1996
2. Control Systems Engineering by I.J. Nagarath and M.Gopal, New Age International (P) Ltd.
3. Digital Control and State Variable Methods – by M. Gopal, Tata McGraw–Hill Companies, 1997.
4. Systems and Control by Stanislaw H. Zak , Oxford Press, 2003.
5. Optimal control theory: an Introduction by Donald E.Kirk by Dover publications.

PROGRAMMABLE LOGIC CONTROLLERS & APPLICATIONS

Preamble: IN most of the industry applications, computer control is gaining importance, PLC is a industry computer, hence this course PLC makes the students to acquire knowledge required for industry.

Learning Objectives:

- To have knowledge on PLC.
- To acquire the knowledge on programming of PLC.
- To understand different PLC registers and their description.
- To have knowledge on data handling functions of PLC.
- To know how to handle analog signal and converting of A/D in PLC.

Unit I:

Introduction

PLC Basics: PLC system, I/O modules and interfacing, CPU processor, programming equipment, programming formats, construction of PLC ladder diagrams, devices connected to I/O modules.

Unit II:

PLC Programming

PLC Programming: Input instructions, outputs, operational procedures, programming examples using contacts and coils. Digital logic gates, programming in the Boolean algebra system, conversion examples. Ladder diagrams and sequence listings, ladder diagram construction.

Unit III:

Programmable Timers and Counters

Timer instructions – On delay time instruction – Off delay timer instruction – Retentive timer – Counter instructions – Up counter – Down counter - Cascading counters - Incremental encoder – Counter applications – Combining counter and timer functions.

Unit IV:

Program Control Instructions

Master control reset instruction – Jump instructions and sub routines – Immediate input and output instructions.

Unit V:

Other Instructions

Data manipulation – Data transfer operation – Data compare instruction – Data manipulation programs – Numerical data I/O interfaces – Math instructions – Addition, subtraction, multiplication & division instruction – Sequential instructions – Sequence programs – Shift registers – Word shift registers.

Unit VI:

Applications

Control of water level indicator – Alarm monitor - Conveyor motor control – Parking garage – Ladder diagram for process control – PID controller.

Learning Outcomes: After completion of the course, students are able to:

- Understand the PLCs and their I/O modules.
- Develop control algorithms to PLC using ladder logic.
- Manage PLC registers for effective utilization in different applications.
- Design PID controller with PLC.

Text Books:

1. Programmable logic controllers by Frank D. Petruzella- McGraw Hill – 3rd Edition.
2. Programmable Logic Controllers – Principle and Applications by John W. Webb and Ronald A. Reiss, Fifth Edition, PHI

Reference Books:

1. Programmable Logic Controllers – Programming Method and Applications by JR. Hackworth and F.D Hackworth Jr. – Pearson, 2004.
2. Introduction to Programmable Logic Controllers- Gary Dunning-Cengage Learning.
3. Programmable Logic Controllers –W.Bolton-Elsevier publisher

INSTRUMENTATION

(Elective – I)

Preamble:

Electrical and Electronic Instrumentation plays a key role in the industry. With the advancement of technology day to day manual maintenance is replaced by simply monitoring using various instruments. Thus this course plays very important role in overall maintenance of the industry.

Learning Objectives:

- To study various types of signals and their representation.
- To study various types of transducers: Electrical, Mechanical, Electromechanical, Optical etc.
- To study and measure the various types of Non–electrical quantities.
- To study various types of digital voltmeters
- To study the working principles of various types of oscilloscopes and their applications.
- To study various types of signal analyzers.

UNIT–I:

Signals and their representation

Measuring Systems, Performance Characteristics, – Static characteristics – Dynamic Characteristics – Errors in Measurement – Gross Errors – Systematic Errors – Statistical analysis of random errors – Signal and their representation – Standard test, periodic, aperiodic, modulated signal – Sampled data pulse modulation and pulse code modulation.

UNIT–II:

Transducers

Definition of transducers – Classification of transducers – Advantages of Electrical transducers – Characteristics and choice of transducers – Principle operation of resistor, inductor, LVDT and capacitor transducers – LVDT Applications – Strain gauge and its principle of operation – Gauge factor – Thermistors – Thermocouples – Synchros – Piezo electric transducers – Photo diodes.

UNIT–III:

Measurement of Non–Electrical Quantities

Measurement of strain – Gauge Sensitivity – Displacement – Velocity – Angular Velocity – Acceleration – Force – Torque – Measurement of Temperature, Pressure, Vacuum, Flow, Liquid level.

UNIT–IV:

Digital Voltmeters

Digital voltmeters – Successive approximation, ramp, dual–Slope integration continuous balance type – Microprocessor based ramp type – DVM digital frequency meter – Digital phase angle meter.

UNIT–V:

Oscilloscope

Cathode ray oscilloscope – Time base generator – Horizontal and vertical amplifiers – Measurement of phase and frequency – Lissajous patterns – Sampling oscilloscope – Analog and digital type data logger – Transient recorder.

UNIT–VI:

Signal Analyzers

Wave Analyzers – Frequency selective analyzers – Heterodyne – Application of Wave analyzers – Harmonic Analyzers – Total Harmonic distortion – Spectrum analyzers – Basic spectrum analyzers – Spectral displays – Vector impedance meter – Q meter – Peak reading and RMS voltmeters.

Learning Outcomes:

- Able to represent various types of signals .
- Acquire proper knowledge to use various types of Transducers.
- Able to monitor and measure various parameters such as strain, velocity, temperature, pressure etc.
- Acquire proper knowledge and working principle of various types of digital voltmeters.
- Able to measure various parameter like phase and frequency of a signal with the help of CRO.
- Acquire proper knowledge and able to handle various types of signal analyzers.

Text Books:

1. Electronic Instrumentation–by H.S.Kalsi Tata MCGraw–Hill Edition, 1995.
2. A course in Electrical and Electronic Measurements and Instrumentation, A.K. Sawhney, Dhanpatrai& Co.

Reference Books:

1. Measurement and Instrumentation theory and application, Alan S.Morris and Reza Langari, Elsevier
2. Measurements Systems, Applications and Design – by D O Doebelin
3. Principles of Measurement and Instrumentation – by A.S Morris, Pearson/Prentice Hall ofIndia
4. Modern Electronic Instrumentation and Measurement techniques – by A.D HelfrickandW.D.Cooper, Pearson/Prentice Hall of India.
4. Transducers and Instrumentation by D.V.S Murthy, Prentice Hall of India.

IV Year – I
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OPTIMIZATION TECHNIQUES
(Elective – II)

Preamble:

Optimization techniques have gained importance to solve many engineering design problems by developing linear and nonlinear mathematical models. The aim of this course is to educate the student to develop a mathematical model by defining an objective function and constraints in terms of design variables and then apply a particular mathematical programming technique. This course covers classical optimization techniques, linear programming, nonlinear programming and Genetic & Partial Swarm Optimization algorithms.

Learning Objectives:

- To define an objective function and constraint functions in terms of design variables, and then state the optimization problem.
- To state single variable and multi variable optimization problems, without and with constraints.
- To explain linear programming technique to an optimization problem, define slack and surplus variables, by using Simplex method.
- To study and explain nonlinear programming techniques, unconstrained or constrained, and define exterior and interior penalty functions for optimization problems.
- To introduce evolutionary programming techniques.
- To introduce basic principles of Genetic Algorithms and Partial Swarm Optimization methods.

UNIT – I:

Introduction and Classical Optimization Techniques:

Statement of an Optimization problem – design vector – design constraints – constraint surface – objective function – objective function surfaces – classification of Optimization problems.

UNIT – II:

Classical Optimization Techniques

Single variable Optimization – multi variable Optimization without constraints – necessary and sufficient conditions for minimum/maximum – multivariable Optimization with equality constraints. Solution by method of Lagrange multipliers – multivariable Optimization with inequality constraints – Kuhn – Tucker conditions.

UNIT – III:

Linear Programming

Standard form of a linear programming problem – geometry of linear programming problems – definitions and theorems – solution of a system of linear simultaneous equations – pivotal reduction of a general system of equations – motivation to the simplex method – simplex algorithm - Duality in Linear Programming – Dual Simplex method.

UNIT – IV:

Nonlinear Programming:

Unconstrained cases - One – dimensional minimization methods: Classification, Fibonacci method and Quadratic interpolation method - Univariate method, Powell's method and steepest descent method.

Constrained cases - Characteristics of a constrained problem, Classification, Basic approach of Penalty Function method; Basic approaches of Interior and Exterior penalty function methods. Introduction to convex Programming Problem.

UNIT – V:

Introduction to Evolutionary Methods:

Evolutionary programming methods - Introduction to Genetic Algorithms (GA)– Control parameters –Number of generation, population size, selection, reproduction, crossover and mutation – Operator selection criteria – Simple mapping of objective function to fitness function – constraints – Genetic algorithm steps – Stopping criteria –Simple examples.

UNIT – VI:

Introduction to Swarm Intelligence Systems:

Swarm intelligence programming methods - Basic Particle Swarm Optimization – Method – Characteristic features of PSO procedure of the global version – Parameters of PSO (Simple PSO algorithm – Operators selection criteria – Fitness function constraints) – Comparison with other evolutionary techniques – Engineering applications of PSO.

Learning Outcomes:

The student should be able to:

- State and formulate the optimization problem, without and with constraints, by using design variables from an engineering design problem.
- Apply classical optimization techniques to minimize or maximize a multi-variable objective function, without or with constraints, and arrive at an optimal solution.
- Formulate a mathematical model and apply linear programming technique by using Simplex method. Also extend the concept of dual Simplex method for optimal solutions.
- Apply gradient and non-gradient methods to nonlinear optimization problems and use interior or exterior penalty functions for the constraints to derive the optimal solutions.
- Able to apply Genetic algorithms for simple electrical problems.
- Able to solve practical problems using PSO.

Text Books

1. “Engineering optimization: Theory and practice”-by S. S.Rao, New Age International (P) Limited, 3rd edition, 1998.
2. Soft Computing with Matlab Programming by N.P.Padhy&S.P.Simson, Oxford University Press – 2015

Reference Books:

1. “Optimization methods in operations Research and Systems Analysis” by K.V.Mital and C.Mohan, New Age International (P) Limited, Publishers, 3rd edition, 1996.
2. Genetic Algorithms in search, optimization, and Machine Learning by David E.Goldberg,ISBN:978-81-7758-829-3, Pearsonby Dorling Kindersley (India) Pvt. Ltd.
3. “Operations Research: An Introduction” by H.A.Taha, PHI pvt. Ltd., 6th edition.
4. Linear Programming by G.Hadley.

ELECTRIC POWER QUALITY

Preamble:

Power quality is a major problem for utilities and customers. Customers using sensitive critical loads need quality power for proper operation of the electrical equipment. It is important for the student to learn the power quality issues and improvement measures provided by the utility companies. This course covers the topics on voltage and current imperfections, harmonics, voltage regulation, power factor improvement, distributed generation, power quality monitoring and measurement equipment.

Learning Objectives:

- To learn different types of power quality phenomena.
- To identify sources for voltage sag, voltage swell, interruptions, transients, long duration over voltages and harmonics in a power system.
- To describe power quality terms and study power quality standards.
- To learn the principle of voltage regulation and power factor improvement methods.
- To explain the relationship between distributed generation and power quality.
- To understand the power quality monitoring concepts and the usage of measuring instruments.

Unit-I:Introduction

Overview of power quality – Concern about the power quality – General classes of power quality and voltage quality problems – Transients – Long-duration voltage variations – Short-duration voltage variations – Voltage unbalance – Waveform distortion – Voltage fluctuation – Power frequency variations.

Unit-II:Voltage imperfections in power systems

Power quality terms – Voltage sags – Voltage swells and interruptions – Sources of voltage sag, swell and interruptions – Nonlinear loads – IEEE and IEC standards. Source of transient over voltages – Principles of over voltage protection – Devices for over voltage protection – Utility capacitor switching transients.

Unit-III: Voltage Regulation and power factor improvement:

Principles of regulating the voltage – Device for voltage regulation – Utility voltage regulator application – Capacitor for voltage regulation – End-user capacitor application – Regulating utility voltage with distributed resources – Flicker – Power factor penalty – Static VAR compensations for power factor improvement.

Unit- IV: Harmonic distortion and solutions

Voltage distortion vs. Current distortion – Harmonics vs. Transients – Harmonic indices – Sources of harmonics – Effect of harmonic distortion – Impact of capacitors, transformers, motors and meters – Point of common coupling – Passive and active filtering – Numerical problems.

Unit-V: Distributed Generation and Power Quality

Resurgence of distributed generation – DG technologies – Interface to the utility system – Power quality issues and operating conflicts – DG on low voltage distribution networks.

Unit-VI :Monitoring and Instrumentation

Power quality monitoring and considerations – Historical perspective of PQ measuring instruments – PQ measurement equipment – Assessment of PQ measuring data – Application of intelligent systems – PQ monitoring standards.

Learning Outcomes:

At the end of this course the student should be able to

- Differentiate between different types of power quality problems.
- Explain the sources of voltage sag, voltage swell, interruptions, transients, long duration over voltages and harmonics in a power system.
- Analyze power quality terms and power quality standards.
- Explain the principle of voltage regulation and power factor improvement methods.
- Demonstrate the relationship between distributed generation and power quality.
- Explain the power quality monitoring concepts and the usage of measuring instruments.

Textbooks:

1. Electrical Power Systems Quality, Dugan R C, McGranaghan M F, Santoso S, and Beaty H W, Second Edition, McGraw–Hill, 2012, 3rd edition.
2. Electric power quality problems –M.H.J.Bollen IEEE series-Wiley India publications,2011.

Reference Books:

1. Power Quality Primer, Kennedy B W, First Edition, McGraw–Hill, 2000.
2. Understanding Power Quality Problems: Voltage Sags and Interruptions, Bollen M HJ, First Edition, IEEE Press; 2000.
3. Power System Harmonics, Arrillaga J and Watson N R, Second Edition, John Wiley & Sons, 2003.
4. Electric Power Quality control Techniques, W. E. Kazibwe and M. H. Sendaula, Van Nostrand Reinhold, New York.
5. Power Quality c.shankaran, CRC Press, 2001
6. Harmonics and Power Systems –Franciso C.DE LA Rosa–CRC Press (Taylor & Francis)
7. Power Quality in Power systems and Electrical Machines–EwaldF.fuchs, Mohammad A.S. Masoum–Elsevier.

SPECIAL ELECTRICAL MACHINES

Preamble:

This is an advanced course on electrical machines. Students will be exposed to various special machines which are gaining importance in industry. This course covers topics related to principles, performance and applications of these special machines including switched reluctance motors, stepper motors, permanent magnet dc motors and linear motors.

Learning Objective:

- To explain theory of operation and control of switched reluctance motor.
- To explain the performance and control of stepper motors, and their applications.
- To describe the operation and characteristics of permanent magnet dc motor.
- To distinguish between brush dc motor and brush less dc motor.
- To explain the theory of travelling magnetic field and applications of linear motors.

Unit I:

Permanent magnet materials and PMDC motors

Introduction-classification of permanent magnet materials used in electrical machines-minor hysteresis loop and recoil line-Stator frames of conventional dc machines-Development of electronically commutated dc motor from conventional dc motor-Permanent-magnet materials and characteristics-B-H loop and demagnetization characteristics-Temperature effects: reversible and irreversible losses-high temperature effects-reversible losses-Irreversible losses recoverable by magnetization-Mechanical properties, handling and magnetization-Application of permanent magnets in motors-power density-operating temperature range-severity of operation duty.

Unit II:

Stepper Motors

Classification of stepper motors – Hybrid and Variable Reluctance Motor (VRM) - Construction and principle of hybrid type synchronous stepper motor – Different configuration for switching the phase windings control circuits for stepper motors – Open loop and closed loop control of 2-phase hybrid stepping motor.

Construction and principle of operation of Variable Reluctance Motor (VRM) – Single stack and multiple stack – Open loop control of 3- phase VR Stepper Motor- Applications.

Unit III:

Switched Reluctance Motors

Construction – Comparison of conventional and switched reluctance motors – Design of stator and rotor pole arcs – Torque producing principle and torque expression – Different converter configurations for SRM – Drive and power circuits for SRM – Position sensing of rotor – Applications of SRM.

Unit IV:

Square Wave Permanent Magnet Brushless DC Motor

Types of constructions – Surface mounted and interior type permanent magnet – Principle of operation of BLDC motor. Torque and EMF equations – Torque speed characteristics – Performance and efficiency- Square wave brushless motors with 120° and 180° magnetic areas commutation.

Unit V:**Sine wave Permanent Magnet Brushless Motor**

Torque and EMF equations – Phasor Diagram – Circle diagram – Torque/speed characteristics – Comparison between square wave and sine wave permanent magnet motors - Applications.

Unit VI:**Linear Induction Motors (LIM)**

Construction– principle of operation–Double sided LIM from rotating type Induction Motor – Schematic of LIM drive for traction – Development of one sided LIM with back iron-equivalent circuit of LIM.

Learning Outcomes:

The student should be able to

- Distinguish between brush dc motor and brush less dc motor.
- Explain the performance and control of stepper motors, and their applications.
- Explain theory of operation and control of switched reluctance motor.
- Explain the theory of travelling magnetic field and applications of linear motors.
- Understand the significance of electrical motors for traction drives.

Text Books:

1. Brushless Permanent magnet and reluctance motor drives, Clarendon press, T.J.E. Miller, 1989, Oxford.
2. Special electrical Machines, K.VenkataRatnam, University press, 2009, New Delhi.

ELECTRICAL SIMULATION LAB

Learning objectives:

- To simulate integrator circuit, differentiator circuit, Boost converter, Buck converter, full convertor and PWM inverter.
- To simulate transmission line by incorporating line, load and transformer models.
- To perform transient analysis of RLC circuit and single machine connected to infinite bus(SMIB).

Following experiments are to be conducted:

1. Simulation of transient response of RLC circuits
 - a. Response to pulse input
 - b. Response to step input
 - c. Response to sinusoidal input
2. Analysis of three phase circuit representing the generator transmission line and load. Plot three phase currents & neutral current .
3. Simulation of single–phase full converter using RLE loads and single phase AC voltage controller using RL loads
4. Plotting of Bode plots, root locus and nyquist plots for the transfer functions of systems up to 5th order
5. Simulation of Boost and Buck converters.
6. Integrator & Differentiator circuits using op–amp.
7. Simulation of D.C separately excited motor using transfer function approach.

Any 2 of the following experiments are to be conducted:

1. Modeling of transformer and simulation of lossy transmission line.
2. Simulation of single phase inverter with PWM control.
3. Simulation of three phase full converter using MOSFET and IGBTs.
4. Transient analysis of single machine connected to infinite bus(SMIB).

Learning outcomes:

- Able to simulate integrator circuit, differentiator circuit, Boost converter, Buck converter, full convertor and PWM inverter.
- Able to simulate transmission line by incorporating line, load and transformer models.
- Able to perform transient analysis of RLC circuit and single machine connected to infinite bus(SMIB).

Reference Books:

1. “Simulation of Power Electronic Circuit“,byM.B.patil, V.Ramanarayan, V.T.Ranganathan.Narosha,2009.
2. Pspice for circuits and electronics using PSPICE – by M.H.Rashid, M/s PHI Publications
3. Pspice A/D user`s manual – Microsim, USA
4. Pspice reference guide – Microsim, USA
5. MATLAB user`s manual – Mathworks, USA
6. MATLAB – control system tool box – Mathworks, USA
7. SIMULINK user`s manual – Mathworks, USA
8. EMTP User`s Manual.
9. SEQUEL– A public domain circuit simulator available at www.ee.iitb.ac.in/~sequel

POWER SYSTEMS LAB**Learning Objectives:**

To impart the practical knowledge of functioning of various power system components and determination of various parameters and simulation of load flows, transient stability, LFC and Economic dispatch.

Any 10 of the Following experiments are to be conducted:

1. Sequence impedances of 3 phase Transformer.
2. Sequence impedances of 3 phase Alternator by Fault Analysis.
3. Sequence impedances of 3 phase Alternator by Direct method.
4. ABCD parameters of Transmission line.
5. Power Angle Characteristics of 3phase Alternator with infinite bus bars.
6. Dielectric strength of Transformer oil.
7. Calibration of Tong Tester.
- 8 Load flow studies using Gauss-seidel method
9. Load flow studies using N-R method..
10. Transient Stability Analysis
11. Load frequency control with &without control
12. Load frequency control with control
13. Economic load dispatch with & without losses
14. Economic load dispatch with losses.

Learning Outcomes:

The student is able to determine the parameters of various power system components which are frequently occur in power system studies and he can execute energy management systems functions at load dispatch center.

DIGITAL CONTROL SYSTEMS**Preamble:**

In recent years digital controllers have become popular due to their capability of accurately performing complex computations at high speeds and versatility in leading nonlinear control systems. In this context, this course focuses on the analysis and design of digital control systems.

Learning objectives:

- To understand the concepts of digital control systems and assemble various components associated with it. Advantages compared to the analog type.
- The theory of z-transformations and application for the mathematical analysis of digital control systems.
- To represent the discrete-time systems in state-space model and evaluation of state transition matrix.
- To examine the stability of the system using different tests.
- To study the conventional method of analyzing digital control systems in the w-plane.
- To study the design of state feedback control by “the pole placement method.”

UNIT – I:**Introduction and signal processing**

Introduction to analog and digital control systems – Advantages of digital systems – Typical examples – Signals and processing – Sample and hold devices – Sampling theorem and data reconstruction – Frequency domain characteristics of zero order hold.

UNIT-II:**z-transformations**

z-Transforms – Theorems – Finding inverse z-transforms – Formulation of difference equations and solving – Block diagram representation – Pulse transfer functions and finding open loop and closed loop responses.

UNIT-III:**State space analysis and the concepts of Controllability and observability**

State space representation of discrete time systems – State transition matrix and methods of evaluation – Discretization of continuous – Time state equations – Concepts of controllability and observability – Tests(without proof).

UNIT – IV:**Stability analysis**

Mapping between the s-Plane and the z-Plane – Primary strips and Complementary strips – Stability criterion – Modified Routh’s stability criterion and Jury’s stability test.

UNIT – V:**Design of discrete-time control systems by conventional methods**

Transient and steady state specifications – Design using frequency response in the w-plane for lag and lead compensators – Root locus technique in the z-plane.

UNIT – VI:

State feedback controllers:

Design of state feedback controller through pole placement – Necessary and sufficient conditions – Ackerman's formula.

Learning outcomes:

- The students learn the advantages of discrete time control systems and the “know how” of various associated accessories.
- The learner understand z-transformations and their role in the mathematical analysis of different systems (like Laplace transforms in analog systems).
- The stability criterion for digital systems and methods adopted for testing the same are explained.
- Finally, the conventional and state space methods of design are also introduced.

Text Book:

1. Discrete-Time Control systems – K. Ogata, Pearson Education/PHI, 2nd Edition.
2. Digital Control and State Variable Methods by M.Gopal, TMH, 4th Edition.

Reference Books:

1. Digital Control Systems, Kuo, Oxford University Press, 2nd Edition, 2003.

H.V.D.C. TRANSMISSION**Preamble:**

This subject deals with the importance of HVDC transmission, analysis of HVDC converters, Faults and protections, Harmonics and Filters. It also deals with Reactive power control and Power factor improvements of the system.

Learning Objectives:

- To Understand basic concepts of HVDC Transmission.
- To analyze the converter configuration.
- To Know the control of converter and HVDC Transmission.
- To Understand the significance of reactive power control and AC/Dc load flow.
- To Know different converter faults, protection and effect of harmonics.
- To leave low pass and high pass filters.

UNIT – I**Basic Concepts**

Economics & Terminal equipment of HVDC transmission systems: Types of HVDC Links – Apparatus required for HVDC Systems – Comparison of AC & DC Transmission, Application of DC Transmission System – Planning & Modern trends in D.C. Transmission.

UNIT – II**Analysis of HVDC Converters**

Choice of converter configuration – analysis of Graetz – characteristics of 6 pulse & 12 pulse converters – Cases of two 3 phase converters in star – star mode – their performance.

UNIT – III**Converter & HVDC System Control**

Principal of DC Link Control – Converters Control Characteristics – Firing angle control – Current and extinction angle control – Effect of source inductance on the system - Starting and stopping of DC link - Power Control.

UNIT-IV**Reactive Power Control in HVDC**

Reactive Power Requirements in steady state-Conventional control strategies-Alternate control strategies-sources of reactive power-AC Filters – shunt capacitors-synchronous condensers.

Power Flow Analysis In AC/DC Systems

Modelling of DC Links-DC Network-DC Converter-Controller Equations-Solution of DC loadflow –solution of AC-DC Power flow-Simultaneous method-Sequential method.

UNIT-V**Converter Fault & Protection**

Converter faults – protection against over current and over voltage in converter station – surge arresters –smoothing reactors – DC breakers –Audible noise-space charge field-corona effects on DC lines-Radio interference.

Harmonics

Generation of Harmonics –Characteristics harmonics, calculation of AC Harmonics, Non-Characteristics harmonics, adverse effects of harmonics – Calculation of voltage & Current harmonics – Effect of Pulse number on harmonics.

UNIT-VI

Filters

Types of AC filters, Design of Single tuned filters – Design of High pass filters.

Learning Outcomes:

The Student shall be able to

- Learn different types of HVDC levels and basic concepts
- Know the operation of converters
- Acquire control concept of reactive power control and AC/DC load flow.
- Understand converter faults, protection and harmonic effects
- Design low pass and high pass filters

Text Books:

1. HVDC Power Transmission Systems: Technology and system Interactions – by K.R.Padiyar, New Age International (P) Limited, and Publishers.
2. HVDC Transmission by S.Kamakshaiah and V.Kamaraju-Tata McGraw-Hill

Reference Books:

1. HVDC Transmission – J.Arrillaga.
2. Direct Current Transmission – by E.W.Kimbark, John Wiley & Sons.
3. Power Transmission by Direct Current – by E.Uhlmann, B.S.Publications.

ELECTRICAL DISTRIBUTION SYSTEMS

Preamble:

This subject deals with the general concept of distribution system, substations and feeders as well as discusses distribution system analysis, protection and coordination, voltage control and power factor improvement.

Learning Objectives

- To study different factors of Distribution system.
- To study and design the substations and distribution systems.
- To study the concepts of voltage drop and power loss.
- To study the distribution system protection and its coordination.
- To study the effect of compensation for power factor improvement.
- To study the effect of voltage control on distribution system.

UNIT – I:

General Concepts

Introduction to distribution systems, Load modeling and characteristics – Coincidence factor – Contribution factor loss factor – Relationship between the load factor and loss factor – Classification of loads (Residential, commercial, Agricultural and Industrial).

UNIT – II:

Substations

Location of substations: Rating of distribution substation – Service area with 'n' primary feeders – Benefits and methods of optimal location of substations..

Distribution Feeders

Design Considerations of distribution feeders: Radial and loop types of primary feeders – Voltage levels – Feeder loading – Basic design practice of the secondary distribution system.

UNIT – III:

System Analysis

Voltage drop and power-loss calculations: Derivation for voltage drop and power loss in lines – Uniformly distributed loads and non-uniformly distributed loads – Numerical problems - Three phase balanced primary lines.

UNIT – IV:

Protection

Objectives of distribution system protection – Types of common faults and procedure for fault calculations for distribution system – Protective devices: Principle of operation of fuses – Circuit reclosures – Line sectionalizes and circuit breakers.

Coordination

Coordination of protective devices: General coordination procedure – Various types of coordinated operation of protective devices - Residual Current Circuit Breaker

UNIT – V:

Compensation for Power Factor Improvement

Capacitive compensation for powerfactor control – Different types of power capacitors – shunt and series capacitors – Effect of shunt capacitors (Fixed and switched) – Power factor correction – Capacitor allocation – Economic justification – Procedure to determine the best capacitor location – Numerical problems.

UNIT – VI:

Voltage Control

Voltage Control: Equipment for voltage control – Effect of series capacitors – Effect of AVB/AVR – Line drop compensation – Numerical problems.

Learning Outcomes:

- Able to understand various factors of distribution system.
- Able to design the substation and feeders.
- Able to determine the voltage drop and power loss
- Able to understand the protection and its coordination.
- Able to understand the effect of compensation for p.f improvement.
- Able to understand the effect of voltage control.

Text Book:

1. “Electric Power Distribution system, Engineering” – by TuranGonen, McGraw–hill Book Company.

Reference Books:

1. Electrical Distribution Systems by Dale R.Patrick and Stephen W.Fardo, CRC press
2. Electric Power Distribution – by A.S. Pabla, Tata McGraw–hill Publishing company, 4th edition, 1997.
3. Electrical Power Distribution Systems by V.Kamaraju, Right Publishers.

HIGH VOLTAGE ENGINEERING (ELECTIVE – III)

Preamble:

With the growth of power, HV power transmission has become an important subject. The performance of generating equipment requires knowledge of different phenomena occurring at higher voltage. Thus evaluations of various insulating materials are required for protection of HV equipments. Keeping this in view the course is designed to understand various phenomena related to breakdown study and withstand characteristics of insulating materials. The course also describes the generation and measurement of DC, AC and Impulse voltages as well various testing techniques.

Learning Objectives:

- To understand electric field distribution and computation in different configuration of electrode systems.
- To understand HV breakdown phenomena in gases, liquids and solids dielectrics.
- To acquaint with the generating principle of operation and design of HVDC, AC and Impulse voltages and currents.
- To understand various techniques of AC, DC and Impulse measurement of high voltages and currents.
- To understand the insulating characteristics of dielectric materials.
- To understand the various testing techniques of HV equipments.

UNIT-I:

Introduction to High Voltage Technology

Electric Field Stresses – Uniform and non-uniform field configuration of electrodes – Estimation and control of electric Stress – Numerical methods for electric field computation.

UNIT-II:

Break down phenomenon in gaseous, liquid and solid insulation

Gases as insulating media – Collision process – Ionization process – Townsend's criteria of breakdown in gases – Paschen's law – Liquid as Insulator – Pure and commercial liquids – Breakdown in pure and commercial liquid – Intrinsic breakdown – Electromechanical breakdown – Thermal breakdown – Breakdown of solid dielectrics, composite dielectrics used in practice.

UNIT-III:

Generation of High voltages and High currents

Generation of high DC voltages – Generation of high alternating voltages – Generation of impulse voltages and currents – Tripping and control of impulse generators.

UNIT-IV:

Measurement of high voltages and High currents

Measurement of high AC, DC and Impulse voltages – Voltages and measurement of high currents – Direct, alternating and Impulse.

UNIT-V:

Non-destructive testing of material and electrical apparatus

Measurement of DC resistivity – Measurement of dielectric constant and loss factor – Partial discharge measurements.

UNIT-VI:

High voltage testing of electrical apparatus

Testing of insulators and bushings – Testing of isolators and circuit breakers – Testing of cables – Testing of transformers – Testing of surge arresters – Radio interference measurements.

Learning Outcomes:

- To be acquainted with the performance of high voltages with regard to different configurations of electrode systems.
- To be able to understand theory of breakdown and withstand phenomena of all types of dielectric materials.
- To acquaint with the techniques of generation of AC,DC and Impulse voltages.
- To be able to apply knowledge for measurement of high voltage and high current AC,DC and Impulse.
- To be in a position to measure dielectric property of material used for HV equipment.
- To know the techniques of testing various equipment's used in HV engineering.

Text Books:

1. High Voltage Engineering: Fundamentals by E.Kuffel, W.S.Zaengl, J.Kuffel by Elsevier, 2nd Edition.
2. High Voltage Engineering and Technology by Ryan, IET Publishers.

Reference Books:

1. High Voltage Engineering by M.S.Naidu and V. Kamaraju – TMH Publications, 3rd Edition
2. High Voltage Engineering by C.L.Wadhwa, New Age Internationals (P) Limited, 1997.
3. High Voltage Insulation Engineering by RavindraArora, Wolfgang Mosch, New Age International (P)Limited,1995.

FLEXIBLE ALTERNATING CURRENT TRANSMISSION SYSTEMS

Preamble:

Flexible Alternating Current Transmission System controllers have become a part of modern power system. It is important for the student to understand the principle of operation of series and shunt compensators by using power electronics. As the heart of many power electronic controllers is a voltage source converter (VSC), the student should be acquainted with the operation and control of VSC. Two modern power electronic controllers are also introduced.

Learning Objectives:

- To learn the basics of power flow control in transmission lines using FACTS controllers
- To explain operation and control of voltage source converter.
- To understand compensation methods to improve stability and reduce power oscillations of a power system.
- To learn the method of shunt compensation using static VAR compensators.
- To learn the methods of compensation using series compensators
- To explain operation of Unified Power Flow Controller (UPFC).

Unit-I:

Introduction to FACTS

Power flow in an AC System – Loading capability limits – Dynamic stability considerations – Importance of controllable parameters – Basic types of FACTS controllers – Benefits from FACTS controllers – Requirements and characteristics of high power devices – Voltage and current rating – Losses and speed of switching – Parameter trade-off devices.

Unit-II:

Voltage source and Current source converters

Concept of voltage source converter(VSC) – Single phase bridge converter – Square-wave voltage harmonics for a single-phase bridge converter – Three-phase full wave bridge converter– Three-phase current source converter – Comparison of current source converter with voltage source converter.

Unit-III:

Shunt Compensators-1

Objectives of shunt compensation – Mid-point voltage regulation for line segmentation – End of line voltage support to prevent voltage instability – Improvement of transient stability – Power oscillation damping.

Unit-IV:

Shunt Compensators-2

Thyristor Switched Capacitor(TSC)–Thyristor Switched Capacitor – Thyristor Switched Reactor (TSC–TCR). Static VAR compensator(SVC) and Static Compensator(STATCOM): The regulation and slope transfer function and dynamic performance – Transient stability enhancement and power oscillation damping– Operating point control and summary of compensation control.

Unit V:**Series Compensators**

Static series compensators: Concept of series capacitive compensation – Improvement of transient stability – Power oscillation damping – Functional requirements. GTO thyristor controlled Series Capacitor (GSC) – Thyristor Switched Series Capacitor (TSSC) and Thyristor Controlled Series Capacitor (TCSC).

Unit-VI:**Combined Controllers**

Schematic and basic operating principles of Unified Power Flow Controller (UPFC).– Application on transmission lines.

Learning Outcomes:

The student should be able to

- Understand power flow control in transmission lines using FACTS controllers.
- Explain operation and control of voltage source converter.
- Analyze compensation methods to improve stability and reduce power oscillations in the transmission lines.
- Explain the method of shunt compensation using static VAR compensators.
- Understand the methods of compensations using series compensators.
- Explain operation of Unified Power Flow Controller (UPFC).

Text Books:

1. “Understanding FACTS” N.G.Hingorani and L.Guygi, IEEE Press.Indian Edition is available:—Standard Publications, 2001.

Reference Books:

1. “Flexible ac transmission system (FACTS)” Edited by Yong Hue Song and Allan T Johns, Institution of Electrical Engineers, London.
2. Thyristor-based FACTS Controllers for Electrical Transmission Systems, by R.MohanMathur and Rajiv k.Varma, Wiley

POWER SYSTEM REFORMS (Elective III)

Preamble:

This course introduces the concepts and issues of power system reforms and aims at computation of Available Transfer Capability (ATC), Congestion Management, Electricity Pricing, Ancillary services Management and Power system operation in competitive environment

Learning Objectives:

- To study fundamentals of power system deregulation and restructuring.
- To study available transfer capability.
- To study congestion management
- To study various electricity pricing methods.
- To study operation of power system in deregulated environment.
- To study importance of Ancillary services management.

UNIT-I

Over view of key issues in electric utilities

Introduction – Restructuring models – Independent system operator (ISO) – Power Exchange – Market operations – Market Power – Standard cost – Transmission Pricing – Congestion Pricing – Management of Inter zonal/Intra zonal Congestion.

UNIT-II

Available Transfer Capability (ATC)

Structure of OASIS – Processing of Information – Transfer capability on OASIS – Definitions Transfer Capability Issues – ATC – TTC – TRM – CBM calculations – Methodologies to calculate ATC.

UNIT-III

Congestion Management

Introduction to congestion management – Methods to relieve congestion

UNIT-IV

Electricity Pricing:

Introduction – Electricity price volatility electricity price indexes – Challenges to electricity pricing – Construction of forward price curves – Short-time price forecasting.

UNIT-V

Power system operation in competitive environment:

Introduction – Operational planning activities of ISO – The ISO in pool markets – The ISO in bilateral markets – Operational planning activities of a GENCO.

UNIT-VI

Ancillary Services Management:

Introduction – Reactive power as an ancillary service – A review – Synchronous generators as ancillary service providers.

Learning Outcomes:

- Will understand importance of power system deregulation and restructuring.
- Able to compute Available Transfer Capability.
- Will understand transmission congestion management.
- Able to compute electricity pricing in deregulated environment.
- Will be able to understand power system operation in deregulated environment.
- Will understand importance of ancillary services.

Text Books:

1. Kankar Bhattacharya, Math H.J. Boller, JaapE.Daalder, 'Operation of Restructured Power System' Kluwer Academic Publisher – 2001.
2. Mohammad Shahidehpour, and Muwaffaqalomoush, – “Restructured electrical Power systems” Marcel Dekker, Inc. 2001

Reference Books:

1. Loi Lei Lai; “Power system Restructuring and Deregulation”, Jhon Wiley & Sons Ltd., England.
2. Electrical Power Distribution Case studies from Distribution reform, upgrades and Management (DRUM) Program, by USAID/India, TMH

COURSE STRUCTURE AND SYLLABUS

For

MECHANICAL ENGINEERING

(Applicable for batches admitted from 2016-2017)



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India

I Year - I Semester

S. No.	Subjects	L	T	P	Credits
1-HS	English – I	4	--	--	3
2-BS	Mathematics - I	4	--	--	3
3-ES	Engineering Chemistry	4	--	--	3
4-BS	Engineering Mechanics	4	--	--	3
5-BS	Computer Programming	4	--	--	3
6-ES	Environmental Studies	4	--	--	3
7-HS	Engineering/Applied Chemistry Laboratory	--	--	3	2
8-BS	English - Communication Skills Lab - I	--	--	3	2
9-ES	Computer Programming Lab	--	--	3	2
Total Credits					24

I Year - II Semester

S. No.	Subjects	L	T	P	Credits
1-HS	English – II	4	--	--	3
2-BS	Mathematics – II (Mathematical Methods)	4	--	--	3
3-BS	Mathematics – III	4	--	--	3
4-ES	Engineering Physics	4	--	--	3
5-HS	Basic Electrical and Electronics Engineering	4	--	--	3
6-ES	Engineering Drawing	4	--	--	3
7-BS	English - Communication Skills Lab - II	--	--	3	2
8-HS	Engineering /Applied Physics Lab	--	--	3	2
9-ES	Engineering /Applied Physics – Virtual Labs - Assignments	--	--	2	--
10	Engg.Workshop & IT Workshop	--	--	3	2
Total Credits					24

II Year - I Semester

S. No.	Subjects	L	T	P	Credits
1	Metallurgy & Materials Science	4	--	--	3
2	Mechanics of Solids	4	--	--	3
3	Thermodynamics	4	--	--	3
4	Managerial Economics & Financial Analysis	4	--	--	3
5	Fluid Mechanics & Hydraulic Machines	4	--	--	3
6	Computer Aided Engineering Drawing Practice	3	3	--	3
7	Electrical & Electronics Engg. Lab	--	--	3	2
8	Mechanics of Solids & Metallurgy Lab	--	--	3	2
Total Credits					22

II Year - II Semester

S. No.	Subjects	L	T	P	Credits
1	Kinematics of Machinery	4	--	--	3
2	Thermal Engineering -I	4	--	--	3
3	Production Technology	4	--	--	3
4	Design of Machine Members -I	4	--	--	3
5	Machine Drawing	3	3	--	3
6	Industrial Engineering and Management	4	--	--	3
7	Fluid Mechanics & Hydraulic Machines Lab	--	--	3	2
8	Production Technology Lab	--	--	3	2
Total Credits					22

III Year - I Semester

S. No.	Subjects	L	T	P	Credits
1	Dynamics of Machinery	4	--	--	3
2	Metal Cutting & Machine Tools	4	--	--	3
3	Design of Machine Members–II	4	--	--	3
4	Operations Research	4	--	--	3
5	Thermal Engineering -II	4	--	--	3
6	Theory of Machines Lab	--	--	3	2
7	Machine Tools Lab	--	--	3	2
8	Thermal Engineering Lab	--	--	3	2
9	IPR & Patents	--	2	--	--
Total Credits					21

III YEAR - II Semester

S. No.	Subjects	L	T	P	Credits
1	Metrology	4	--	--	3
2	Instrumentation & Control Systems	4	--	--	3
3	Refrigeration & Air-conditioning	4	--	--	3
4	Heat Transfer	4	--	--	3
5	OPEN ELECTIVE 1. Entrepreneurship 2. Data Base Management System 3. Waste Water Management 4. Computer Graphics 5. Industrial Robotics 6. Green Engineering Systems	4	--	--	3
6	Heat Transfer Lab	--	--	3	2
7	Metrology & Instrumentation Lab	--	--	3	2
8	Computational Fluid Dynamics Lab	--	--	3	2
9MC	Professional Ethics & Human Values	--	3	--	--
Total Credits					21

IV Year - I Semester

S. NO	Subjects	L	T	P	Credits
1	Mechatronics	4	--	--	3
2	CAD/CAM	4	--	--	3
3	Finite Element Methods	4	--	--	3
4	Power Plant Engineering	4	--	--	3
5	Elective I 1. Computational Fluid Dynamics 2. Condition Monitoring 3. Additive Manufacturing	4	--	--	3
6	Elective II 1. Advanced Materials 2. Design for Manufacture 3. Gas Dynamics & Jet Propulsion	4	--	--	3
7	CAD/CAM Lab	--	--	2	2
8	Mechatronics Lab	--	--	2	2
Total Credits					22

IV Year - II Semester

S. No.	Subjects	L	T	P	Credits
1	Production Planning and Control	4	--	--	3
T 2	Unconventional Machining Processes	4	--	--	3
3	Automobile Engineering	4	--	--	3
4	Elective III 1. Thermal Equipment Design 2. Non Destructive Evaluation 3. Quality and Reliability Engineering	4	--	--	3
5	Seminar	--	3	--	2
6	Project	--	--	--	10
Total Credits					24

Total Course Credits = 48+44 + 42 + 46 = 180

SYLLABUS

I Year - I Semester

L	T	P	C
4	0	0	3

ENGLISH - I

Introduction:

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training the students to acquire communicative competence, the syllabus has been designed to develop linguistic and communicative competence of the students of Engineering.

As far as the detailed Textbooks are concerned, the focus should be on the skills of listening, speaking, reading and writing. The non-detailed Textbooks are meant for extensive reading for pleasure and profit.

Thus the stress in the syllabus is primarily on the development of communicative skills and fostering of ideas.

Objectives:

1. To improve the language proficiency of the students in English with emphasis on LSRW skills.
2. To enable the students to study and comprehend the prescribed lessons and subjects more effectively relating to their theoretical and practical components.
3. To develop the communication skills of the students in both formal and informal situations.

LISTENING SKILLS:

Objectives:

1. To enable the students to appreciate the role of listening skill and improve their pronunciation.
2. To enable the students to comprehend the speech of people belonging to different backgrounds and regions.
3. To enable the students to listen for general content, to fill up information and for specific information.

SPEAKING SKILLS:

Objectives:

1. To make the students aware of the importance of speaking for their personal and professional communication.
2. To enable the students to express themselves fluently and accurately in social and professional success.
3. To help the students describe objects, situations and people.
4. To make the students participate in group activities like roleplays, discussions and debates.
5. To make the students participate in Just a Minute talks.

READING SKILLS:

Objectives:

1. To enable the students to comprehend a text through silent reading.
2. To enable the students to guess the meanings of words, messages and inferences of texts in given contexts.
3. To enable the students to skim and scan a text.
4. To enable the students to identify the topic sentence.
5. To enable the students to identify discourse features.
6. To enable the students to make intensive and extensive reading.

WRITING SKILLS:

Objectives:

1. To make the students understand that writing is an exact formal skills.
2. To enable the students to write sentences and paragraphs.
3. To make the students identify and use appropriate vocabulary.
4. To enable the students to narrate and describe.
5. To enable the students capable of note-making.
6. To enable the students to write coherently and cohesively.
7. To make the students to write formal and informal letters.
8. To enable the students to describe graphs using expressions of comparison.
9. To enable the students to write technical reports.

Methodology:

1. The class are to be learner-centered where the learners are to read the texts to get a comprehensive idea of those texts on their own with the help of the peer group and the teacher.
2. Integrated skill development methodology has to be adopted with focus on individual language skills as per the tasks/exercise.
3. The tasks/exercises at the end of each unit should be completed by the learners only and the teacher intervention is permitted as per the complexity of the task/exercise.
4. The teacher is expected to use supplementary material wherever necessary and also generate activities/tasks as per the requirement.
5. The teacher is permitted to use lecture method when a completely new concept is introduced in the class.

Assessment Procedure: Theory

1. The formative and summative assessment procedures are to be adopted (mid exams and end semester examination).
2. Neither the formative nor summative assessment procedures should test the memory of the content of the texts given in the textbook. The themes and global comprehension of the units in the present day context with application of the language skills learnt in the unit are to be tested.
3. Only new unseen passages are to be given to test reading skills of the learners. Written skills are to be tested from sentence level to essay level. The communication formats—emails, letters and reports-- are to be tested along with appropriate language and expressions.
4. Examinations:

I mid exam + II mid exam (15% for descriptive tests+10% for online tests)= 25%

(80% for the best of two and 20% for the other)

Assignments= 5%

End semester exams=70%

5. Three take home assignments are to be given to the learners where they will have to read texts from the reference books list or other sources and write their gist in their own words.

The following text books are recommended for study in I B.Tech I Semester (Common for all branches)and I B.Pharma I Sem of JNTU Kakinada from the academic year 2016-17

(R-16 Regualtions)

DETAILED TEXTBOOK:

ENGLISH FOR ENGINEERS AND TECHNOLOGISTS, Published by **Orient Blackswan Pvt Ltd**

NON-DETAILED TEXTBOOK:

PANORAMA: A COURSE ON READING, Published by **Oxford University Press India**

The course content along with the study material is divided into six units.

UNIT I:

1. 'Human Resources' from English for Engineers and Technologists.

OBJECTIVE:

To develop human resources to serve the society in different ways.

OUTCOME:

The lesson motivates the readers to develop their knowledge different fields and serve the society accordingly.

2. 'An Ideal Family' from Panorama: A Course on Reading

OBJECTIVE:

To develop extensive reading skill and comprehension for pleasure and profit.

OUTCOME:

Acquisition of writing skills

UNIT 2:

1. ' Transport: Problems and Solutions' from English for Engineers and Technologists.

OBJECTIVE:

To highlight road safety measures whatever be the mode of transport.

OUTCOME:

The lesson motivates the public to adopt road safety measures.

2. 'War' from 'Panorama : A Course on Reading'

OBJECTIVE:

To develop extensive reading skill and comprehension for pleasure and profit.

OUTCOME:

Acquisition of writing skills

UNIT 3:

1. 'Evaluating Technology' from English for Engineers and Technologists.

OBJECTIVE:

To highlight the advantages and disadvantages of technology.

OUTCOME:

The lesson creates an awareness in the readers that mass production is ultimately detrimental to biological survival.

2. 'The Verger' from 'Panorama : A Course on Reading'

OBJECTIVE:

To develop extensive reading skill and comprehension for pleasure and profit.

OUTCOME:

Acquisition of writing skills

UNIT 4:

1. 'Alternative Sources of Energy' from English for Engineers and Technologists.

OBJECTIVE:

To bring into focus different sources of energy as alternatives to the depleting sources.

OUTCOME:

The lesson helps to choose a source of energy suitable for rural India.

2. 'The Scarecrow' from Panorama : A Course on Reading

OBJECTIVE:

To develop extensive reading skill and comprehension for pleasure and profit.

OUTCOME:

Acquisition of writing skills

UNIT 5:

1. 'Our Living Environment' from English for Engineers and Technologists.

OBJECTIVE:

To highlight the fact that animals must be preserved because animal life is precious.

OUTCOME:

The lesson creates an awareness in the reader as to the usefulness of animals for the human society.

2. 'A Village Host to Nation' from Panorama: A Course on Reading

OBJECTIVE:

To develop extensive reading skill and comprehension for pleasure and profit.

OUTCOME:

Acquisition of writing skills

UNIT 6:

1. ' Safety and Training' from English for Engineers and Technologists.

OBJECTIVE:

To highlight the possibility of accidents in laboratories, industries and other places and to follow safety measures.

OUTCOME:

The lesson helps in identifying safety measures against different varieties of accidents at home and in the workplace.

2. 'Martin Luther King and Africa' from Panorama : A Course on Reading

OBJECTIVE:

To develop extensive reading skill and comprehension for pleasure and profit.

OUTCOME:

Acquisition of writing skills

NOTE:

All the exercises given in the prescribed lessons in both detailed and non-detailed textbooks relating to the theme and language skills must be covered.

OVERALL COURSE OUTCOME:

1. Using English languages, both written and spoken, competently and correctly.
2. Improving comprehension and fluency of speech.
3. Gaining confidence in using English in verbal situations.

MODEL QUESTION PAPER FOR THEORY

PART- I

Six short answer questions on 6 unit themes

One question on eliciting student's response to any of the themes

PART-II

Each question should be from one unit and the last question can be a combination of two or more units.

Each question should have 3 sub questions: A,B & C

A will be from the main text: 5 marks

B from non-detailed text: 3 marks

C on grammar and Vocabulary: 6 marks

I Year - I Semester

L	T	P	C
4	0	0	3

MATHEMATICS-I

(Common to ALL branches of First Year B.Tech.)

Course Objectives:

1. The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course.
2. The skills derived from the course will help the student from a necessary base to develop analytic and design concepts.

Course Outcomes: At the end of the Course, Student will be able to:

1. Solve linear differential equations of first, second and higher order.
2. Determine Laplace transform and inverse Laplace transform of various functions and use Laplace transforms to determine general solution to linear ODE.
3. Calculate total derivative, Jacobian and minima of functions of two variables.

UNIT I: Differential equations of first order and first degree:

Linear-Bernoulli-Exact-Reducible to exact.

Applications: Newton's Law of cooling-Law of natural growth and decay-Orthogonal trajectories- Electrical circuits- Chemical reactions.

UNIT II: Linear differential equations of higher order:

Non-homogeneous equations of higher order with constant coefficients with RHS term of the type e^{ax} , $\sin ax$, $\cos ax$, polynomials in x , $e^{ax} V(x)$, $xV(x)$ - Method of Variation of parameters.

Applications: LCR circuit, Simple Harmonic motion.

UNIT III: Laplace transforms:

Laplace transforms of standard functions-Shifting theorems - Transforms of derivatives and integrals – Unit step function –Dirac's delta function- Inverse Laplace transforms– Convolution theorem (with out proof).

Applications: Solving ordinary differential equations (initial value problems) using Laplace transforms.

UNIT IV: Partial differentiation:

Introduction- Homogeneous function-Euler's theorem-Total derivative-Chain rule-Generalized Mean value theorem for single variable (without proof)-Taylor's and Mc Laurent's series expansion of functions of two variables– Functional dependence- Jacobian.

Applications: Maxima and Minima of functions of two variables without constraints and Lagrange's method (with constraints).

UNIT V: First order Partial differential equations:

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions –solutions of first order linear (Lagrange) equation and nonlinear (standard types) equations.

UNIT VI: Higher order Partial differential equations:

Solutions of Linear Partial differential equations with constant coefficients. RHS term of the type e^{ax+by} , $\sin(ax+by)$, $\cos(ax+by)$, $x^m y^n$. Classification of second order partial differential equations.

Text Books:

1. **B.S.Grewal**, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. **N.P.Bali**, Engineering Mathematics, Lakshmi Publications.

Reference Books:

1. **Erwin Kreyszig**, Advanced Engineering Mathematics, 10th Edition, Wiley-India
2. **Micheael Greenberg**, Advanced Engineering Mathematics, 9th edition, Pearson edn
3. **Dean G. Duffy**, Advanced engineering mathematics with MATLAB, CRC Press
4. **Peter O'neil**, Advanced Engineering Mathematics, Cengage Learning.
5. **Srimanta Pal, Subodh C.Bhunia**, Engineering Mathematics, Oxford University Press.
6. **Dass H.K., Rajnish Verma. Er.**, Higher Engineering Mathematics, S. Chand Co. Pvt. Ltd, Delhi.

I Year - I Semester

L	T	P	C
4	0	0	3

ENGINEERING CHEMISTRY

(CE, ME, PCE, PE, Met.E, Mining, Automobile, Aeronautical, Chemical, Bio. Tech.)

Knowledge of basic concepts of Chemistry for Engineering students will help them as professional engineers later in design and material selection, as well as utilizing the available resources.

Learning Objectives:

- Plastics are nowadays used in household appliances; also they are used as composites (FRP) in aerospace and automotive industries.
- Fuels as a source of energy are a basic need of any industry, particularly industries like thermal power stations, steel industry, fertilizer industry etc., and hence they are introduced.
- The basics for the construction of galvanic cells are introduced. Also if corrosion is to be controlled, one has to understand the mechanism of corrosion which itself is explained by electrochemical theory.
- With the increase in demand, a wide variety of materials are coming up; some of them have excellent engineering properties and a few of these materials are introduced.
- Water is a basic material in almost all the industries, more so where steam is generated and also where it is supplied for drinking purposes.
- Materials used in major industries like steel industry, metallurgical industries and construction industries and electrical equipment manufacturing industries are introduced. Also lubrication is introduced.

UNIT I: HIGH POLYMERS AND PLASTICS

Polymerisation:- Introduction- Mechanism of polymerization - Stereo regular polymers – methods of polymerization (emulsion and suspension) -Physical and mechanical properties – **Plastics** as engineering materials : advantages and limitations – Thermoplastics and Thermosetting plastics – Compounding and fabrication (4/5 techniques)- Preparation, properties and applications of polyethene, PVC, Bakelite Teflon and polycarbonates

Elastomers :- Natural rubber- compounding and vulcanization – Synthetic rubbers : Buna S, Buna N, Thiokol and polyurethanes – Applications of elastomers.

Composite materials & Fiber reinforced plastics – Biodegradable polymers – Conducting polymers.

UNIT II: FUEL TECHNOLOGY

Fuels – Introduction – Classification – Calorific value - HCV and LCV – Dulong's formula – Bomb calorimeter – Numerical problems – Coal — Proximate and ultimate analysis – Significance of the analyses – Liquid fuels – Petroleum- Refining – Cracking – Synthetic petrol –Petrol knocking – Diesel knocking - Octane and Cetane ratings – Anti-knock agents – Power alcohol – Bio-diesel – Gaseous fuels – Natural gas, LPG and CNG – Combustion – Calculation of air for the combustion of a fuel – Flue gas analysis – Orsat apparatus – Numerical problems on combustion.

Explosives:- Rocket fuels

UNIT III: ELECTROCHEMICAL CELLS AND CORROSION

Galvanic cells - Reversible and irreversible cells – Single electrode potential – Electro chemical series and uses of this series- Standard electrodes (Hydrogen and Calomel electrodes) - Concentration Cells – Batteries: Dry Cell - Ni-Cd cells - Ni-Metal hydride cells - Li cells - Zinc – air cells.

Corrosion :- Definition – Theories of Corrosion (chemical & electrochemical) – Formation of galvanic cells by different metals, by concentration cells, by differential aeration and waterline corrosion – Passivity of metals – Pitting corrosion - Galvanic series – Factors which influence the rate of corrosion - Protection from corrosion – Design and material selection – Cathodic protection - Protective coatings: – Surface preparation – Metallic (cathodic and anodic) coatings - Methods of application on metals (Galvanizing, Tinning, Electroplating, Electroless plating).

UNIT IV: CHEMISTRY OF ADVANCED MATERIALS

Nano materials:- Introduction – Sol-gel method & chemical reduction method of preparation – Characterization by BET method and TEM methods - Carbon nano tubes and fullerenes: Types, preparation, properties and applications

Liquid crystals:- Introduction – Types – Applications

Super conductors:-Type –I, Type II – Characteristics and applications

Green synthesis:- Principles - 3or 4 methods of synthesis with examples – R₄M₄ principles

UNIT V: WATER TECHNOLOGY

Hard water:- Reasons for hardness – units of hardness - determination of hardness and alkalinity - Water for steam generation - Boiler troubles – Priming and Foaming, Scale formation, Boiler corrosion, Caustic embrittlement - Internal treatments - Softening of Hard water : Lime – Soda process, Zeolite process and numerical problems based on these processes and Ion Exchange process - Water for drinking purposes- Purification – Sterilization and disinfection : Chlorination, Break point chlorination and other methods – Reverse Osmosis and Electro Dialysis.

UNIT VI: CHEMISTRY OF ENGINEERING MATERIALS AND FUEL CELLS

Refractories:- Definition, characteristics, classification, properties, failure of refractories

Lubricants:- Definition, function, Theory and mechanism of lubricants, properties (Definition and importance)

Cement:- Constituents, manufacturing, hardening and setting, deterioration of cement

Insulators:- Thermal and electrical insulators

Fuel cells:- Hydrogen Oxygen fuel cells – Methanol Oxygen fuel cells

Outcome: The advantages and limitations of plastic materials and their use in design would be understood. Fuels which are used commonly and their economics, advantages and limitations are discussed. Reasons for corrosion and some methods of corrosion control would be understood. The students would be now aware of materials like nano materials and fullerenes and their uses. Similarly liquid crystals and superconductors are understood. The importance of green synthesis is well understood and how they are different from conventional methods is also explained. The impurities present in raw water, problems associated with them and how to avoid them are understood. The advantages and limitations of plastic materials and their use in design would be understood. The commonly used industrial materials are introduced.

Standard Books:

1. Engineering Chemistry by Jain and Jain; Dhanpat Rai Publicating Co.
2. Engineering Chemistry by Shikha Agarwal; Cambridge University Press, 2015 edition.

Reference Books:

1. Engineering Chemistry of Wiley India Pvt. Ltd., Vairam and others, 2014 edition (second).
2. Engineering Chemistry by Prasanth Rath, Cengage Learning, 2015 edition.
3. A text book of engineering Chemistry by S. S. Dara; S. Chand & Co Ltd., Latest Edition
4. Applied Chemistry by H.D. Gesser, Springer Publishers
5. Text book of Nano-science and nanotechnology by B.S. Murthy, P. Shankar and others, University Press, IIM

I Year - I Semester

L	T	P	C
4	0	0	3

ENGINEERING MECHANICS

(Common to all branches)

Objectives: The students completing this course are expected to understand the concepts of forces and its resolution in different planes, resultant of force system, Forces acting on a body, their free body diagrams using graphical methods. They are required to understand the concepts of centre of gravity and moments of inertia and their application, Analysis of frames and trusses, different types of motion, friction and application of work - energy method.

UNIT – I

Objectives: The students are to be exposed to the concepts of force and friction, direction and its application.

Introduction to Engg. Mechanics – Basic Concepts.

Systems of Forces: Coplanar Concurrent Forces – Components in Space – Resultant – Moment of Force and its Application – Couples and Resultant of Force Systems.

Friction: Introduction, limiting friction and impending motion, coulomb's laws of dry friction, coefficient of friction, cone of friction

UNIT II

Objectives: The students are to be exposed to application of free body diagrams. Solution to problems using graphical methods and law of triangle of forces.

Equilibrium of Systems of Forces: Free Body Diagrams, Equations of Equilibrium of Coplanar Systems, Spatial Systems for concurrent forces. Lamis Theorem, Graphical method for the equilibrium of coplanar forces, Converse of the law of Triangle of forces, converse of the law of polygon of forces condition of equilibrium, analysis of plane trusses.

UNIT – III

Objectives : The students are to be exposed to concepts of centre of gravity.

Centroid: Centroids of simple figures (from basic principles) – Centroids of Composite Figures

Centre of Gravity: Centre of gravity of simple body (from basic principles), centre of gravity of composite bodies, Pappus theorems.

UNIT IV

Objective: The students are to be exposed to concepts of moment of inertia and polar moment of inertia including transfer methods and their applications.

Area moments of Inertia: Definition – Polar Moment of Inertia, Transfer Theorem, Moments of Inertia of Composite Figures, Products of Inertia, Transfer Formula for Product of Inertia. **Mass Moment of Inertia:** Moment of Inertia of Masses, Transfer Formula for Mass Moments of Inertia, mass moment of inertia of composite bodies.

UNIT – V

Objectives: The students are to be exposed to motion in straight line and in curvilinear paths, its velocity and acceleration computation and methods of representing plane motion.

Kinematics: Rectilinear and Curvelinear motions – Velocity and Acceleration – Motion of Rigid Body – Types and their Analysis in Planar Motion. **Kinetics:** Analysis as a Particle and Analysis as a Rigid Body in Translation – Central Force Motion – Equations of Plane Motion – Fixed Axis Rotation – Rolling Bodies.

UNIT – VI

Objectives: The students are to be exposed to concepts of work, energy and particle motion

Work – Energy Method: Equations for Translation, Work-Energy Applications to Particle Motion, Connected System-Fixed Axis Rotation and Plane Motion. Impulse momentum method.

TEXT BOOKS :

1. Engg. Mechanics - S.Timoshenko & D.H.Young., 4th Edn - , Mc Graw Hill publications.

REFERENCES :

1. Engineering Mechanics statics and dynamics – R.C.Hibbeler, 11th Edn – Pearson Publ.
2. Engineering Mechanics, statics – J.L.Meriam, 6th Edn – Wiley India Pvt Ltd.
3. Engineering Mechanics, statics and dynamics – I.H.Shames, – Pearson Publ.
4. Mechanics For Engineers, statics - F.P.Beer & E.R.Johnston – 5th Edn Mc Graw Hill Publ.
5. Mechanics For Engineers, dynamics - F.P.Beer & E.R.Johnston – 5th Edn Mc Graw Hill Publ.
6. Theory & Problems of engineering mechanics, statics & dynamics – E.W.Nelson, C.L.Best & W.G. McLean, 5th Edn – Schaum's outline series - Mc Graw Hill Publ.
7. Singer's Engineering Mechanics: Statics And Dynamics, K. Vijay Kumar Reddy, J. Suresh Kumar, Bs Publications
8. Engineering Mechanics, Ferdinand . L. Singer, Harper – Collins.
9. Engineering Mechanics statics and dynamics , A Nelson , Mc Graw Hill publications

I Year - I Semester

L	T	P	C
4	0	0	3

COMPUTER PROGRAMMING

Learning objectives:

Formulating algorithmic solutions to problems and implementing algorithms in C.

- Notion of Operation of a CPU, Notion of an algorithm and computational procedure, editing and executing programs in Linux.
- Understanding branching, iteration and data representation using arrays.
- Modular programming and recursive solution formulation.
- Understanding pointers and dynamic memory allocation.
- Understanding miscellaneous aspects of C.
- Comprehension of file operations.

UNIT-I:

History and Hardware - Computer Hardware, Bits and Bytes, Components, Programming Languages - Machine Language, Assembly Language, Low- and High-Level Languages, Procedural and Object-Oriented Languages, Application and System Software, The Development of C Algorithms The Software Development Process.

UNIT-II:

Introduction to C Programming- Identifiers, The main () Function, The printf () Function

Programming Style - Indentation, Comments, Data Types, Arithmetic Operations, Expression Types, Variables and Declarations, Negation, Operator Precedence and Associativity, Declaration Statements, Initialization.

Assignment - Implicit Type Conversions, Explicit Type Conversions (Casts), Assignment Variations, Mathematical Library Functions, Interactive Input, Formatted Output, Format Modifiers.

UNIT -III:

Control Flow-Relational Expressions - Logical Operators:

Selection: if-else Statement, nested if, examples, Multi-way selection: switch, else-if, examples.

Repetition: Basic Loop Structures, Pretest and Posttest Loops, Counter-Controlled and Condition-Controlled Loops, The while Statement, The for Statement, Nested Loops, The do-while Statement.

UNIT-IV

Modular Programming: Function and Parameter Declarations, Returning a Value, Functions with Empty Parameter Lists, Variable Scope, Variable Storage Class, Local Variable Storage Classes, Global Variable Storage Classes, Pass by Reference, Passing Addresses to a Function, Storing Addresses, Using Addresses, Declaring and Using Pointers, Passing Addresses to a Function.

Case Study: Swapping Values, Recursion - Mathematical Recursion, Recursion versus Iteration.

UNIT-V:

Arrays & Strings

Arrays: One-Dimensional Arrays, Input and Output of Array Values, Array Initialization, Arrays as Function Arguments, Two-Dimensional Arrays, Larger Dimensional Arrays- Matrices

Strings: String Fundamentals, String Input and Output, String Processing, Library Functions

UNIT-VI:

Pointers, Structures, Files

Pointers: Concept of a Pointer, Initialization of pointer variables, pointers as function arguments, passing by address, Dangling memory, address arithmetic, character pointers and functions, pointers to pointers, Dynamic memory management functions, command line arguments.

Structures: Derived types, Structures declaration, Initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self referential structures, unions, typedef, bit-fields.

Data Files: Declaring, Opening, and Closing File Streams, Reading from and Writing to Text Files, Random File Access

Outcomes:

- Understand the basic terminology used in computer programming
- Write, compile and debug programs in C language.
- Use different data types in a computer program.
- Design programs involving decision structures, loops and functions.
- Explain the difference between call by value and call by reference
- Understand the dynamics of memory by the use of pointers
- Use different data structures and create/update basic data files.

Text Books:

1. ANSI C Programming, Gary J. Bronson, Cengage Learning.
2. Programming in C, BI Juneja Anita Seth, Cengage Learning.
3. The C programming Language, Dennis Richie and Brian Kernighan, Pearson Education.

Reference Books:

1. C Programming-A Problem Solving Approach, Forouzan, Gilberg, Cengage.
2. Programming with C, Bichkar, Universities Press.
3. Programming in C, ReemaThareja, OXFORD.
4. C by Example, Noel Kalicharan, Cambridge.

I Year - I Semester

L	T	P	C
4	0	0	3

ENVIRONMENTAL STUDIES

Course Learning Objectives:

The objectives of the course is to impart

- Overall understanding of the natural resources
- Basic understanding of the ecosystem and its diversity
- Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities
- An understanding of the environmental impact of developmental activities
- Awareness on the social issues, environmental legislation and global treaties

Course Outcomes:

The student should have knowledge on

- The natural resources and their importance for the sustenance of the life and recognize the need to conserve the natural resources
- The concepts of the ecosystem and its function in the environment. The need for protecting the producers and consumers in various ecosystems and their role in the food web
- The biodiversity of India and the threats to biodiversity, and conservation practices to protect the biodiversity
- Various attributes of the pollution and their impacts and measures to reduce or control the pollution along with waste management practices
- Social issues both rural and urban environment and the possible means to combat the challenges
- The environmental legislations of India and the first global initiatives towards sustainable development.
- About environmental assessment and the stages involved in EIA and the environmental audit.
- Self Sustaining Green Campus with Environment Friendly aspect of – Energy, Water and Wastewater reuse Plantation, Rain water Harvesting, Parking Curriculum.

Syllabus:

UNIT – I Multidisciplinary nature of Environmental Studies: Definition, Scope and Importance – Sustainability: Stockholm and Rio Summit–Global Environmental Challenges: Global warming and climate change, Carbon Credits, acid rains, ozone layer depletion, population growth and explosion, effects. Role of information Technology in Environment and human health.

Ecosystems: Concept of an ecosystem. - Structure and function of an ecosystem. - Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession. - Food chains, food webs and ecological pyramids. - Introduction, types, characteristic features, structure and function of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems.

UNIT – II Natural Resources: Natural resources and associated problems

Forest resources – Use and over – exploitation, deforestation – Timber extraction – Mining, dams and other effects on forest and tribal people

Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems

Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, Sustainable mining of Granite, Lignite, Coal, Sea and River sands.

Food resources: World food problems, changes caused by non-agriculture activities-effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity

Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources Vs Oil and Natural Gas Extraction.

Land resources: Land as a resource, land degradation, Wasteland reclamation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

UNIT – III Biodiversity and its conservation: Definition: genetic, species and ecosystem diversity-classification - Value of biodiversity: consumptive use, productive use, social-Biodiversity at national and local levels. India as a mega-diversity nation - Hot-spots of biodiversity - Threats to biodiversity: habitat loss, man-wildlife conflicts - Endangered and endemic species of India – Conservation of biodiversity: conservation of biodiversity.

UNIT – IV Environmental Pollution: Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies, Sustainable Life Studies. Impact of Fire Crackers on Men and his well being.

Solid Waste Management: Sources, Classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products, Biomedical, Hazardous and e – waste management.

UNIT – V Social Issues and the Environment: Urban problems related to energy -Water conservation, rain water harvesting-Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Environmental Protection Act -Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act -Wildlife Protection Act -Forest Conservation Act-Issues involved in enforcement of environmental legislation. -Public awareness.

UNIT – VI Environmental Management: Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS, Environmental audit. Ecotourism, Green Campus – Green business and Green politics.

The student should Visit an Industry / Ecosystem and submit a report individually on any issues related to Environmental Studies course and make a power point presentation.

TEXT BOOKS:

1. Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers, Vijayawada
2. Environmental Studies, R. Rajagopalan, 2nd Edition, 2011, Oxford University Press.
3. Environmental Studies, P. N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; Pearson Education, Chennai

REFERENCE:

1. Text Book of Environmental Studies, Deeshita Dave & P. Udaya Bhaskar, Cengage Learning.
2. A Textbook of Environmental Studies, Shaashi Chawla, TMH, New Delhi
3. Environmental Studies, Benny Joseph, Tata McGraw Hill Co, New Delhi
4. Perspectives in Environment Studies, Anubha Kaushik, C P Kaushik, New Age International Publishers, 2014

I Year - I Semester	L	T	P	C
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ENGINEERING / APPLIED CHEMISTRY LABORATORY

1. Introduction to Chemistry laboratory – Molarity, Normality, Primary, secondary standard solutions, Volumetric titrations, Quantitative analysis, Qualitative analysis, etc.
2. Trial experiment - Determination of HCl using standard Na₂CO₃ solution.
3. Determination of alkalinity of a sample containing Na₂CO₃ and NaOH.
4. Determination of KMnO₄ using standard Oxalic acid solution.
5. Determination of Ferrous iron using standard K₂Cr₂O₇ solution.
6. Determination of Copper using standard K₂Cr₂O₇ solution.
7. Determination of temporary and permanent hardness of water using standard EDTA solution.
8. Determination of Copper using standard EDTA solution.
9. Determination of Iron by a Colorimetric method using thiocyanate as reagent.
10. Determination of pH of the given sample solution using pH meter.
11. Conductometric titration between strong acid and strong base.
12. Conductometric titration between strong acid and weak base.
13. Potentiometric titration between strong acid and strong base.
14. Potentiometric titration between strong acid and weak base.
15. Determination of Zinc using standard EDTA solution.
16. Determination of Vitamin – C.

Outcomes: The students entering into the professional course have practically very little exposure to lab classes. The experiments introduce volumetric analysis; redox titrations with different indicators; EDTA titrations; then they are exposed to a few instrumental methods of chemical analysis. Thus at the end of the lab course, the student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills.

Reference Books

1. A Textbook of Quantitative Analysis, Arthur J. Vogel.
2. Dr. Jyotsna Cherukuris (2012) *Laboratory Manual of engineering chemistry-II*, VGS Techno Series
3. Chemistry Practical Manual, Lorven Publications
4. K. Mukkanti (2009) *Practical Engineering Chemistry*, B.S. Publication

I Year - I Semester

L	T	P	C
0	0	3	2

ENGLISH - COMMUNICATION SKILLS LAB- I

PRESCRIBED LAB MANUAL FOR SEMESTER I:

'**INTERACT:** English Lab Manual for Undergraduate Students' Published by **Orient Blackswan Pvt Ltd.**

OBJECTIVES:

To enable the students to learn through practice the communication skills of listening, speaking, reading and writing.

OUTCOME:

A study of the communicative items in the laboratory will help the students become successful in the competitive world.

The course content along with the study material is divided into six units.

UNIT 1:

1. WHY study Spoken English?
2. Making Inquiries on the phone, thanking and responding to Thanks
Practice work.

UNIT 2:

1. Responding to Requests and asking for Directions
Practice work.

UNIT 3:

1. Asking for Clarifications, Inviting, Expressing Sympathy, Congratulating
2. Apologising, Advising, Suggesting, Agreeing and Disagreeing
Practice work.

UNIT 4:

1. Letters and Sounds
Practice work.

UNIT 5:

1. The Sounds of English
Practice work.

UNIT 6:

1. Pronunciation
2. Stress and Intonation
Practice work.

Assessment Procedure: Laboratory

1. Every lab session (150 minutes) should be handled by not less than two teachers (three would be ideal) where each faculty has to conduct a speaking activity for 20/30 students.
2. The teachers are to assess each learner in the class for not less than 10 speaking activities, each one to be assessed for 10 marks or 10%. The average of 10 day-to-day activity assessments is to be calculated for 10 marks for internal assessment.

The rubric given below has to be filled in for all the students for all activities.

The rubric to assess the learners:

	Body language		Fluency & Audibility	Clarity in Speech	Neutralization of accent	Appropriate Language		Total 10 marks	Remarks
	Gestures & Postures	Eye Contact				Grammar	Vocabulary & expressions		

- **Lab Assessment: Internal (25 marks)**

1. Day-to-Day activities: 10 marks
2. Completing the exercises in the lab manual: 5 marks
3. Internal test (5 marks written and 5 marks oral)

- **Lab Assessment: External (50 marks)**

1. Written test: 20 marks (writing a dialogue, note-taking and answering questions on listening to an audio recording).
2. Oral: Reading aloud a text or a dialogue- 10 marks
3. Viva-Voce by the external examiner: 20 marks

Reference Books:

1. Strengthen your communication skills by Dr M Hari Prasad, Dr Salivendra Raju and Dr G Suvarna Lakshmi, Maruti Publications.
2. English for Professionals by Prof Eliah, B.S Publications, Hyderabad.
3. Unlock, Listening and speaking skills 2, Cambridge University Press
4. Spring Board to Success, Orient BlackSwan
5. A Practical Course in effective english speaking skills, PHI
6. Word power made handy, Dr shalini verma, Schand Company
7. Let us hear them speak, Jayashree Mohanraj, Sage texts
8. Professional Communication, Aruna Koneru, Mc Grawhill Education
9. Cornerstone, Developing soft skills, Pearson Education

I Year - I Semester

L	T	P	C
0	0	3	2

COMPUTER PROGRAMMING LAB

OBJECTIVES:

- Understand the basic concept of C Programming, and its different modules that includes conditional and looping expressions, Arrays, Strings, Functions, Pointers, Structures and File programming.
- Acquire knowledge about the basic concept of writing a program.
- Role of constants, variables, identifiers, operators, type conversion and other building blocks of C Language.
- Use of conditional expressions and looping statements to solve problems associated with conditions and repetitions.
- Role of Functions involving the idea of modularity.

Programming

Exercise - 1 Basics

- a) What is an OS Command, Familiarization of Editors - vi, Emacs
- b) Using commands like mkdir, ls, cp, mv, cat, pwd, and man
- c) C Program to Perform Adding, Subtraction, Multiplication and Division of two numbers From Command line

Exercise - 2 Basic Math

- a) Write a C Program to Simulate 3 Laws at Motion
- b) Write a C Program to convert Celsius to Fahrenheit and vice versa

Exercise - 3 Control Flow - I

- a) Write a C Program to Find Whether the Given Year is a Leap Year or not.
- b) Write a C Program to Add Digits & Multiplication of a number

Exercise – 4 Control Flow - II

- a) Write a C Program to Find Whether the Given Number is
 - i) Prime Number
 - ii) Armstrong Number
- b) Write a C program to print Floyd Triangle
- c) Write a C Program to print Pascal Triangle

Exercise – 5 Functions

- a) Write a C Program demonstrating of parameter passing in Functions and returning values.
- b) Write a C Program illustrating Fibonacci, Factorial with Recursion without Recursion

Exercise – 6 Control Flow - III

- a) Write a C Program to make a simple Calculator to Add, Subtract, Multiply or Divide Using switch...case
- b) Write a C Program to convert decimal to binary and hex (using switch call function the function)

Exercise – 7 Functions - Continued

Write a C Program to compute the values of $\sin x$ and $\cos x$ and e^x values using Series expansion. (use factorial function)

Exercise – 8 Arrays

Demonstration of arrays

- a) Search-Linear.
- b) Sorting-Bubble, Selection.
- c) Operations on Matrix.

Exercises - 9 Structures

- a) Write a C Program to Store Information of a Movie Using Structure
- b) Write a C Program to Store Information Using Structures with Dynamically Memory Allocation
- c) Write a C Program to Add Two Complex Numbers by Passing Structure to a Function

Exercise - 10 Arrays and Pointers

- a) Write a C Program to Access Elements of an Array Using Pointer
- b) Write a C Program to find the sum of numbers with arrays and pointers.

Exercise – 11 Dynamic Memory Allocations

- a) Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc () function.
- b) Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc () function.

Understand the difference between the above two programs

Exercise – 12 Strings

- a) Implementation of string manipulation operations **with** library function.
 - i) copy
 - ii) concatenate
 - iii) length
 - iv) compare
- b) Implementation of string manipulation operations **without** library function.
 - i) copy
 - ii) concatenate
 - iii) length
 - iv) compare

Exercise -13 Files

- a) Write a C programming code to open a file and to print its contents on screen.
- b) Write a C program to copy files

Exercise - 14 Files Continued

- a) Write a C program merges two files and stores their contents in another file.
- b) Write a C program to delete a file.

OUTCOMES:

- Apply and practice logical ability to solve the problems.
- Understand C programming development environment, compiling, debugging, and linking and executing a program using the development environment
- Analyzing the complexity of problems, Modularize the problems into small modules and then convert them into programs
- Understand and apply the in-built functions and customized functions for solving the problems.
- Understand and apply the pointers, memory allocation techniques and use of files for dealing with variety of problems.
- Document and present the algorithms, flowcharts and programs in form of user-manuals
- Identification of various computer components, Installation of software

Note:

- a) All the Programs must be executed in the Linux Environment. (Mandatory)**
- b) The Lab record must be a print of the LATEX (.tex) Format.**

I Year - II Semester

L	T	P	C
4	0	0	3

ENGLISH -II

Introduction:

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training the students to acquire communicative competence, the syllabus has been designed to develop linguistic and communicative competence of the students of Engineering.

As far as the detailed Textbooks are concerned, the focus should be on the skills of listening, speaking, reading and writing. The non-detailed Textbooks are meant for extensive reading for pleasure and profit.

Thus the stress in the syllabus is primarily on the development of communicative skills and fostering of ideas.

Objectives:

1. To improve the language proficiency of the students in English with emphasis on LSRW skills.
2. To enable the students to study and comprehend the prescribed lessons and subjects more effectively relating to their theoretical and practical components.
3. To develop the communication skills of the students in both formal and informal situations.

LISTENING SKILLS:

Objectives:

1. To enable the students to appreciate the role of listening skill and improve their pronunciation.
2. To enable the students to comprehend the speech of people belonging to different backgrounds and regions.
3. To enable the students to listen for general content, to fill up information and for specific information.

SPEAKING SKILLS:

Objectives:

1. To make the students aware of the importance of speaking for their personal and professional communication.
2. To enable the students to express themselves fluently and accurately in social and professional success.
3. To help the students describe objects, situations and people.
4. To make the students participate in group activities like roleplays, discussions and debates.
5. To make the students participate in Just a Minute talks.

READING SKILLS:

Objectives:

1. To enable the students to comprehend a text through silent reading.
2. To enable the students to guess the meanings of words, messages and inferences of texts in given contexts.
3. To enable the students to skim and scan a text.
4. To enable the students to identify the topic sentence.

5. To enable the students to identify discourse features.
6. To enable the students to make intensive and extensive reading.

WRITING SKILLS:

Objectives:

1. To make the students understand that writing is an exact formal skills.
2. To enable the students to write sentences and paragraphs.
3. To make the students identify and use appropriate vocabulary.
4. To enable the students to narrate and describe.
5. To enable the students capable of note-making.
6. To enable the students to write coherently and cohesively.
7. To make the students to write formal and informal letters.
8. To enable the students to describe graphs using expressions of comparison.
9. To enable the students to write technical reports.

Methodology:

1. The class are to be learner-centered where the learners are to read the texts to get a comprehensive idea of those texts on their own with the help of the peer group and the teacher.
2. Integrated skill development methodology has to be adopted with focus on individual language skills as per the tasks/exercise.
3. The tasks/exercises at the end of each unit should be completed by the learners only and the teacher interventions permitted as per the complexity of the task/exercise.
4. The teacher is expected to use supplementary material wherever necessary and also generate activities/tasks as per the requirement.
5. The teacher is permitted to use lecture method when a completely new concept is introduced in the class.

Assessment Procedure: Theory

1. The formative and summative assessment procedures are to be adopted (mid exams and end semester examination).
2. Neither the formative nor summative assessment procedures should test the memory of the content of the texts given in the textbook. The themes and global comprehension of the units in the present day context with application of the language skills learnt in the unit are to be tested.
3. Only new unseen passages are to be given to test reading skills of the learners. Written skills are to be tested from sentence level to essay level. The communication formats—emails, letters and reports-- are to be tested along with appropriate language and expressions.
4. Examinations:

I mid exam + II mid exam (15% for descriptive tests+10% for online tests)= 25%

(80% for the best of two and 20% for the other)

Assignments= 5%

End semester exams=70%

5. Three take home assignments are to be given to the learners where they will have to read texts from the reference books list or other sources and write their gist in their own words.

The following text books are recommended for study in I B. Tech II Semester (Common for all branches)and I B.Pharma II Sem of JNTU Kakinada from the academic year 2016-17 (**R-16 Regulations**)

DETAILED TEXTBOOK: ENGLISH ENCOUNTERS Published by **Maruthi Publishers**.

DETAILED NON-DETAIL: THE GREAT INDIAN SCIENTISTS Published by **Cengage learning**

The course content along with the study material is divided into six units.

UNIT 1:

1. ' The Greatest Resource- Education' from English Encounters

OBJECTIVE:

Schumacher describes the education system by saying that it was mere training, something more than mere knowledge of facts.

OUTCOME:

The lesson underscores that the ultimate aim of Education is to enhance wisdom.

2. ' A P J Abdul Kalam' from The Great Indian Scientists.

OBJECTIVE:

The lesson highlights Abdul Kalam's contributions to Indian science and the awards he received.

OUTCOME:

Abdul Kalam's simple life and service to the nation inspires the readers to follow in his footsteps.

UNIT 2:

1. ' A Dilemma' from English Encounters

OBJECTIVE: The lesson centres on the pros and cons of the development of science and technology.

OUTCOME: The lesson enables the students to promote peaceful co-existence and universal harmony among people and society.

2. 'C V Raman' from The Great Indian Scientists.

OBJECTIVE:

The lesson highlights the dedicated research work of C V Raman and his achievements in Physics.

OUTCOME:

The Achievements of C V Raman are inspiring and exemplary to the readers and all scientists.

UNIT 3:

1. 'Cultural Shock': Adjustments to new Cultural Environments from English Encounters.

OBJECTIVE: The lesson depicts of the symptoms of Cultural Shock and the aftermath consequences

OUTCOME:

The lesson imparts the students to manage different cultural shocks due to globalization.

2. 'Homi Jehangir Bhabha' from The Great Indian Scientists.

OBJECTIVE:

The lesson highlights Homi Jehangir Bhabha's contributions to Indian nuclear programme as architect.

OUTCOME:

The seminal contributions of Homi Jehangir Bhabha to Indian nuclear programme provide an aspiration to the readers to serve the nation and strengthen it.

UNIT 4:

1. 'The Lottery' from English Encounters.

OBJECTIVE:

The lesson highlights insightful commentary on cultural traditions.

OUTCOME:

The theme projects society's need to re examine its traditions when they are outdated.

2. 'Jagadish Chandra Bose' from The Great Indian Scientists.

OBJECTIVE:

The lesson gives an account of the unique discoveries and inventions of Jagadish Chandra Bose in Science.

OUTCOME: The Scientific discoveries and inventions of Jagadish Chandra Bose provide inspiration to the readers to make their own contributions to science and technology, and strengthen the nation.

UNIT 5:

1. ' The Health Threats of Climate Change' from English Encounters.

OBJECTIVE:

The essay presents several health disorders that spring out due to environmental changes

OUTCOME:

The lesson offers several inputs to protect environment for the sustainability of the future generations.

2. ' Prafulla Chandra Ray' from The Great Indian Scientists.

OBJECTIVE:

The lesson gives an account of the experiments and discoveries in Pharmaceuticals of Prafulla Chandra Ray.

OUTCOME:

Prafulla Chandra Ray's scientific achievements and patriotic fervour provide inspiration to the reader.

UNIT 6:

1. 'The Chief Software Architect' from English Encounters

OBJECTIVE:

The lesson supports the developments of technology for the betterment of human life.

OUTCOME:

Pupil get inspired by eminent personalities who toiled for the present day advancement of software development.

2. 'Srinivasa Ramanujan from The Great Indian Scientists.

OBJECTIVE:

The lesson highlights the extraordinary achievements of Srinivasa Ramanujan, a great mathematician and the most romantic figure in mathematics.

OUTCOME:

The lesson provides inspiration to the readers to think and tap their innate talents.

NOTE:

All the exercises given in the prescribed lessons in both detailed and non-detailed textbooks relating to the theme and language skills must be covered.

MODEL QUESTION PAPER FOR THEORY**PART-I**

Six short answer questions on 6 unit themes

One question on eliciting student's response to any of the themes

PART-II

Each question should be from one unit and the last question can be a combination of two or more units.

Each question should have 3 sub questions: A,B & C

A will be from the main text: 5 marks

B from non-detailed text: 3 marks

C on grammar and Vocabulary: 6 marks

I Year - II Semester

L	T	P	C
4	0	0	3

MATHEMATICS – II (MATHEMATICAL METHODS)

Course Objectives:

1. The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course.
2. The skills derived from the course will help the student from a necessary base to develop analytic and design concepts.
3. Understand the most basic numerical methods to solve simultaneous linear equations.

Course Outcomes: At the end of the Course, Student will be able to:

1. Calculate a root of algebraic and transcendental equations. Explain relation between the finite difference operators.
2. Compute interpolating polynomial for the given data.
3. Solve ordinary differential equations numerically using Euler's and RK method.
4. Find Fourier series and Fourier transforms for certain functions.
5. Identify/classify and solve the different types of partial differential equations.

UNIT I: Solution of Algebraic and Transcendental Equations:

Introduction- Bisection method – Method of false position – Iteration method – Newton-Raphson method (One variable and simultaneous Equations).

UNIT II: Interpolation:

Introduction- Errors in polynomial interpolation – Finite differences- Forward differences- Backward differences –Central differences – Symbolic relations and separation of symbols - Differences of a polynomial-Newton's formulae for interpolation – Interpolation with unequal intervals - Lagrange's interpolation formula.

UNIT III: Numerical Integration and solution of Ordinary Differential equations:

Trapezoidal rule- Simpson's $1/3^{\text{rd}}$ and $3/8^{\text{th}}$ rule-Solution of ordinary differential equations by Taylor's series- Picard's method of successive approximations-Euler's method - Runge-Kutta method (second and fourth order).

UNIT IV: Fourier Series:

Introduction- Periodic functions – Fourier series of π -periodic function - Dirichlet's conditions – Even and odd functions –Change of interval– Half-range sine and cosine series.

UNIT V: Applications of PDE:

Method of separation of Variables- Solution of One dimensional Wave, Heat and two-dimensional Laplace equation.

UNIT VI: Fourier Transforms:

Fourier integral theorem (without proof) – Fourier sine and cosine integrals - sine and cosine transforms – properties – inverse transforms – Finite Fourier transforms.

Text Books:

1. **B.S.Grewal**, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. **N.P.Bali**, Engineering Mathematics, Lakshmi Publications.

Reference Books:

1. **Dean G. Duffy**, Advanced engineering mathematics with MATLAB, CRC Press
2. **V.Ravindranath and P.Vijayalakshmi**, Mathematical Methods, Himalaya Publishing House.
3. **Erwin Kreyszig**, Advanced Engineering Mathematics, 10th Edition, Wiley-India
4. **David Kincaid, Ward Cheney**, Numerical Analysis-Mathematics of Scientific Computing, 3rd Edition, Universities Press.
5. **Srimanta Pal, Subodh C.Bhunja**, Engineering Mathematics, Oxford University Press.
6. **Dass H.K., Rajnish Verma. Er.**, Higher Engineering Mathematics, S. Chand Co. Pvt. Ltd, Delhi.

I Year - II Semester

L	T	P	C
4	0	0	3

MATHEMATICS-III

Course Objectives:

1. The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course.
2. The skills derived from the course will help the student from a necessary base to develop analytic and design concepts.
3. Understand the most basic numerical methods to solve simultaneous linear equations.

Course Outcomes: At the end of the Course, Student will be able to:

1. Determine rank, Eigen values and Eigen vectors of a given matrix and solve simultaneous linear equations.
2. Solve simultaneous linear equations numerically using various matrix methods.
3. Determine double integral over a region and triple integral over a volume.
4. Calculate gradient of a scalar function, divergence and curl of a vector function. Determine line, surface and volume integrals. Apply Green, Stokes and Gauss divergence theorems to calculate line, surface and volume integrals.

UNIT I: Linear systems of equations:

Rank-Echelon form-Normal form – Solution of linear systems – Gauss elimination - Gauss Jordan- Gauss Jacobi and Gauss Seidal methods. Applications: Finding the current in electrical circuits.

UNIT II: Eigen values - Eigen vectors and Quadratic forms:

Eigen values - Eigen vectors– Properties – Cayley-Hamilton theorem - Inverse and powers of a matrix by using Cayley-Hamilton theorem- Diagonalization- Quadratic forms- Reduction of quadratic form to canonical form – Rank - Positive, negative and semi definite - Index – Signature.

Applications: Free vibration of a two-mass system.

UNIT III: Multiple integrals:

Curve tracing: Cartesian, Polar and Parametric forms.

Multiple integrals: Double and triple integrals – Change of variables – Change of order of integration.

Applications: Finding Areas and Volumes.

UNIT IV: Special functions:

Beta and Gamma functions- Properties - Relation between Beta and Gamma functions- Evaluation of improper integrals.

Applications: Evaluation of integrals.

UNIT V: Vector Differentiation:

Gradient- Divergence- Curl - Laplacian and second order operators -Vector identities.

Applications: Equation of continuity, potential surfaces

UNIT VI: Vector Integration:

Line integral – Work done – Potential function – Area- Surface and volume integrals Vector integral theorems: Greens, Stokes and Gauss Divergence theorems (without proof) and related problems.

Applications: Work done, Force.

Text Books:

1. **B.S.Grewal**, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. **N.P.Bali**, Engineering Mathematics, Lakshmi Publications.

Reference Books:

1. **Greenberg**, Advanced Engineering Mathematics, 2nd edition, Pearson edn
2. **Erwin Kreyszig**, Advanced Engineering Mathematics, 10th Edition, Wiley-India
3. **Peter O'Neil**, Advanced Engineering Mathematics, 7th edition, Cengage Learning.
4. **D.W. Jordan and T.Smith**, Mathematical Techniques, Oxford University Press.
5. **Srimanta Pal, Subodh C.Bhunia**, Engineering Mathematics, Oxford University Press.
6. **Dass H.K., Rajnish Verma. Er.**, Higher Engineering Mathematics, S. Chand Co. Pvt. Ltd, Delhi.

I Year - II Semester

L	T	P	C
4	0	0	3

ENGINEERING PHYSICS

(ME, CE, PE, PCE, MET.E, MINING, AUTOMOBILE, CHEMICAL, AERONAUTICAL, BIO.TECH)

OBJECTIVES: Physics curriculum which is re-oriented to the needs of Circuital branches of graduate engineering courses offered by JNTUniv. KKD. that serves as a transit to understand the branch specific advanced topics. The courses are designed to:

- Impart concepts of Optical Interference, Diffraction and Polarization required to design instruments with higher resolution - Concepts of coherent sources, its realization and utility optical instrumentation.
- Study the Structure-property relationship exhibited by solid crystal materials for their utility.
- Tap the Simple harmonic motion and its adaptability for improved acoustic quality of concert halls.
- To explore the Nuclear Power as a reliable source required to run industries
- To impart the knowledge of materials with characteristic utility in appliances.

UNIT-I

INTERFERENCE: Principle of Superposition – Coherent Sources – Interference in thin films (reflection geometry) – Newton's rings – construction and basic principle of Interferometers.

UNIT-II

DIFFRACTION: Fraunhofer diffraction at single slit cases of double slit, N-slits & Circular Aperture (Qualitative treatment only)-Grating equation - Resolving power of a grating, Telescope and Microscopes.

UNIT-III

POLARIZATION: Types of Polarization-production - Nicol Prism -Quarter wave plate and Half Wave plate – Working principle of Polarimeter (Sacharimeter)

LASERS: Characteristics– Stimulated emission – Einstein's Transition Probabilities- Pumping schemes - Ruby laser – Helium Neon laser.

UNIT-IV

ACOUSTICS: Reverberation time - Sabine's formula – Acoustics of concert-hall.

ULTRASONICS: Production - Ultrasonic transducers- Non-Destructive Testing –Applications.

UNIT-V

CRYSTALLOGRAPHY & X-RAY DIFFRACTION: Basis and lattice – Bravais systems- Symmetry elements- Unit cell- packing fraction – coordination number- Miller indices – Separation between successive (h k l) planes – Bragg's law.

NUCLEAR ENERGY – SOURCE OF POWER: Mass defect & Binding Energy – Fusion and Fission as sources – Fast breeder Reactors.

UNIT-VI

MAGNETISM: Classification based on Field, Temperature and order/disorder –atomic origin – Ferromagnetism- Hysteresis- applications of magnetic materials (Para & Ferro)..

DIELECTRICS: Electric Polarization – Dielectrics in DC and AC fields – Internal field – Clausius Mossoti Equation - Loss, Breakdown and strength of dielectric materials – Ferroelectric Hysteresis and applications.

Outcome: *Construction and working details of instruments, ie., Interferometer, Diffractometer and Polarimeter are learnt. Study Acoustics, crystallography magnetic and dielectric materials enhances the utility aspects of materials.*

Text Books:

1. A Text book of Engineering Physics – by Dr. M.N.Avadhanulu and Dr.P.G.Kshirasagar, S.Chand & Company Ltd., (2014)
2. Physics for Engineers by M.R.Srinasan, New Age international publishers (2009)
3. Engineering Physics by D.K.Bhattacharya and Poonam Tandon , Oxford press (2015)

Reference books:

1. Applied Physics by P.K.Palanisamy , Scitech publications (2014)
2. Lasers and Non-Linear optics by B.B.Laud , Newage international publishers (2008)

I Year - II Semester

L	T	P	C
4	0	0	3

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

Preamble:

This course covers the topics related to analysis of various electrical circuits, operation of various electrical machines, various electronic components to perform well in their respective fields.

Learning Objectives:

- To learn the basic principles of electrical circuit law's and analysis of networks.
- To understand the principle of operation and construction details of DC machines & Transformers.
- To understand the principle of operation and construction details of alternator and 3-Phase induction motor.
- To study the operation of PN junction diode, half wave, full wave rectifiers and OP-AMPS.
- To learn the operation of PNP and NPN transistors and various amplifiers.

UNIT - I

Electrical Circuits:

Basic definitions - Types of network elements - Ohm's Law - Kirchoff's Laws - Inductive networks - Capacitive networks – Series - Parallel circuits - Star-delta and delta-star transformations.

UNIT - II

Dc Machines:

Principle of operation of DC generator – EMF equation - Types of DC machine – Torque equation – Applications – Three point starter - Speed control methods of DC motor – Swinburne's Test.

UNIT - III

Transformers:

Principle of operation and construction of single phase transformers – EMF equation – Losses – OC & SC tests - Efficiency and regulation.

UNIT - IV

AC Rotating Machines:

Principle of operation and construction of alternators– Types of alternators – Principle of operation of synchronous motor - Principle of operation of 3-Phase induction motor – Slip-torque characteristics - Efficiency – Applications.

UNIT V

Rectifiers & Linear ICs:

PN junction diodes - Diode applications(Half wave and bridge rectifiers). Characteristics of operation amplifiers (OP-AMP) - application of OP-AMPs (inverting, non-inverting, integrator and differentiator).

UNIT VI

Transistors:

PNP and NPN junction transistor, transistor as an amplifier- Transistor amplifier - Frequency response of CE amplifier - Concepts of feedback amplifier.

Learning Outcomes:

- Able to analyse the various electrical networks.
- Able to understand the operation of DC generators,3-point starter and DC machine testing by Swinburne's Test.
- Able to analyse the performance of single-phase transformer.
- Able to explain the operation of 3-phase alternator and 3-phase induction motors.
- Able to analyse the operation of half wave, full wave bridge rectifiers and OP-AMPs.
- Able to explain the single stage CE amplifier and concept of feedback amplifier.

Text Books:

1. Electrical Technology by Surinder Pal Bali, Pearson Publications.
2. Electronic Devices and Circuits, R.L. Boylestad and Louis Nashelsky, 9th edition, PEI/PHI 2006.

Reference Books:

1. Electrical Circuit Theory and Technology by John Bird, Routledge Taylor & Francis Group
2. Basic Electrical Engineering by M.S.Naidu and S.Kamakshiah, TMH Publications
3. Fundamentals of Electrical Engineering by Rajendra Prasad, PHI Publications, 2nd edition
4. Basic Electrical Engineering by Nagsarkar, Sukhija, Oxford Publications, 2nd edition
5. Industrial Electronics by G.K. Mittal, PHI

I Year - II Semester

L	T	P	C
4	0	0	3

ENGINEERING DRAWING

(Common to all branches)

Objective: Engineering drawing being the principle method of communication for engineers, the objective is to introduce the students, the techniques of constructing the various types of polygons, curves and scales. The objective is also to visualize and represent the 3D objects in 2D planes with proper dimensioning, scaling etc.

UNIT I

Objective: To introduce the students to use drawing instruments and to draw polygons, Engg. Curves.

Polygons: Constructing regular polygons by general methods, inscribing and describing polygons on circles.

Curves: Parabola, Ellipse and Hyperbola by general methods, cycloids, involutes, tangents & normals for the curves.

UNIT II

Objective: To introduce the students to use scales and orthographic projections, projections of points & simple lines.

Scales: Plain scales, diagonal scales and vernier scales

Orthographic Projections: Horizontal plane, vertical plane, profile plane, importance of reference lines, projections of points in various quadrants, projections of lines, lines parallel either to of the reference planes (HP, VP or PP)

UNIT III

Objective: The objective is to make the students draw the projections of the lines inclined to both the planes.

Projections of straight lines inclined to both the planes, determination of true lengths, angle of inclination and traces- HT, VT

UNIT IV

Objective: The objective is to make the students draw the projections of the plane inclined to both the planes.

Projections of planes: regular planes perpendicular/parallel to one plane and inclined to the other reference plane; inclined to both the reference planes.

UNIT V

Objective: The objective is to make the students draw the projections of the various types of solids in different positions inclined to one of the planes.

Projections of Solids – Prisms, Pyramids, Cones and Cylinders with the axis inclined to one of the planes.

UNIT VI

Objective: The objective is to represent the object in 3D view through isometric views. The student will be able to represent and convert the isometric view to orthographic view and vice versa.

Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

TEXT BOOKS:

1. Engineering Drawing by N.D. Butt, Chariot Publications
2. Engineering Drawing by Agarwal & Agarwal, Tata McGraw Hill Publishers

REFERENCE BOOKS:

1. Engineering Drawing by K.L.Narayana & P. Kannaiah, Scitech Publishers
2. Engineering Graphics for Degree by K.C. John, PHI Publishers
3. Engineering Graphics by PI Varghese, McGrawHill Publishers
4. Engineering Drawing + AutoCad – K Venugopal, V. Prabhu Raja, New Age

I Year - II Semester

L	T	P	C
0	0	3	2

ENGLISH-COMMUNICATIONS SKILLS LAB-II

PRESCRIBED LAB MANUAL FOR SEMESTER II:

'**INTERACT: English Lab Manual for Undergraduate Students**' Published by **Orient Blackswan Pvt Ltd.**

OBJECTIVES:

To enable the students to learn demonstratively the communication skills of listening, speaking, reading and writing.

OUTCOME:

A study of the communicative items in the laboratory will help the students become successful in the competitive world.

The course content along with the study material is divided into six units.

UNIT 1:

1. Debating
Practice work

UNIT 2:

1. Group Discussions
Practice work

UNIT 3:

1. Presentation Skills
Practice work

UNIT 4:

1. Interview Skills
Practice work

UNIT 5:

1. Email,
2. Curriculum Vitae
Practice work

UNIT 6:

1. Idiomatic Expressions
2. Common Errors in English
Practice work

Reference Books:

1. Strengthen your communication skills by Dr M Hari Prasad, Dr Salivendra Raju and Dr G Suvarna Lakshmi, Maruti Publications.
2. English for Professionals by Prof Eliah, B.S Publications, Hyderabad.
3. Unlock, Listening and speaking skills 2, Cambridge University Press
4. Spring Board to Success, Orient BlackSwan
5. A Practical Course in effective english speaking skills, PHI
6. Word power made handy, Dr shalini verma, Schand Company
7. Let us hear them speak, Jayashree Mohanraj, Sage texts
8. Professional Communication, Aruna Koneru, Mc Grawhill Education
9. Cornerstone, Developing soft skills, Pearson Education

I Year - II Semester

L	T	P	C
0	0	3	2

ENGINEERING / APPLIED PHYSICS LAB
(Any 10 of the following listed experiments)

Objective: *Training field oriented Engineering graduates to handle instruments and their design methods to improve the accuracy of measurements.*

LIST OF EXPERIMENTS:

1. Determination of wavelength of a source-Diffraction Grating-Normal incidence.
2. Newton's rings – Radius of Curvature of Plano - Convex Lens.
3. Determination of thickness of a spacer using wedge film and parallel interference fringes.
4. Determination of Rigidity modulus of a material- Torsional Pendulum.
5. Determination of Acceleration due to Gravity and Radius of Gyration- Compound Pendulum.
6. Melde's experiment – Transverse and Longitudinal modes.
7. Verification of laws of vibrations in stretched strings – Sonometer.
8. Determination of velocity of sound – Volume Resonator.
9. L- C- R Series Resonance Circuit.
10. Study of I/V Characteristics of Semiconductor diode.
11. I/V characteristics of Zener diode.
12. Characteristics of Thermistor – Temperature Coefficients.
13. Magnetic field along the axis of a current carrying coil – Stewart and Gee's apparatus.
14. Energy Band gap of a Semiconductor p - n junction.
15. Hall Effect in semiconductors.
16. Time constant of CR circuit.
17. Determination of wavelength of laser source using diffraction grating.
18. Determination of Young's modulus by method of single cantilever oscillations.
19. Determination of lattice constant – lattice dimensions kit.
20. Determination of Planck's constant using photocell.
21. Determination of surface tension of liquid by capillary rise method.

Outcome: *Physics lab curriculum gives fundamental understanding of design of an instrument with targeted accuracy for physical measurements.*

I Year - II Semester

L	T	P	C
0	0	2	0

ENGINEERING / APPLIED PHYSICS - VIRTUAL LABS – ASSIGNMENTS
(Constitutes 5% marks of 30marks of Internal-component)

Objective: *Training Engineering students to prepare a technical document and improving their writing skills.*

LIST OF EXPERIMENTS

1. Hall Effect
2. Crystal Structure
3. Hysteresis
4. Brewster's angle
5. Magnetic Levitation / SQUID
6. Numerical Aperture of Optical fiber
7. Photoelectric Effect
8. Simple Harmonic Motion
9. Damped Harmonic Motion
10. LASER – Beam Divergence and Spot size
11. B-H curve
12. Michelson's interferometer
13. Black body radiation

URL: www.vlab.co.in

Outcome: *Physics Virtual laboratory curriculum in the form of assignment ensures an engineering graduate to prepare a /technical/mini-project/ experimental report with scientific temper.*

I Year - II Semester

L **T** **P** **C**
0 **0** **3** **2**

ENGINEERING WORKSHOP & IT WORKSHOP

ENGINEERING WORKSHOP

Course Objective: To impart hands-on practice on basic engineering trades and skills.

Note: At least two exercises to be done from each trade.

Trade:

Carpentry	1. T-Lap Joint 2. Cross Lap Joint 3. Dovetail Joint 4. Mortise and Tenon Joint
Fitting	1. Vee Fit 2. Square Fit 3. Half Round Fit 4. Dovetail Fit
Black Smithy	1. Round rod to Square 2. S-Hook 3. Round Rod to Flat Ring 4. Round Rod to Square headed bolt
House Wiring	1. Parallel / Series Connection of three bulbs 2. Stair Case wiring 3. Florescent Lamp Fitting 4. Measurement of Earth Resistance
Tin Smithy	1. Taper Tray 2. Square Box without lid 3. Open Scoop 4. Funnel

IT WORKSHOP

OBJECTIVES:

- Understand the basic components and peripherals of a computer.
- To become familiar in configuring a system.
- Learn the usage of productivity tools.
- Acquire knowledge about the netiquette and cyber hygiene.
- Get hands on experience in trouble shooting a system?

1. System Assembling, Disassembling and identification of Parts / Peripherals

2. **Operating System Installation**-Install Operating Systems like Windows, Linux along with necessary Device Drivers.

3. MS-Office / Open Office

- a. **Word** - Formatting, Page Borders, Reviewing, Equations, symbols.
- b. **Spread Sheet** - organize data, usage of formula, graphs, charts.
- c. **Power point** - features of power point, guidelines for preparing an effective presentation.
- d. **Access**- creation of database, validate data.

4. **Network Configuration & Software Installation**-Configuring TCP/IP, proxy and firewall settings. Installing application software, system software & tools.
5. **Internet and World Wide Web**-Search Engines, Types of search engines, netiquette, cyber hygiene.
6. **Trouble Shooting**-Hardware trouble shooting, Software trouble shooting.
7. **MATLAB**- basic commands, subroutines, graph plotting.
8. **LATEX**-basic formatting, handling equations and images.

OUTCOMES:

- Common understanding of concepts, patterns of decentralization implementation in Africa †
- Identified opportunities for coordinated policy responses, capacity building and implementation of best practices †
- Identified instruments for improved decentralization to the local level †
- Identified strategies for overcoming constraints to effective decentralization and sustainable management at different levels

TEXT BOOKS:

1. Computer Hardware, Installation, Interfacing, Troubleshooting and Maintenance, K.L. James, Eastern Economy Edition.
2. Microsoft Office 2007: Introductory Concepts and Techniques, Windows XP Edition By Gary B. Shelly, Misty E. Vermaat and Thomas J. Cashman (2007, Paperback).
3. LATEX- User's Guide and Reference manual, Leslie Lamport, Pearson, LPE, 2/e.
4. Getting Started with MATLAB: A Quick Introduction for Scientists and Engineers, Rudraprathap, Oxford University Press, 2002.
5. Scott Mueller's Upgrading and Repairing PCs, 18/e, Scott. Mueller, QUE, Pearson, 2008
6. The Complete Computer upgrade and repair book, 3/e, Cheryl A Schmidt, Dreamtech.
7. Comdex Information Technology course tool kit Vikas Gupta, WILEY Dreamtech.
8. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.

II Year - I Semester

L	T	P	C
4	0	0	3

METALLURGY & MATERIALS SCIENCE

Course Objective: To understand the basic fundamentals of Material science and Physical metallurgy. The basic concepts to be taught will help for the improvement, proper selection and effective utilization of materials which is essential to satisfy the ever increasing demands of the society.

UNIT – I

Learning Objectives: To know the basic concepts of bonds in metals and alloys. To understand the basic requirements for the formation of solid solutions and other compounds.

Structure of Metals and Constitution of alloys: Bonds in Solids – Metallic bond - crystallization of metals, grain and grain boundaries, effect of grain boundaries on the properties of metal / alloys – determination of grain size. Necessity of alloying, types of solid solutions, Hume Rotherys rules, intermediate alloy phases, and electron compounds.

UNIT –II

Learning objectives: To understand the regions of stability of the phases that can occur in an alloy system in order to solve the problems in practical metallurgy.

Equilibrium Diagrams : Experimental methods of construction of equilibrium diagrams, Isomorphous alloy systems, equilibrium cooling and heating of alloys, Lever rule, coring miscibility gaps, eutectic systems, congruent melting intermediate phases, peritectic reaction. Transformations in the solid state – allotropy, eutectoid, peritectoid reactions, phase rule, relationship between equilibrium diagrams and properties of alloys. Study of important binary phase diagrams of Cu-Ni-, Al-Cu, Bi-Cd and Fe-Fe₃C.

UNIT –III

Learning objectives: To study the basic differences between cast irons and steels, their properties and practical applications.

Cast Irons and Steels: Structure and properties of White Cast iron, Malleable Cast iron, grey cast iron, Spheroidal graphite cast iron, Alloy cast irons. Classification of steels, structure and properties of plain carbon steels, Low alloy steels, Hadfield manganese steels, tool and die steels.

UNIT – IV

Learning objectives: To study the affect of various alloying elements on iron-iron carbide system. To understand the various heat treatment and strengthening processes used in practical applications.

Heat treatment of Alloys: Effect of alloying elements on Fe-Fe₃C system, Annealing, normalizing, hardening, TTT diagrams, tempering , hardenability, surface - hardening methods, Age hardening treatment, Cryogenic treatment of alloys.

UNIT – V

Learning objectives: To study the properties and applications of widely used non-ferrous metals and alloys so as to use the suitable material for practical applications.

Non-ferrous Metals and Alloys: Structure and properties of Copper and its alloys, Aluminium and its alloys, Titanium and its alloys.

UNIT – VI

Learning objectives: To study the properties and applications of ceramic, composite and other advanced materials so as to use the suitable material for practical applications.

Ceramic and composite materials: Crystalline ceramics, glasses, cermets, abrasive materials, nanomaterials – definition, properties and applications of the above.

Classification of composites, various methods of component manufacture of composites, particle – reinforced materials, fiber reinforced materials, metal ceramic mixtures, metal – matrix composites and C – C composites.

Text Books:

1. Introduction to Physical Metallurgy - Sidney H. Avener - McGrawHill
2. Essential of Materials science and engineering - Donald R.Askeland - Cengage.

References :

1. Material Science and Metallurgy – Dr. V.D.Kodgire.
2. Materials Science and engineering - Callister & Baalashubrahmanyam
3. Material Science for Engineering students – Fischer – Elsevier Publishers
4. Material science and Engineering - V. Rahghavan
5. Introduction to Material Science and Engineering – Yip-Wah Chung CRC Press
6. Material Science and Metallurgy – A V K Suryanarayana – B S Publications
7. Material Science and Metallurgy – U. C. Jindal – Pearson Publications

II Year - I Semester

L	T	P	C
4	0	0	3

MECHANICS OF SOLIDS

Common to Mechanical, Aeronautical & Automobile Engineering.

Objective: The students completing this course are expected to understand the basic terms like stress, strain, Poisson's ratio...etc and different stresses induced in beams, thin cylinders, thick cylinders, columns. Further, the student shall be able to understand the shear stresses in circular shafts.

UNIT – I

Objective: After studying this unit student will know the basic terms like stress, strain Poisson's ratio...etc and stresses in bars of varying cross sections, composite bars, thermal stress in members, stresses on inclined planes with analytical approach and graphical approach, strain energy under different loadings and also problem solving techniques.

SIMPLE STRESSES & STRAINS : Elasticity and plasticity – Types of stresses & strains–Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio & volumetric strain – Bars of varying section – composite bars – Temperature stresses- Complex Stresses - Stresses on an inclined plane under different uniaxial and biaxial stress conditions - Principal planes and principal stresses - Mohr's circle - Relation between elastic constants, Strain energy – Resilience – Gradual, sudden, impact and shock loadings.

UNIT – II

Objective: After studying this unit student will know the construction of shear force diagrams and bending moment diagrams to the different loads for the different support arrangements and also problem solving techniques.

SHEAR FORCE AND BENDING MOMENT : Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, u.d.l, uniformly varying loads and combination of these loads – Point of contra flexure – Relation between S.F., B.M and rate of loading at a section of a beam.

UNIT – III

Objective: After studying this unit student will know the bending and shear stress induced in the beams which are made with different cross sections like rectangular, circular, triangular, I, T angle sections and also problem solving techniques.

FLEXURAL STRESSES : Theory of simple bending – Assumptions – Derivation of bending equation: $M/I = f/y = E/R$ Neutral axis – Determination bending stresses – section modulus of rectangular and circular sections (Solid and Hollow), I,T, Angle and Channel sections – Design of simple beam sections.

SHEAR STRESSES: Derivation of formula – Shear stress distribution across various beams sections like rectangular, circular, triangular, I, T angle sections.

UNIT – IV

Objective: *After studying this unit student will know how to finding slope and deflection for different support arrangements by Double integration method, Macaulay's method and Moment-Area and also problem solving techniques.*

DEFLECTION OF BEAMS : Bending into a circular arc – slope, deflection and radius of curvature – Differential equation for the elastic line of a beam – Double integration and Macaulay's methods – Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, - U.D.L uniformly varying load. Mohr's theorems – Moment area method – application to simple cases including overhanging beams, Statically Indeterminate Beams and solution methods.

UNIT – V

Objective: *After studying this unit student will know how a cylinder fails, what kind of stresses induced in cylinders subjected to internal, external pressures and also problem solving techniques.*

THIN CYLINDERS: Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and Volumetric strains – changes in dia, and volume of thin cylinders – Riveted boiler shells – Thin spherical shells.

THICK CYLINDERS: –Lame's equation – cylinders subjected to inside & outside pressures –compound cylinders.

UNIT –VI

Objective: *After studying this unit student will know shear stresses induced in circular shafts, discussing columns in stability point of view and columns with different end conditions.*

TORSION: Introduction-Derivation- Torsion of Circular shafts- Pure Shear-Transmission of power by circular shafts, Shafts in series, Shafts in parallel.

COLUMNS:

Buckling and Stability, Columns with Pinned ends, Columns with other support Conditions, Limitations of Euler's Formula, Rankine's Formula,

Text Books:

1. Strength of materials /GH Ryder/ Mc Millan publishers India Ltd
2. Solid Mechanics, by Popov
3. Mechanics of Materials/Gere and Timoshenko, CBS Publishers

References :

1. Strength of Materials -By Jindal, Umesh Publications.
2. Analysis of structures by Vazirani and Ratwani.
3. Mechanics of Structures Vol-III, by S.B.Junnarkar.
4. Strength of Materials by S.Timoshenko
5. Strength of Materials by Andrew Pytel and Ferdinond L. Singer Longman.

THERMODYNAMICS

Course Objectives:

To impart the knowledge of the thermodynamic laws and principles so as to enable the student to prepare an energy audit of any mechanical system that exchange heat and work with the surroundings.

UNIT – I

Objectives: The student should be able to understand the basic concepts like thermodynamic system, its boundary and related fundamental definitions. Distinction between point function and path function shall be made with respect to energy, work and Heat.

Introduction: Basic Concepts : System, boundary, Surrounding, control volume, Universe, Types of Systems, Macroscopic and Microscopic viewpoints, Concept of Continuum, Thermodynamic Equilibrium, State, Property, Process, Cycle – Reversibility – Quasi – static Process, Irreversible Process, Causes of Irreversibility – Energy in State and in Transition, Types, Work and Heat, Point and Path function. Zeroth Law of Thermodynamics – Concept of Temperature – Principles of Thermometry –Reference Points – Const. Volume gas Thermometer – Scales of Temperature, Ideal Gas Scale – PMM I

UNIT II

Objectives: To learn the first law of thermodynamics, which is also the energy conservation principle, and should be able to apply to different thermodynamic systems. To understand the concept of equality of temperature and the principle of operation of various temperature measuring devices. To learn the applications of steady flow energy equation to the various mechanical components.

Joule's Experiments – First law of Thermodynamics – Corollaries – First law applied to a Process – applied to a flow system – Steady Flow Energy Equation. PMM-I, throttling and free expansion processes – deviations from perfect gas model – Vander waals equation of state – compressibility charts – variable specific heats – gas tables.

UNIT – III

Objectives: To understand the second law statements and the associated terms and should be able to apply the principles to heat engines. Should be able to analyse the concepts of Carnot cycle, entropy, availability and irreversibility. Should be able to understand the use of Maxwells relations and thermodynamic functions.

Limitations of the First Law – Thermal Reservoir, Heat Engine, Heat pump, Parameters of performance, Second Law of Thermodynamics, Kelvin-Planck and Clausius Statements and their Equivalence / Corollaries, PMM of Second kind, Carnot's principle, Carnot cycle and its specialties, Thermodynamic scale of Temperature, Clausius Inequality, Entropy, Principle of Entropy Increase – Energy Equation, Availability and Irreversibility – Thermodynamic Potentials, Gibbs and Helmholtz Functions, Maxwell Relations – Elementary Treatment of the Third Law of Thermodynamics.

UNIT IV

Objectives: should understand the process of steam formation and its representation on property diagrams with various phase changes and should be able to calculate the quality of steam after its expansion in a steam turbine, with the help of standard steam tables and charts.

Pure Substances, P-V-T- surfaces, T-S and h-s diagrams, Mollier Charts, Phase Transformations – Triple point at critical state properties during change of phase, Dryness Fraction – Clausius – Clapeyron Equation Property tables. Mollier charts – Various Thermodynamic processes and energy Transfer – Steam Calorimetry.

UNIT – V

Objectives: Should be able to use Psychrometric chart and calculate various psychrometric properties of air.

Mixtures of perfect Gases – Mole Fraction, Mass fraction Gravimetric and volumetric Analysis – Dalton's Law of partial pressure, Avogadro's Laws of additive volumes – Mole fraction, Volume fraction and partial pressure, Equivalent Gas const. And Molecular Internal Energy, Enthalpy, sp. Heats and Entropy of Mixture of perfect Gases and Vapour, Atmospheric air - Psychrometric Properties – Dry bulb Temperature, Wet Bulb Temperature, Dew point Temperature, Thermodynamic Wet Bulb Temperature, Specific Humidity, Relative Humidity, saturated Air, Vapour pressure, Degree of saturation – Adiabatic Saturation, Carrier's Equation – Psychrometric chart.

UNIT - VI

Objectives: To understand the concept of air standard cycles and should be able to calculate the efficiency and performance parameters of the systems that use these cycles.

Power Cycles : Otto, Diesel, Dual Combustion cycles, Sterling Cycle, Atkinson Cycle, Ericsson Cycle, Lenoir Cycle – Description and representation on P-V and T-S diagram, Thermal Efficiency, Mean Effective Pressures on Air standard basis – comparison of Cycles.

Refrigeration Cycles : Brayton and Rankine cycles – Performance Evaluation – combined cycles, Bell- Coleman cycle, Vapour compression cycle-performance Evaluation.

Text Books :

1. Engineering Thermodynamics, PK Nag 4th Edn, TMH.
2. Thermodynamics – An Engineering Approach with student resources DVD – Y.A.Cengel & M.A.Boles, 7th Edn - McGrawHill

References :

1. Engineering Thermodynamics – Jones & Dugan PHI
2. Thermodynamics – J.P.Holman, McGrawHill
3. Basic Engineering Thermodynamics – A.Venkatesh – Universities press.
4. An Introduction to Thermodynamics - Y.V.C.Rao – Universities press.
5. Thermodynamics – W.Z.Black & J.G.Hartley, 3rd Edn Pearson Publ.
6. Engineering Thermodynamics – D.P.Misra, Cengage Publ.
7. Engineering Thermodynamics – P.Chattopadhyay – Oxford Higher Edn Publ.

II Year - I Semester

L	T	P	C
4	0	0	3

MANAGERIAL ECONOMICS & FINANCIAL ANALYSIS

Course Objectives:

- The Learning objectives of this paper is to understand the concept and nature of Managerial Economics and its relationship with other disciplines and also to understand the Concept of Demand and Demand forecasting, Production function, Input Output relationship, Cost-Output relationship and Cost-Volume-Profit Analysis.
- To understand the nature of markets, Methods of Pricing in the different market structures and to know the different forms of Business organization and the concept of Business Cycles.
- To learn different Accounting Systems, preparation of Financial Statement and uses of different tools for performance evaluation. Finally, it is also to understand the concept of Capital, Capital Budgeting and the techniques used to evaluate Capital Budgeting proposals.

UNIT-I

Introduction to Managerial Economics and demand Analysis:

Definition of Managerial Economics –Scope of Managerial Economics and its relationship with other subjects – Concept of Demand, Types of Demand, Determinants of Demand- Demand schedule, Demand curve, Law of Demand and its limitations- Elasticity of Demand, Types of Elasticity of Demand and Measurement- Demand forecasting and Methods of forecasting, Concept of Supply and Law of Supply.

UNIT – II:

Production and Cost Analysis:

Concept of Production function- Cobb-Douglas Production function- Leontief production function - Law of Variable proportions-Isoquants and Isocosts and choice of least cost factor combination-Concepts of Returns to scale and Economies of scale-Different cost concepts: opportunity costs, explicit and implicit costs- Fixed costs, Variable Costs and Total costs –Cost –Volume-Profit analysis-Determination of Breakeven point(simple problems)-Managerial significance and limitations of Breakeven point.

UNIT – III:

Introduction to Markets, Theories of the Firm & Pricing Policies:

Market Structures: Perfect Competition, Monopoly, Monopolistic competition and Oligopoly – Features – Price and Output Determination – Managerial Theories of firm: Marris and Williamson's models – other Methods of Pricing: Average cost pricing, Limit Pricing, Market Skimming Pricing, Internet Pricing: (Flat Rate Pricing, Usage sensitive pricing) and Priority Pricing.

UNIT – IV:

Types of Business Organization and Business Cycles:

Features and Evaluation of Sole Trader, Partnership, Joint Stock Company – State/Public Enterprises and their forms – Business Cycles : Meaning and Features – Phases of a Business Cycle.

UNIT – V:

Introduction to Accounting & Financing Analysis:

Introduction to Double Entry Systems – Preparation of Financial Statements-Analysis and Interpretation of Financial Statements-Ratio Analysis – Preparation of Funds flow and cash flow statements (Simple Problems)

UNIT – VI:

Capital and Capital Budgeting: Capital Budgeting: Meaning of Capital-Capitalization-Meaning of Capital Budgeting-Time value of money- Methods of appraising Project profitability: Traditional Methods(pay back period, accounting rate of return) and modern methods(Discounted cash flow method, Net Present Value method, Internal Rate of Return Method and Profitability Index)

Course Outcome:

*The Learner is equipped with the knowledge of estimating the Demand and demand elasticities for a product and the knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs.

* One is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units.

*The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis and to evaluate various investment project proposals with the help of capital budgeting techniques for decision making.

TEXT BOOKS

1. Dr. N. AppaRao, Dr. P. Vijay Kumar: 'Managerial Economics and Financial Analysis', Cengage Publications, New Delhi – 2011
2. Dr. A. R. Aryasri – Managerial Economics and Financial Analysis, TMH 2011
3. Prof. J.V.Prabhakararao, Prof. P. Venkatarao. 'Managerial Economics and Financial Analysis', Ravindra Publication.

References:

1. Dr. B. Kuberudu and Dr. T. V. Ramana: Managerial Economics & Financial Analysis, Himalaya Publishing House, 2014.
2. V. Maheswari: Managerial Economics, Sultan Chand.2014
3. Suma Damodaran: Managerial Economics, Oxford 2011.
4. Vanitha Agarwal: Managerial Economics, Pearson Publications 2011.
5. Sanjay Dhameja: Financial Accounting for Managers, Pearson.
6. Maheswari: Financial Accounting, Vikas Publications.
7. S. A. Siddiqui & A. S. Siddiqui: Managerial Economics and Financial Analysis, New Age International Publishers, 2012
8. Ramesh Singh, Indian Economy, 7th Edn., TMH2015
9. Pankaj Tandon A Text Book of Microeconomic Theory, Sage Publishers, 2015
10. Shailaja Gajjala and Usha Munipalle, Universities press, 2015

FLUID MECHANICS & HYDRAULIC MACHINES

Objective: *The students completing this course are expected to understand the properties of fluids, its kinematic and dynamic behavior through various laws of fluids like continuity, Euler's, Bernoulli's equations, energy and momentum equations. Further, the student shall be able to understand the theory of boundary layer, working and performance characteristics of various hydraulic machines like pumps and turbines.*

UNIT I

Objective: *After studying this unit student will know the concept of fluid and its properties, manometry, hydrostatic forces acting on different surfaces and also problem solving techniques.*

Fluid statics: Dimensions and units: physical properties of fluids- specific gravity, viscosity and its significance, surface tension, capillarity, vapor pressure. Atmospheric gauge and vacuum pressure – measurement of pressure. Manometers- Piezometer, U-tube, inverted and differential manometers. Pascal's law, hydrostatic law.

Buoyancy and floatation: Meta center, stability of floating body. Submerged bodies. Calculation of metacenter height. Stability analysis and applications.

UNIT II

Objective: *In this unit student will be exposed to the basic laws of fluids, flow patterns, viscous flow through ducts and their corresponding problems.*

Fluid kinematics: Introduction, flow types. Equation of continuity for one dimensional flow, circulation and vorticity, Stream line, path line and streak lines and stream tube. Stream function and velocity potential function, differences and relation between them. Condition for irrotational flow, flow net, source and sink, doublet and vortex flow.

Fluid dynamics: surface and body forces –Euler's and Bernoulli's equations for flow along a stream line, momentum equation and its applications, force on pipe bend.

Closed conduit flow: Reynold's experiment- Darcy Weisbach equation- Minor losses in pipes- pipes in series and pipes in parallel- total energy line-hydraulic gradient line.

UNIT III

Objective: *At the end of this unit student will be aware of the concepts related to boundary layer theory, flow separation, basic concepts of velocity profiles, dimensionless numbers and dimensional analysis.*

Boundary Layer Theory: Introduction, momentum integral equation, displacement, momentum and energy thickness, separation of boundary layer, control of flow separation, Stream lined body, Bluff body and its applications, basic concepts of velocity profiles.

Dimensional Analysis: Similitude and modelling – Dimensionless numbers

UNIT IV

Objective: *In this unit student will know the hydrodynamic forces acting on vanes and their performance evaluation.*

Basics of turbo machinery: hydrodynamic force of jets on stationary and moving flat, inclined, and curved vanes, jet striking centrally and at tip, velocity diagrams, work done and efficiency, flow over radial vanes.

UNIT V

Objective: *At the end of this unit student will be aware of the importance, function and performance of hydro machinery.*

Centrifugal pumps: classification, working, work done – manometric head- losses and efficiencies- specific speed- pumps in series and parallel-performance characteristic curves, cavitation & NPSH.

Reciprocating pumps: Working, Discharge, slip, indicator diagrams.

UNIT VI

Objective: *After studying this unit student will be in a position to evaluate the performance characteristics of hydraulic turbines. Also a little knowledge on hydraulic systems and fluidics is imparted to the student.*

Hydraulic Turbines: classification of turbines, impulse and reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine-working proportions, work done, efficiencies, hydraulic design –draft tube- theory- functions and efficiency.

Performance of hydraulic turbines: Geometric similarity, Unit and specific quantities, characteristic curves, governing of turbines, selection of type of turbine, cavitation, surge tank, water hammer. Hydraulic systems- hydraulic ram, hydraulic lift, hydraulic coupling. Fluidics – amplifiers, sensors and oscillators. Advantages, limitations and applications.

Text Books:

1. Hydraulics, fluid mechanics and Hydraulic machinery MODI and SETH.
2. Fluid Mechanics and Hydraulic Machines by Rajput.
3. Fluid Mechanics and Hydraulic Machines/ RK Bansal/Laxmi Publications (P) Ltd.

Reference Books:

1. Fluid Mechanics and Fluid Power Engineering by D.S. Kumar, Kotaria & Sons.
2. Fluid Mechanics and Machinery by D. Rama Durgaiyah, New Age International.
3. Hydraulic Machines by Banga & Sharma, Khanna Publishers.
4. Instrumentation for Engineering Measurements by James W. Dally, William E. Riley ,John Wiley & Sons Inc. 2004 (Chapter 12 – Fluid Flow Measurements)
5. Fluid Mechanics and Hydraulic Machines by Domkundwar & Domkundwar, Dhanpatrai & Co.

II Year - I Semester

L	T	P	C
3	3	0	3

COMPUTER AIDED ENGINEERING DRAWING PRACTICE

Course Objective: To enhance the student's knowledge and skills in engineering drawing and to introduce drafting packages and commands for computer aided drawing and modelling.

UNIT-I:

Objective: The knowledge of projections of solids is essential in 3D modelling and animation. The student will be able to draw projections of solids. The objective is to enhance the skills they already acquired in their earlier course in drawing of projection.

PROJECTIONS OF SOLIDS: Projections of Regular Solids inclined to both planes – Auxiliary Views.

UNIT-II:

The knowledge of sections of solids and development of surfaces is required in designing and manufacturing of the objects. Whenever two or more solids combine, a definite curve is seen at their intersection.

SECTIONS OF SOLIDS: Sections and Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views.

DEVELOPMENT AND INTERPENETRATION OF SOLIDS: Development of Surfaces of Right Regular Solids – Prisms, Cylinder, Pyramid Cone and their parts.

UNIT-III:

The intersection of solids also plays an important role in designing and manufacturing. The objective is to impart this knowledge through this topic. A perspective view provides a realistic 3D View of an object. The objective is to make the students learn the methods of Iso and Perspective views.

INTERPENETRATION OF RIGHT REGULAR SOLIDS: Intersection of Cylinder Vs Cylinder, Cylinder Vs Prism, Cylinder Vs Cone, Prism Vs Cone.

PERSPECTIVE PROJECTIONS: Perspective View: Points, Lines, Plane Figures and Simple Solids, Vanishing Point Methods (General Method only).

In part B computer aided drafting is introduced.

UNIT IV:

The objective is to introduce various commands in AutoCAD to draw the geometric entities and to create 2D and 3D wire frame models.

INTRODUCTION TO COMPUTER AIDED DRAFTING: Generation of points, lines, curves, polygons, dimensioning. Types of modeling : object selection commands – edit, zoom, cross hatching, pattern filling, utility commands, 2D wire frame modeling, 3D wire frame modeling,.

UNIT V:

By going through this topic the student will be able to understand the paper-space environment thoroughly.

VIEW POINTS AND VIEW PORTS: view point coordinates and view(s) displayed, examples to exercise different options like save, restore, delete, joint , single option.

UNIT VI:

The objective is to make the students create geometrical model of simple solids and machine parts and display the same as an Isometric, Orthographic or Perspective projection.

COMPUTER AIDED SOLID MODELLING: Isometric projections, orthographic projections of isometric projections, Modeling of simple solids, Modeling of Machines & Machine Parts.

Text Books :

1. Engineering drawing by N.D Bhatt, Charotar publications.
2. Engineering Graphics, K.C. John, PHI Publications

References:

1. Mastering Auto CAD 2013 and Auto CAD LT 2013 – George Omura, Sybex
2. Auto CAD 2013 fundamentals- Elisemoss, SDC Publ.
3. Engineering Drawing and Graphics using Auto Cad – T Jeyapoovan, vikas
4. Engineering Drawing + AutoCAD – K Venugopal, V. Prabhu Raja, New Age
5. Engineering Drawing – RK Dhawan, S Chand
6. Engineering Drawing – MB Shaw, BC Rana, Pearson
7. Engineering Drawing – KL Narayana, P Kannaiah, Scitech
8. Engineering Drawing – Agarwal and Agarwal, Mc Graw Hill
9. Engineering Graphics – PI Varghese, Mc Graw Hill
10. Text book of Engineering Drawing with auto-CAD , K.Venkata Reddy/B.S . publications.
11. Engineering Drawing with Auto CAD/ James D Bethune/Pearson Publications
12. Engineering Graphics with Auto CAD/Kulkarni D.M, Rastogi A.P, Sarkar A.K/PHI Publications

End Semester examination shall be conducted for **Four** hours with the following pattern:

- a) Two hours-Conventional drawing
- b) Two hours – Computer Aided Drawing

ELECTRICAL & ELECTRONICS ENGINEERING LAB

Section A: Electrical Engineering:

Learning Objectives:

- To predetermine the efficiency of dc shunt machine using Swinburne's test.
- To predetermine the efficiency and regulation of 1-phase transformer with O.C and S.C tests.
- To obtain performance characteristics of DC shunt motor & 3-phase induction motor.
- To find out regulation of an alternator with synchronous impedance method.
- To control speed of dc shunt motor using speed control methods.
- To find out the characteristics of PN junction diode & transistor
- To determine the ripple factor of half wave & full wave rectifiers.

The following experiments are required to be conducted as compulsory experiments:

1. Swinburne's test on D.C. Shunt machine (Predetermination of efficiency of a given D.C. Shunt machine working as motor and generator).
2. OC and SC tests on single phase transformer (Predetermination of efficiency and regulation at given power factors).
3. Brake test on 3-phase Induction motor (Determination of performance characteristics)
4. Regulation of alternator by Synchronous impedance method.
5. Speed control of D.C. Shunt motor by
 - a) Armature Voltage control
 - b) Field flux control method
6. Brake test on D.C. Shunt Motor.

Section B: Electronics Engineering.

The following experiments are required to be conducted as compulsory experiments:

1. PN junction diode characteristics a) Forward bias b) Reverse bias (Cut in voltage and resistance calculations)
2. Transistor CE characteristics (Input and output)
3. Half wave rectifier with and with out filters.
4. Full wave rectifier with and with out filters.
5. CE amplifiers.
6. OP- Amp applications (inverting, non inverting, integrator and differentiator)

Learning Outcomes:

- Able to find out the efficiency of dc shunt machine without actual loading of the machine.
- Able to estimate the efficiency and regulation for different load conditions and power factors of single phase transformer with OC and SC test.
- Able to analyse the performance characteristics and to determine efficiency of DC shunt motor & 3-phase induction motor.
- Able to pre-determine the regulation of an alternator by synchronous impedance method.
- Able to control the speed of dc shunt motor using speed control methods.
- Able to find out the characteristics of PN junction diode & transistor
- Able to determine the ripple factor of half wave & full wave rectifiers.

II Year - I Semester

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MECHANICS OF SOLIDS & METALLURGY LAB

Course Objective: To impart practical exposure on the microstructures of various materials and their hardness evaluation. Also to impart practical knowledge on the evaluation of material properties through various destructive testing procedures.

NOTE: Any 6 experiments from each section A and B.

(A) MECHANICS OF SOLIDS LAB :

1. Direct tension test
2. Bending test on
 - a) Simple supported
 - b) Cantilever beam
3. Torsion test
4. Hardness test
 - a) Brinells hardness test
 - b) Rockwell hardness test
5. Test on springs
6. Compression test on cube
7. Impact test
8. Punch shear test

(B) METALLURGY LAB:

1. Preparation and study of the Micro Structure of pure metals like Iron, Cu and Al.
2. Preparation and study of the Microstructure of Mild steels, low carbon steels, high – C steels.
3. Study of the Micro Structures of Cast Irons.
4. Study of the Micro Structures of Non-Ferrous alloys.
5. Study of the Micro structures of Heat treated steels.
6. Hardenability of steels by Jominy End Quench Test.
7. To find out the hardness of various treated and untreated steels.

KINEMATICS OF MACHINERY

Objective: The students completing this course are expected to understand the nature and role of the kinematics of machinery, the mechanisms and machines. The course includes velocity and acceleration diagrams, analysis of mechanisms joints, Cams and their applications. It exposes the students to various kinds of power transmission devices like belt, rope, chain and gear drives and their working principles and their merits and demerits.

UNIT – I

Objective: The objective of this unit is to make student understand the purpose of kinematics, Kinematic joint and mechanism and to study the relative motion of parts in a machine without taking into consideration the forces involved.

MECHANISMS : Elements or Links – Classification – Rigid Link, flexible and fluid link – Types of kinematic pairs – sliding, turning, rolling, screw and spherical pairs – lower and higher pairs – closed and open pairs – constrained motion – completely, partially or successfully constrained and incompletely constrained .

Grublers criterion, Grashoff's law, Degrees of freedom, Kutzbach criterion for planar mechanisms, Mechanism and machines – classification of machines – kinematic chain – inversion of mechanism – inversion of mechanism – inversions of quadric cycle, chain – single and double slider crank chains.

UNIT – II

Objective: The objective of this unit is to make student understand various mechanisms for straight line motion and their applications including steering mechanism.

LOWER PAIR MECHANISM: Exact and approximate copiers and generated types – Peaucellier, Hart and Scott Russel – Grasshopper – Watt T. Chebicheff and Robert Mechanisms and straight line motion, Pantograph.

Conditions for correct steering – Davis Steering gear, Ackermans steering gear – velocity ratio; Hooke's Joint: Single and double – Universal coupling–application–problems.

UNIT – III

Objective : The objective of this unit is to make student understand the velocity and acceleration concepts and the methodology using graphical methods and principles and application of four bar chain. To understand the application of slider crank mechanism etc. and study of plane motion of the body

KINEMATICS: Velocity and acceleration – Motion of a link in machine – Determination of Velocity and acceleration diagrams – Graphical method – Application of relative velocity method four bar chain. Velocity and acceleration analysis of for a given mechanism, Kleins construction, Coriolis acceleration, determination of Coriolis component of acceleration.

Plane motion of body: Instantaneous centre of rotation, centroids and axodes – relative motion between two bodies – Three centres in line theorem – Graphical determination of instantaneous centre, diagrams for simple mechanisms and determination of angular velocity of points and links.

UNIT – IV

Objective: The objective of this unit is to make student understand the theories involved in cams. Further the students are exposed to the applications of cams and their working principles.

CAMS

Definitions of cam and followers – their uses – Types of followers and cams – Terminology –Types of follower motion: Uniform velocity, Simple harmonic motion and uniform acceleration and retardation. Maximum velocity and maximum acceleration during outward and return strokes in the above 3 cases.

Analysis of motion of followers: Roller follower – circular cam with straight, concave and convex flanks.

UNIT – V

Objective: The objective of this unit is to make student understand gears, power transmission through different types of gears including gear profiles and its efficiency.

GEARS

Higher pairs, friction wheels and toothed gears–types – law of gearing, condition for constant velocity ratio for transmission of motion, Form of teeth: cycloidal and involute profiles. Velocity of sliding – phenomena of interferences – Methods of interference. Condition for minimum number of teeth to avoid interference, expressions for arc of contact and path of contact – Introduction to Helical, Bevel and worm gearing.

UNIT – VI

Objective: The objective of this unit is to make student understand various power transmission mechanisms and methodologies and working principles. Students are exposed to merits and demerits of each drive.

Power Transmissions : Introduction, Belt and rope drives, selection of belt drive- types of belt drives, V-belts, materials used for belt and rope drives, velocity ratio of belt drives, slip of belt, creep of belt, tensions for flat belt drive, angle of contact, centrifugal tension, maximum tension of belt, Chains- length, angular speed ratio, classification of chains.

Introduction to gear Trains, Train value, Types – Simple and reverted wheel train – Epicyclic gear Train. Methods of finding train value or velocity ratio – Epicyclic gear trains. Selection of gear box-Differential gear for an automobile.

Text Books:

1. Mechanism and Machine Theory by Ashok G. Ambekar, PHI Publishers
2. Theory of Machines – S. S Rattan- TMH
3. Theory of machines and Mechanisms – J.J Uicker, G.R.Pennock & J.E.Shigley - Oxford publishers.

References:

1. Theory of Machines Sadhu Singh, Pearsons Edn
2. Theory of machines and Machinery /Vickers /Oxford .
3. Theory of Machines by Thomas Bevan/ CBS
4. Kinematics of Machinery through Hyper Works – J.S. Rao – Springer Publ
5. Theory of Mechanisms and machines – A.Ghosh & A.K.Malik – East West Press Pvt. Ltd.

THERMAL ENGINEERING – I

UNIT – I

Objectives: To make the student learn and understand the reasons and affects of various losses that occur in the actual engine operation.

Actual Cycles and their Analysis: Introduction, Comparison of Air Standard and Actual Cycles, Time Loss Factor, Heat Loss Factor, Exhaust Blowdown-Loss due to Gas exchange process, Volumetric Efficiency. Loss due to Rubbing Friction, Actual and Fuel-Air Cycles of CI Engines.

UNIT – II

Objectives: To familiarize the student with the various engine systems along with their function and necessity.

I. C. ENGINES : Classification - Working principles, Valve and Port Timing Diagrams, - Engine systems – Fuel, Carburettor, Fuel Injection System, Ignition, Cooling and Lubrication, principle of wankle engine, principles of supercharging and turbo charging.

UNIT – III

Objectives: To learn about normal combustion phenomenon and knocking in S.I. and C.I. Engines and to find the several engine operating parameters that affect the smooth engine operation.

Combustion in S.I. Engines : Normal Combustion and abnormal combustion – Importance of flame speed and effect of engine variables – Types of Abnormal combustion, pre-ignition and knocking (explanation of) – Fuel requirements and fuel rating, anti knock additives – combustion chamber – requirements, types.

Combustion in C.I. Engines : Four stages of combustion – Delay period and its importance – Effect of engine variables – Diesel Knock– Need for air movement, suction, compression and combustion induced turbulence – open and divided combustion chambers and nozzles used – fuel requirements and fuel rating.

UNIT – IV

Objectives: To make the student learn to perform testing on S.I and C.I Engines for the calculations of performance and emission parameters.

Measurement, Testing and Performance: Parameters of performance - measurement of cylinder pressure, fuel consumption, air intake, exhaust gas composition, Brake power – Determination of frictional losses and indicated power – Performance test – Heat balance sheet and chart.

UNIT – V

Objectives: To make students learn about different types of compressors and to calculate power and efficiency of reciprocating compressors.

COMPRESSORS – Classification –positive displacement and roto dynamic machinery – Power producing and power absorbing machines, fan, blower and compressor – positive displacement and dynamic types – reciprocating and rotary types.

Reciprocating: Principle of operation, work required, Isothermal efficiency, volumetric efficiency and effect of clearance, multi stage compression, undercooling, saving of work, minimum work condition for two stage compression.

UNIT VI

Objectives: To make students learn mechanical details, and to calculate power and efficiency of rotary compressors

Rotary (Positive displacement type) : Roots Blower, vane sealed compressor, Lysholm compressor – mechanical details and principle of working – efficiency considerations.

Dynamic Compressors: Centrifugal compressors: Mechanical details and principle of operation – velocity and pressure variation. Energy transfer-impeller blade shape-losses, slip factor, power input factor, pressure coefficient and adiabatic coefficient – velocity diagrams – power.

Axial Flow Compressors: Mechanical details and principle of operation – velocity triangles and energy transfer per stage degree of reaction, work done factor - isentropic efficiency- pressure rise calculations – Polytropic efficiency.

Text Books:

1. I.C. Engines / V. Ganesan- TMH
2. Heat engines, Vasandani & Kumar publications Thermal

References:

1. Thermal Engineering / RK Rajput/ Lakshmi Publications
2. IC Engines – M.L.Mathur &R.P.Sharma – Dhanpath Rai & Sons.
3. I.C.Engines–AppliedThermosciences–C.R.Ferguson&A.T.Kirkpatrick-2ndEdition-Wiley Publ
4. I.C. Engines - J.B.Heywood /McGrawHill.
5. Thermal Engineering – R.S.Khurmi & J.S.Gupta- S.chand Publ
6. Thermal Engineering / PL Ballaney, Khanna Publishers

PRODUCTION TECHNOLOGY

Course Objective:

To impart basic knowledge and understanding about the primary manufacturing processes such as casting, joining, bulk forming, sheet metal forming and powder metallurgy and their relevance in current manufacturing industry; To introduce processing methods of plastics.

UNIT – I

CASTING : Steps involved in making a casting – Advantage of casting and its applications. – Patterns and Pattern making – Types of patterns – Materials used for patterns, pattern allowances and their construction, Principles of Gating, Gating ratio and design of Gating systems

UNIT – II

Methods of melting and types of furnaces, Solidification of castings, Solidification of pure metals and alloys, short & long freezing range alloys. Risers – Types, function and design, casting design considerations, Basic principles and applications of Centrifugal casting, Die casting and Investment casting.

UNIT – III

Welding : Classification of welding processes, types of welded joints and their characteristics, Gas welding, Different types of flames and uses, Oxy – Acetylene Gas cutting. Basic principles of Arc welding, Manual metal arc welding, Submerged arc welding, Inert Gas welding- TIG & MIG welding.

UNIT – IV

Resistance welding, Solid state welding processes- Friction welding, Friction stir welding, Forge welding, Explosive welding; Thermit welding, Plasma welding, Laser welding, electron beam welding, Soldering & Brazing.

Heat affected zones in welding; pre & post heating, Weldability of metals, welding defects – causes and remedies – destructive and non destructive testing of welds, Design of welded joints.

UNIT – V

Plastic deformation in metals and alloys, Hot working and Cold working, Strain hardening and Annealing. Bulk forming processes: Forging - Types Forging, Smith forging, Drop Forging, Roll forging, Forging hammers, Rotary forging, forging defects; Rolling – fundamentals, types of rolling mills and products, Forces in rolling and power requirements. Extrusion and its characteristics. Types of extrusion, Impact extrusion, Hydrostatic extrusion; Wire drawing and Tube drawing.

Introduction to powder metallurgy – compaction and sintering, advantages and applications

UNIT – VI

Sheet metal forming - Blanking and piercing, Forces and power requirement in these operations, Deep drawing, Stretch forming, Bending, Spring back and its remedies, Coining, Spinning, Types of presses and press tools.

High energy rate forming processes: Principles of explosive forming, electromagnetic forming, Electro hydraulic forming, rubber pad forming, advantages and limitations.

Processing of Plastics: Types of Plastics, Properties, Applications and their processing methods, Blow and Injection moulding.

Text Books:

1. Manufacturing Processes for Engineering Materials - Kalpakjain S and Steven R Schmid- Pearson Publ , 5th Edn.
2. Manufacturing Technology -Vol I- P.N. Rao- TMH

References :

1. Manufacturing Science – A.Ghosh & A.K.Malik – East West Press Pvt. Ltd
2. Process and materials of manufacture- Lindberg- PHI
3. Production Technology- R.K. Jain- Khanna
4. Production Technology-P C Sharma-S. Chand
5. Manufacturing Processes- H.S. Shaun- Pearson
6. Manufacturing Processes- J.P. Kaushish- PHI
7. Workshop Technology /WAJ Chapman/CBS Publishers & Distributors Pvt.Ltd.

Course out comes: At the end of the course the student shall be able to:

1. Design patterns, Gating, runner and riser systems
2. Select a suitable casting process based on the component
3. Learn various arc and solid state welding processes and select a suitable process based on the application and requirements
4. Understand various bulk deformation processes
5. Understand various sheet metal forming and processing of plastics

II Year - II Semester

L	T	P	C
4	0	0	3

DESIGN OF MACHINE MEMBERS – I

Course Objectives:

1. The student shall gain appreciation and understanding of the design function in mechanical engineering, the steps involved in designing and the relation of design activity with manufacturing activity
2. Selection of proper materials to different machine elements based on their physical and mechanical properties.
3. Learn and understanding of the different types of failure modes and criteria.
4. Procedure for the different machine elements such as fasteners, shafts, couplings, keys, axially loaded joints etc.

UNIT – I

INTRODUCTION: General considerations in the design of Engineering Materials and their properties – selection –Manufacturing consideration in design, tolerances and fits –BIS codes of steels.

STRESSES IN MACHINE MEMBERS: Simple stresses – combined stresses – torsional and bending stresses – impact stresses – stress strain relation – various theories of failure – factor of safety – design for strength and rigidity – preferred numbers. the concept of stiffness in tension, bending, torsion and combined situations – static strength design based on fracture toughness.

UNIT – II

STRENGTH OF MACHINE ELEMENTS: Stress concentration – theoretical stress concentration factor – fatigue stress concentration factor notch sensitivity – design for fluctuating stresses – endurance limit – estimation of endurance strength – Goodman’s line – Soderberg’s line – modified Goodman’s line.

UNIT – III

Riveted and welded joints – design of joints with initial stresses – eccentric loading.

Bolted joints – design of bolts with pre-stresses – design of joints under eccentric loading – locking devices – both of uniform strength, different seals.

UNIT – IV

KEYS, COTTERS AND KNUCKLE JOINTS: Design of keys-stresses in keys-cotter joints-spigot and socket, sleeve and cotter, jib and cotter joints- knuckle joints.

SHAFTS: Design of solid and hollow shafts for strength and rigidity – design of shafts for combined bending and axial loads – shaft sizes – BIS code. Use of internal and external circlips, gaskets and seals (stationary & rotary).

UNIT – V

SHAFT COUPLING: Rigid couplings – muff, split muff and flange couplings, flexible couplings – flange coupling (modified).

UNIT – VI

MECHANICAL SPRINGS:

Stresses and deflections of helical springs – extension -compression springs – springs for fatigue loading, energy storage capacity – helical torsion springs – co-axial springs, leaf springs.

Note: Design data book is NOT Permitted for examination

Text Books:

1. Machine Design/V.Bandari/ TMH Publishers
2. Machine design / NC Pandya & CS Shah/Charotar Publishing House Pvt. Limited
3. Design data book of Engineers-

References:

1. Design of Machine Elements / V.M. Faires/McMillan
2. Machine design / Schaum Series/McGrawHill Professional
3. Machine Design/ Shigley, J.E/McGraw Hill.
4. Design data handbook/ K.Mahadevan & K. Balaveera Reddy/ CBS publishers.
5. Design of machine elements-Spotts/Pearson Publications
6. Machine Design –Norton/ Pearson publishers

Course outcomes:

Upon successful completion of this course student should be able to:

1. Apply the design procedure to engineering problems, including the consideration of technical and manufacturing constraints.
2. Select suitable materials and significance of tolerances and fits in critical design applications.
3. Utilize design data hand book and design the elements for strength, stiffness and fatigue.
4. Identify the loads, the machine members subjected and calculate static and dynamic stresses to ensure safe design.

II Year - II Semester

L	T	P	C
3	3	0	3

MACHINE DRAWING

Course Objective: The student will acquire knowledge of fastening arrangements such as welding, riveting the different styles of attachment for shaft. The student also is enabled to prepare the assembly of various machine or engine components and miscellaneous machine components.

Machine Drawing Conventions :

Need for drawing conventions – introduction to IS conventions

- a) Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs, ribs.
- b) Types of sections – selection of section planes and drawing of sections and auxiliary sectional views. Parts not usually sectioned.
- c) Methods of dimensioning, general rules for sizes and placement of dimensions for holes, centers, curved and tapered features.
- d) Title boxes, their size, location and details - common abbreviations & their liberal usage
- e) Types of Drawings – working drawings for machine parts.

PART-A

I. Drawing of Machine Elements and simple parts

Objective: To provide basic understanding and drawing practice of various joint, simple mechanical parts

Selection of Views, additional views for the following machine elements and parts with every drawing proportions.

- a) Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, set screws.
- b) Keys, cotter joints and knuckle joint.
- c) Riveted joints for plates
- d) Shaft coupling, spigot and socket pipe joint.
- e) Journal, pivot and collar and foot step bearings.

PART-B

II. Assembly Drawings:

Objective: The student will be able to draw the assembly from the individual part drawing.

Drawings of assembled views for the part drawings of the following using conventions and easy drawing proportions.

- a) Engine parts –Gear pump, Fuel pump Petrol Engine connecting rod, piston assembly.
- b) Other machine parts - Screws jacks, Machine Vices Plummer block, Tailstock.
- c) Valves: spring loaded safety valve, feed check valve and air cock, Control valves

NOTE : First angle projection to be adopted. The student should be able to provide working drawings of actual parts. End semester examination for 70 Marks, Part A- 20 Marks (Answer two questions out of Three), Part B- 50 Marks (Assembly Drawing).

Text Books:

1. Machine Drawing – N.Siddeswar, K.Kannaiah & V.V.S.Sastry - TMH
2. Machine Drawing –K.L.Narayana, P.Kannaiah & K. Venkata Reddy / New Age/ Publishers

References:

1. Machine Drawing – P.S.Gill,
2. Machine Drawing – Luzzader
3. Machine Drawing – Rajput
4. Machine Drawing – N.D. Junnarkar, Pearson
5. Machine Drawing – Ajeeth Singh, McGraw Hill
6. Machine Drawing – KC John, PHI
7. Machine Drawing – B Battacharya, Oxford
8. Machine Drawing – Gowtham and Gowtham, Pearson

II Year - II Semester

L	T	P	C
4	0	0	3

INDUSTRIAL ENGINEERING AND MANAGEMENT

Course Objectives:

1. To impart fundamental knowledge and skill sets required in the Industrial Management and Engineering profession, which include the ability to apply basic knowledge of mathematics, probability and statistics, and the domain knowledge of Industrial Management and Engineering
2. To produce graduates with the ability to adopt a system approach to design, develop, implement and innovate integrated systems that include people, materials, information, equipment and energy.
3. To enable students to understand the interactions between engineering, business, technological and environmental spheres in the modern society.
4. To enable students to understand their role as engineers and their impact to society at the national and global context.

UNIT – I

INTRODUCTION: Definition of industrial engineering (I.E), development, applications, role of an industrial engineer, differences between production management and industrial engineering, quantitative tools of IE and productivity measurement. concepts of management, importance, functions of management, scientific management, Taylor's principles, theory X and theory Y, Fayol's principles of management.

UNIT – II

PLANT LAYOUT: Factors governing plant location, types of production layouts, advantages and disadvantages of process layout and product layout, applications, quantitative techniques for optimal design of layouts, plant maintenance, preventive and breakdown maintenance.

UNIT – III

OPERATIONS MANAGEMENT: Importance, types of production, applications, workstudy, method study and time study, work sampling, PMTS, micro-motion study, rating techniques, MTM, work factor system, principles of Ergonomics, flow process charts, string diagrams and Therbligs,

UNIT – IV

STATISTICAL QUALITY CONTROL: Quality control, its importance, SQC, attribute sampling inspection with single and double sampling, Control charts – \bar{X} and R – charts \bar{X} AND S charts and their applications, numerical examples.

TOTAL QUALITY MANAGEMENT: zero defect concept, quality circles, implementation, applications, ISO quality systems. six sigma – definition, basic concepts

UNIT – V

RESOURCE MANAGEMENT: Concept of human resource management, personnel management and industrial relations, functions of personnel management, Job-evaluation, its importance and types, merit rating, quantitative methods, wage incentive plans, types.

UNIT - VI

VALUE ANALYSIS: Value engineering, implementation procedure, enterprise resource planning and supply chain management.

PROJECT MANAGEMENT: PERT, CPM – differences & applications, critical path, determination of floats, importance, project crashing, smoothing and numerical examples.

TEXT BOOKS:

1. Industrial Engineering and management / O.P Khanna/Khanna Publishers.
2. Industrial Engineering and Production Management/Martand Telsang/S.Chand & Company Ltd. New Delhi

Reference Books:

1. Industrial Management / Bhattacharya DK/Vikas publishers
2. Operations Management / J.G Monks/McGrawHill Publishers.
3. Industrial Engineering and Management Science/ T. R. Banga, S. C. Sharma, N. K. Agarwal/Khanna Publishers
4. Principles of Management /Koontz O' Donnel/McGraw Hill Publishers.
5. Statistical Quality Control /Gupta/Khanna Publishers
6. Industrial Engineering and Management /NVS Raju/Cengage Publishers

Course outcome:

Upon successful completion of this course you should be able to:

1. Design and conduct experiments, analyse, interpret data and synthesize valid conclusions
2. Design a system, component, or process, and synthesize solutions to achieve desired needs
3. Use the techniques, skills, and modern engineering tools necessary for engineering practice with appropriate considerations for public health and safety, cultural, societal, and environmental constraints
4. Function effectively within multi-disciplinary teams and understand the fundamental precepts of effective project management

II Year - II Semester

L	T	P	C
0	0	3	2

FLUID MECHANICS & HYDRAULIC MACHINES LAB

Course Objective: To impart practical exposure on the performance evaluation methods of various flow measuring equipment and hydraulic turbines and pumps.

1. Impact of jets on Vanes.
2. Performance Test on Pelton Wheel.
3. Performance Test on Francis Turbine.
4. Performance Test on Kaplan Turbine.
5. Performance Test on Single Stage Centrifugal Pump.
6. Performance Test on Multi Stage Centrifugal Pump.
7. Performance Test on Reciprocating Pump.
8. Calibration of Venturimeter.
9. Calibration of Orifice meter.
10. Determination of friction factor for a given pipe line.
11. Determination of loss of head due to sudden contraction in a pipeline.
12. Turbine flow meter.

II Year - II Semester

L	T	P	C
0	0	3	2

PRODUCTION TECHNOLOGY LAB

Course Objective: To impart hands-on practical exposure on manufacturing processes and equipment.

Minimum of 12 Exercises need to be performed

I. METAL CASTING :

1. Pattern Design and making - for one casting drawing.
2. Sand properties testing - for strength and permeability
3. Mould preparation, Melting and Casting

II WELDING:

1. Gas welding
2. Gas cutting
3. Manual metal arc welding - Lap & Butt Joints
4. TIG/MIG Welding
5. Resistance Spot Welding
6. Brazing and soldering

III METAL FORMING AND POWDER METALLURGY:

1. Blanking & Piercing operations and study of simple, compound and progressive dies.
2. Deep drawing and extrusion operations.
3. Bending and other operations
4. Basic powder compaction and sintering

IV PROCESSING OF PLASTICS

1. Injection Moulding
2. Blow Moulding

DYNAMICS OF MACHINERY

Course Objectives:

1. To equip the student with fundamental knowledge of dynamics of machines so that student can appreciate problems of dynamic force balance, transmissibility of forces, isolation of systems, vibrations.
2. Develop knowledge of analytical and graphical methods for calculating balancing of rotary and reciprocating masses.
3. Develop understanding of vibrations and its significance on engineering design
4. Develop understanding of dynamic balancing, flywheel analysis, gyroscopic forces and moments

UNIT – I

PRECESSION: Gyroscopes, effect of precession motion on the stability of moving vehicles such as motor car, motor cycle, aero planes and ships, static and dynamic force analysis of planar mechanisms, (Demonstration of models in video show).

UNIT – II

FRICTION: Inclined plane, friction of screw and nuts, pivot and collar, uniform pressure, uniform wear, friction circle and friction axis: lubricated surfaces, boundary friction, film lubrication.

CLUTCHES: Friction clutches- single disc or plate clutch, multiple disc clutch, cone clutch, centrifugal clutch.

BRAKES AND DYNAMOMETERS: Simple block brakes, internal expanding brake, band brake of vehicle. General description and operation of dynamometers: Prony, Rope brake, Epicyclic, Bevis Gibson and belt transmission,

UNIT – III

TURNING MOMENT DIAGRAMS: Dynamic force analysis of slider crank mechanism, inertia torque, angular velocity and acceleration of connecting rod, crank effort and turning moment diagrams – fluctuation of energy – fly wheels and their design.

UNIT-IV

GOVERNERS: Watt, porter and proell governors, spring loaded governors – Hartnell and Hartung with auxiliary springs. sensitiveness, isochronism and hunting.

UNIT – V

BALANCING: Balancing of rotating masses single and multiple – single and different planes, use analytical and graphical methods. Primary, secondary, and higher balancing of reciprocating masses. analytical and graphical methods, unbalanced forces and couples – examination of “V” multi cylinder in line and radial engines for primary and secondary balancing, locomotive balancing, hammer blow, swaying couple, variation of tractive effort.

UNIT – VI

VIBRATIONS: Free Vibration of spring mass system –Natural frequency-types of damping – damped free vibration, Simple problems on forced damped vibration, vibration isolation and transmissibility transverse loads, vibrations of beams with concentrated and distributed loads. Dunkerly's methods, Raleigh's method, whirling of shafts, critical speeds, torsional vibrations, two and three rotor systems.

Text Books :

1. Theory of Machines / S.S Rattan/ Mc. Graw Hill
2. Mechanism and machine theory /Ashok G. Ambedkar/PHI Publications.

References :

1. Mechanism and Machine Theory / JS Rao and RV Dukkipati / New Age
2. Theory of Machines / Shigley / MGH
3. Theory of Machines / Thomas Bevan / CBS Publishers
4. Theory of machines / Khurmi/S.Chand.

Course outcomes:

Upon successful completion of this course the student should be able to:

1. Analyze stabilization of sea vehicles, aircrafts and automobile vehicles
2. Compute frictional losses, torque transmission of mechanical systems.
3. Analyze dynamic force analysis of slider crank mechanism and design of flywheel.
4. Understand how to determine the natural frequencies of continuous systems starting from the general equation of displacement.
5. Understand balancing of reciprocating and rotary masses.

METAL CUTTING & MACHINE TOOLS**Course objectives:**

1. The course provides students with fundamental knowledge and principles in material removal processes.
2. In this course, the students apply the fundamentals and principles of metal cutting to practical applications through multiple labs using lathes, milling machines, grinding machines, and drill presses, Computer Numerical Control etc
3. To demonstrate the fundamentals of machining processes and machine tools.
4. To develop knowledge and importance of metal cutting parameters.
5. To develop fundamental knowledge on tool materials, cutting fluids and tool wear mechanisms.
6. To apply knowledge of basic mathematics to calculate the machining parameters for different machining processes.

UNIT – I**FUNDAMENTAL OF MACHINING:**

Elementary treatment of metal cutting theory – element of cutting process – geometry of single point cutting tool, tool angles, chip formation and types of chips – built up edge and its effects, chip breakers, mechanics of orthogonal cutting –Merchant's force diagram, cutting forces, cutting speeds, feed, depth of cut, tool life, tool wear, machinability, economics of machining, coolants, tool materials and properties.

UNIT – II**LATHE MACHINES:**

Engine lathe – principle of working, specification of lathe – types of lathe – work holders tool holders – box tools taper turning, thread turning – for lathes and attachments, constructional features of speed gear box and feed gear box. Turret and capstan lathes – collet chucks – other work holders – tool holding devices – box and tool layout. Principal features of automatic lathes – classification – single spindle and multi-spindle automatic lathes – tool layout and cam design for automats.

UNIT – III

SHAPING, SLOTTING AND PLANNING MACHINES: Principles of working – principal parts – specifications, operations performed, machining time calculations.

DRILLING & BORING MACHINES: Principles of working, specifications, types, operations performed – tool holding devices – twist drill – Boring Machines – fine Boring Machines – jig boring machine, deep hole Drilling Machine.

UNIT – IV

MILLING MACHINES: Principles of working – specifications – classification of Milling Machines – principal features of horizontal, vertical and universal Milling Machine, machining operations, types of cutters, geometry of milling cutters – methods of indexing, accessories to milling machines.

UNIT –V

FINISHING PROCESSES: Theory of grinding – classification of grinding machines, cylindrical and surface grinding machines, tool and cutter grinding machines, different types of abrasives, bonds, specification and selection of a grinding wheel. Lapping, Honing & Broaching operations, comparison to grinding.

UNIT - VI

JIGS & FIXTURES: Principles of design of jigs and fixtures and uses, classification of jigs & fixtures, principles of location and clamping, types of clamping & work holding devices, typical examples of jigs and fixtures.

CNC MACHINE TOOLS: CNC Machines, working principle, classification, constructional features of CNC machines, CNC controller, types of motion controls in CNC machines, applications of CNC machines.

Text Books:

1. Manufacturing Processes / JP Kaushish/ PHI Publishers-2nd Edition
2. Manufacturing Technology Vol-II/P.N Rao/Tata McGraw Hill

References:

1. Metal cutting and machine tools /Geoffrey Boothroyd, Winston A.Knight/ Taylor & Francis
2. Production Technology / H.M.T. Hand Book (Hindustan Machine Tools).
3. Production Engineering/K.C Jain & A.K Chitale/PHI Publishers
4. Technology of machine tools/S.F.Krar, A.R. Gill, Peter SMID/ TMH
5. Manufacturing Processes for Engineering Materials-Kalpakjian S & Steven R Schmid/Pearson Publications 5th Edition

Course Outcomes:

Upon successful completion of this course, the students will be able to:

- 1) Apply cutting mechanics to metal machining based on cutting force and power consumption.
- 2) Operate lathe, milling machines, drill press, grinding machines, etc.
- 3) Select cutting tool materials and tool geometries for different metals.
- 4) Select appropriate machining processes and conditions for different metals.
- 5) Learn machining economics.
- 6) Design jigs and Fixtures for simple parts.
- 7) Learn principles of CNC Machines

III Year - I Semester

L	T	P	C
4	0	0	3

DESIGN OF MACHINE MEMBERS– II

Course Objectives:

- This course gives the insight of slider and roller bearings and the life prediction.
- Learn to design I.C engine parts
- Design the mechanical systems for power transmission elements such as gears,belts,ropes,chains, keys and levers

UNIT – I

BEARINGS: Classification of bearings- applications, types of journal bearings – lubrication – bearing modulus – full and partial bearings – clearance ratio – heat dissipation of bearings, bearing materials – journal bearing design – ball and roller bearings – static loading of ball & roller bearings, bearing life.

UNIT – II

ENGINE PARTS: Connecting Rod: Thrust in connecting rod – stress due to whipping action on connecting rod ends – cranks and crank shafts, strength and proportions of over hung and center cranks – crank pins, crank shafts.

Pistons, forces acting on piston – construction design and proportions of piston, cylinder, cylinder liners,

UNIT – III

Design of curved beams: introduction, stresses in curved beams, expression for radius of neutral axis for rectangular, circular, trapezoidal and t-section, design of crane hooks, c –clamps.

UNIT – IV

POWER TRANSMISSIONS SYSTEMS, PULLEYS: Transmission of power by belt and rope drives , transmission efficiencies, belts – flat and v types – ropes - pulleys for belt and rope drives, materials, chain drives

DESIGN OF POWER SCREWS: Design of screw, square ACME, buttress screws, design of nut, compound screw, differential screw, ball screw- possible failures.

UNIT – V

SPUR & HELICAL GEAR DRIVES: Spur gears- helical gears – load concentration factor – dynamic load factor, surface compressive strength – bending strength – design analysis of spur gears – estimation of centre distance, module and face width, check for plastic deformation, check for dynamic and wear considerations.

UNIT – VI

MACHINE TOOL ELEMENTS: Levers and brackets: design of levers – hand levers-foot lever – cranked lever – lever of a lever loaded safety valve- rocker arm straight – angular- design of a crank pin – brackets- hangers- wall boxes.

Wire Ropes: Construction, Designation, Stresses in wire ropes, rope sheaves and drums.

Note: Design data book is permitted for examination

Text Books:

1. Machine Design/V.Bandari/TMH Publishers
2. Machine Design/ NC Pandya & CS Shaw/ Charotar publishers
3. Design data book.

References:

1. Machine Design: An integrated Approach / R.L. Norton / Pearson Education
2. Mech. Engg. Design / JE Shigley/Tata McGraw Hill education
3. Design of machine elements- spots/Pearson Publications
4. Machine Design-Norton/Pearson Publications

Course outcomes: At the end of the course

1. The student will able to select the suitable bearing based on the application of the loads and predict the life of the bearing
2. Design power transmission elements such as gears, belts, chains, pulleys, ropes, levers and power screws.
3. Design of IC Engines parts.

OPERATIONS RESEARCH

Course Objectives:

To learn the importance of Operations Research in the design, planning, scheduling, manufacturing and business applications and to use the various techniques of Operations Research in solving such problems.

UNIT – I

Development – definition– characteristics and phases – types of operation research models – applications.

ALLOCATION: Linear programming problem formulation – graphical solution – simplex method – artificial variables techniques -two–phase method, big-M method – duality principle.

UNIT – II

TRANSPORTATION PROBLEM: Formulation – optimal solution, unbalanced transportation problem – degeneracy, assignment problem – formulation – optimal solution - variants of assignment problem- traveling salesman problem.

SEQUENCING – Introduction – flow –shop sequencing – n jobs through two machines – n jobs through three machines – job shop sequencing – two jobs through ‘ m ’ machines.

UNIT – III

REPLACEMENT: Introduction – replacement of items that deteriorate with time – when money value is not counted and counted – replacement of items that fail completely, group replacement.

UNIT – IV

THEORY OF GAMES: Introduction – mini. max (max. mini) – criterion and optimal strategy – solution of games with saddle points – rectangular games without saddle points – 2×2 games – dominance principle – $m \times 2$ & $2 \times n$ games -graphical method.

WAITING LINES: Introduction – single channel – poisson arrivals – exponential service times – with infinite population and finite population models– multichannel – poisson arrivals – exponential service times with infinite population single channel poisson arrivals.

UNIT – V

INVENTORY : Introduction – single item – deterministic models – purchase inventory models with one price break and multiple price breaks – shortages are not allowed – stochastic models – demand may be discrete variable or continuous variable – instantaneous production. Instantaneous demand and continuous demand and no set up cost. ABC & VED Analysis.

UNIT – VI

DYNAMIC PROGRAMMING: Introduction – Bellman’s principle of optimality – applications of dynamic programming- capital budgeting problem – shortest path problem – linear programming problem.

SIMULATION: Definition – types of simulation models – phases of simulation– applications of simulation – inventory and queuing problems – advantages and disadvantages – simulation languages.

TEXT BOOKS:

1. Operations Research-An Introduction/Hamdy A Taha/Pearson publishers
2. Operations Research –Theory & publications / S.D.Sharma-Kedarnath/McMillan publishers India Ltd

REFERENCES:

1. Introduction to O.R/Hiller & Libermann/TMH
2. Operations Research /A.M.Natarajan,P.Balasubramani,A. Tamilarasi/Pearson Education.
3. Operations Research: Methods & Problems / Maurice Saseini, Arhur Yaspan & Lawrence Friedman/Wiley
4. Operations Research / R.Pannerselvam/ PHI Publications.
5. Operations Research / Wagner/ PHI Publications.
6. Operation Research /J.K.Sharma/MacMilan Publ.
7. Operations Research/ Pai/ Oxford Publications
8. Operations Research/S Kalavathy / Vikas Publishers
9. Operations Research / DS Cheema/University Science Press
10. Operations Research / Ravindran, Philips, Solberg / Wiley publishers

Course Outcomes:

After completion of the course, the student will be able to:

To solve the LP and DP problems

To solve the Transportation, assignment, game, inventory, replacement, sequencing, queuing problems.

THERMAL ENGINEERING – II

(Use of steam tables and Mollier chart is allowed)

Course objectives:

This course is intended to provide basic knowledge of components being used in steam and gas power plant cycles and to analyse the energy transfers and transformations in these components including individual performance evaluation.

UNIT – I

BASIC CONCEPTS: Rankine cycle - schematic layout, thermodynamic analysis, concept of mean temperature of heat addition, methods to improve cycle performance – regeneration & reheating. combustion: fuels and combustion, concepts of heat of reaction, adiabatic flame temperature, Stoichiometry, flue gas analysis.

UNIT II

BOILERS : Classification – working principles of L.P & H.P boilers with sketches – mountings and accessories – working principles, boiler horse power, equivalent evaporation, efficiency and heat balance – draught, classification – height of chimney for given draught and discharge, condition for maximum discharge, efficiency of chimney – artificial draught, induced and forced.

UNIT – III

STEAM NOZZLES: Function of a nozzle – applications - types, flow through nozzles, thermodynamic analysis – assumptions -velocity of fluid at nozzle exit-Ideal and actual expansion in a nozzle, velocity coefficient, condition for maximum discharge, critical pressure ratio, criteria to decide nozzle shape: Super saturated flow, its effects, degree of super saturation and degree of under cooling - Wilson line.

STEAM TURBINES: Classification – impulse turbine; mechanical details – velocity diagram – effect of friction – power developed, axial thrust, blade or diagram efficiency – condition for maximum efficiency. De-laval turbine - methods to reduce rotor speed-velocity compounding, pressure compounding and velocity & pressure compounding, velocity and pressure variation along the flow – combined velocity diagram for a velocity compounded impulse turbine, condition for maximum efficiency

UNIT IV

REACTION TURBINE: Mechanical details – principle of operation, thermodynamic analysis of a stage, degree of reaction –velocity diagram – Parson’s reaction turbine – condition for maximum efficiency – calculation of blade height.

STEAM CONDENSERS: Requirements of steam condensing plant – classification of condensers – working principle of different types – vacuum efficiency and condenser efficiency – air leakage, sources and its affects, air pump- cooling water requirement.

UNIT – V

GAS TURBINES: Simple gas turbine plant – ideal cycle, essential components – parameters of performance – actual cycle – regeneration, inter cooling and reheating –closed and semi-closed cycles – merits and demerits, types of combustion chambers.

UNIT – VI

JET PROPULSION : Principle of operation –classification of jet propulsive engines – working principles with schematic diagrams and representation on t-s diagram - thrust, thrust power and propulsion efficiency – turbo jet engines – needs and demands met by turbo jet – schematic diagram, thermodynamic cycle, performance evaluation, thrust augmentation – methods.

Rockets : Application – working principle – classification – propellant type – thrust, propulsive efficiency – specific impulse – solid and liquid propellant rocket engines.

Text Books:

1. Thermodynamics and Heat Engines/R.Yadav, Volume -II /Central Publishing House
2. Gas Turbines /V.Ganesan /TMH
3. Heat Engineering /V.P Vasandani and D.S Kumar/Metropolitan Book Company, New Delhi

References:

1. Gas Turbines and Propulsive Systems /P.Khajuria & S.P.Dubey /Dhanpatrai
2. Gas Turbines / Cohen, Rogers and Saravana Muttoo / Addison Wesley – Longman
3. Thermal Engineering-R.S Khurmi, &J S Gupta/S.Chand.
4. Thermal Engineering-P.L.Bellaney/ Khanna publishers.
5. Thermal Engineering-M.L.Marthur & Mehta/Jain bros. Publishers
6. Thermal Engineering / RK Rajput/ Lakshmi Publications

Course outcomes:

After undergoing this course the student is expected to understand the working of steam and gas power plant cycles and also should be able to analyze and evaluate the performance of individual components. The student also should be in a position to understand basic principles of Jet propulsion and rocket engineering.

THEORY OF MACHINES LAB

1. To determine whirling speed of shaft theoretically and experimentally.
2. To determine the position of sleeve against controlling force and speed of a Hartnell governor and to plot the characteristic curve of radius of rotation.
3. To analyse the motion of a motorized gyroscope when the couple is applied along its spin axis
4. To determine the frequency of undamped free vibration of an equivalent spring mass system.
5. To determine the frequency of damped force vibration of a spring mass system
6. To study the static and dynamic balancing using rigid blocks.
7. To find the moment of inertia of a flywheel
8. To plot follower displacement vs cam rotation for various Cam Follower systems.
9. To plot slider displacement, velocity and acceleration against crank rotation for single slider crank mechanism/Four bar mechanism
10. To find coefficient of friction between belt and pulley.
11. To study simple and compound screw jack and determine the mechanical advantage , velocity ratio and efficiency
12. To study various types of gears- Spur, Helical, Worm and Bevel Gears

III Year - I Semester

L	T	P	C
0	0	3	2

MACHINE TOOLS LAB

Course objectives:

The students are required to understand the parts of various machine tools and operate them. They are required to understand the different shapes of products that can be produced on these machine tools.

1. Introduction of general purpose machines -lathe, drilling machine, milling machine, shaper, planing machine, slotting machine, cylindrical grinder, surface grinder and tool and cutter grinder.
2. Step turning and taper turning on lathe machine
3. Thread cutting and knurling on lathe machine.
4. Drilling and tapping
5. Shaping and planing
6. Slotting
7. Milling
8. Cylindrical surface grinding
9. Grinding of tool angles.

Course outcome:

The students can operate different machine tools with understanding of work holders and operating principles to produce different part features to the desired quality.

THERMAL ENGINEERING LAB

Course objective: To provide hands on experience in operating various types of internal combustion engines and understand their functioning and performance.

1. I.C. Engines valve / port timing diagrams.
2. Testing of Fuels – Viscosity, flash point/fire point, carbon residue, calorific value.
3. I.C. Engines performance test and Exhaust emission measurements (4 -stroke diesel engine)
4. I.C. Engines performance test and Exhaust emission measurements (2-stroke petrol engine)
5. Evaluation of engine friction by conducting Morse test on 4-stroke multi cylinder petrol engine.
6. Determination of FP by retardation and motoring test on IC engine.
7. I.C. Engines heat balance at different loads and show the heat distribution curve.
8. Economical speed test of an IC engine.
9. Performance test on variable compression ratio engines.
10. Performance test on reciprocating air compressor unit.
11. Dis-assembly / assembly of different parts of two wheelers. 3 wheelers & 4 wheelers. Tractor & Heavy duty engines covering 2-stroke and 4 stroke, SI and CI engines.
12. Study of boilers, mountings and accessories.

III Year - I Semester

L	T	P	C
0	2	0	0

IPR & PATENTS

Objectives:

***To know the importance of Intellectual property rights, which plays a vital role in advanced Technical and Scientific disciplines.**

***Imparting IPR protections and regulations for further advancement, so that the students can familiarize with the latest developments.**

UNIT I: Introduction to Intellectual Property Rights (IPR)

Concept of Property - Introduction to IPR – International Instruments and IPR - WIPO - TRIPS – WTO -Laws Relating to IPR - IPR Tool Kit - Protection and Regulation - Copyrights and Neighboring Rights – Industrial Property – Patents - Agencies for IPR Registration – Traditional Knowledge –Emerging Areas of IPR - Layout Designs and Integrated Circuits – Use and Misuse of Intellectual Property Rights.

UNIT II: Copyrights and Neighbouring Rights

Introduction to Copyrights – Principles of Copyright Protection – Law Relating to Copyrights - Subject Matters of Copyright – Copyright Ownership – Transfer and Duration – Right to Prepare Derivative Works –Rights of Distribution – Rights of Performers – Copyright Registration – Limitations – Infringement of Copyright – Relief and Remedy – Case Law - Semiconductor Chip Protection Act.

UNIT III: Patents

Introduction to Patents - Laws Relating to Patents in India – Patent Requirements – Product Patent and Process Patent - Patent Search - Patent Registration and Granting of Patent - Exclusive Rights – Limitations - Ownership and Transfer — Revocation of Patent – Patent Appellate Board - Infringement of Patent – Compulsory Licensing — Patent Cooperation Treaty – New developments in Patents – Software Protection and Computer related Innovations.

UNIT IV: Trademarks

Introduction to Trademarks – Laws Relating to Trademarks – Functions of Trademark – Distinction between Trademark and Property Mark – Marks Covered under Trademark Law - Trade Mark Registration – Trade Mark Maintenance – Transfer of rights - Deceptive Similarities - Likelihood of Confusion - Dilution of Ownership – Trademarks Claims and Infringement – Remedies – Passing Off Action.

UNIT V: Trade Secrets

Introduction to Trade Secrets – General Principles - Laws Relating to Trade Secrets - Maintaining Trade Secret – Physical Security – Employee Access Limitation – Employee Confidentiality Agreements – Breach of Contract – Law of Unfair Competition – Trade Secret Litigation – Applying State Law.

UNIT VI: Cyber Law and Cyber Crime

Introduction to Cyber Law – Information Technology Act 2000 - Protection of Online and Computer Transactions - E-commerce - Data Security – Authentication and Confidentiality - Privacy - Digital Signatures – Certifying Authorities - Cyber Crimes - Prevention and Punishment – Liability of Network Providers.

- Relevant Cases Shall be dealt where ever necessary.

Outcome:

*** IPR Laws and patents pave the way for innovative ideas which are instrumental for inventions to seek Patents.**

***Student get an insight on Copyrights, Patents and Software patents which are instrumental for further advancements.**

References:

1. Intellectual Property Rights (Patents & Cyber Law), Dr. A. Srinivas. Oxford University Press, New Delhi.
2. Deborah E.Bouchoux: Intellectual Property, Cengage Learning, New Delhi.
3. PrabhuddhaGanguli: Intellectual Property Rights, Tata Mc-Graw –Hill, New Delhi
4. Richard Stim: Intellectual Property, Cengage Learning, New Delhi.
5. Kompal Bansal &Parishit Bansal Fundamentals of IPR for Engineers, B. S. Publications (Press).
6. Cyber Law - Texts & Cases, South-Western's Special Topics Collections.
7. R.Radha Krishnan, S.Balasubramanian: Intellectual Property Rights, Excel Books. New Delhi.
8. M.Ashok Kumar and MohdIqbal Ali: Intellectual Property Rights, Serials Pub.

III Year - II Semester

L	T	P	C
4	0	0	3

METROLOGY

Course objectives:

The students will learn

1. Inspection of engineering parts with various precision instruments
2. Design of part, tolerances and fits
3. Principles of measuring instruments and gauges and their uses
4. Evaluation and inspection of surface roughness
5. Inspection of spur gear and thread elements
6. Machine tool testing to evaluate machine tool quality

UNIT-I

SYSTEMS OF LIMITS AND FITS: Introduction, nominal size, tolerance, limits, deviations, fits -Unilateral and bilateral tolerance system, hole and shaft basis systems- interchangeability, deterministic & statistical tolerances, selective assembly. International standard system of tolerances, selection of limits and tolerances for correct functioning.

UNIT-II

LINEAR MEASUREMENT: Length standards, end standards, slip gauges- calibration of the slip gauges, dial indicators, micrometers.

MEASUREMENT OF ANGLES AND TAPERS:

Different methods – bevel protractor, angle slip gauges- angle dekkor- spirit levels- sine bar- sine table, rollers and spheres used to measure angles and tapers.

LIMIT GAUGES:

Taylor's principle – design of go and no go gauges; plug, ring, snap, gap, taper, profile and position gauges.

UNIT-III

OPTICAL MEASURING INSTRUMENTS: Tools maker's microscope and uses - autocollimators, optical projector, optical flats and their uses.

INTERFEROMETRY:

Interference of light, Michelson's interferometer, NPL flatness interferometer, and NPL gauge interferometer.

UNIT-IV

SURFACE ROUGHNESS MEASUREMENT: Differences between surface roughness and surface waviness – Numerical assessment of surface finish-CLA, Rt., R.M.S. Rz, R10 values, Method of measurement of surface finish – Profilograph, Talysurf, ISI symbols for indication of surface finish.

COMPARATORS: Types - mechanical, optical, electrical and electronic, pneumatic comparators and their uses.

UNIT – V

GEAR MEASUREMENT: Nomenclature of gear tooth, tooth thickness measurement with gear tooth vernier & flange micro meter, pitch measurement, total composite error and tooth to tooth composite errors, rolling gear tester, involute profile checking.

SCREW THREAD MEASUREMENT: Elements of measurement – errors in screw threads- concept of virtual effective diameter, measurement of effective diameter, angle of thread and thread pitch, and profile thread gauges.

UNIT – VI

FLATNESS MEASUREMENT:

Measurement of flatness of surfaces- instruments used- straight edges- surface plates – auto collimator.

MACHINE TOOL ALIGNMENT TESTS: Principles of machine tool alignment testing on lathe, drilling and milling machines.

Text Books:

1. Dimensional Metrology/Connie Dotson/Cengage Learning
2. Engineering Metrology / R.K.Jain / Khanna Publishers

References:

1. Engineering Metrology / Mahajan / Dhanpat Rai Publishers
2. Engineering Metrology / I.C.Gupta / Dhanpat Rai Publishers
3. Precision Engineering in Manufacturing / R.L.Murthy / New Age
4. Engineering Metrology and Measurements / NV Raghavendra, L Krishna murthy/ Oxford publishers.
5. Engineering Metrology / KL Narayana/Scitech publishers

Course outcomes:

Students will be able to design tolerances and fits for selected product quality. They can choose appropriate method and instruments for inspection of various gear elements and thread elements. They can understand the standards of length, angles, they can understand the evaluation of surface finish and measure the parts with various comparators. The quality of the machine tool with alignment test can also be evaluated by them.

III Year - II Semester

L	T	P	C
4	0	0	3

INSTRUMENTATION & CONTROL SYSTEMS

Course Objectives:

The course focuses on imparting the principles of measurement which includes the working mechanism of various sensors and devices, that are in use to measure the important physical variables of various mechatronic systems.

UNIT – I

Definition – Basic principles of measurement – measurement systems, generalized configuration and functional descriptions of measuring instruments – examples. dynamic performance characteristics – sources of error, classification and elimination of error.

Measurement of Displacement: Theory and construction of various transducers to measure displacement – piezo electric, inductive, capacitance, resistance, ionization and photo electric transducers, calibration procedures.

UNIT – II

MEASUREMENT OF TEMPERATURE: Classification – ranges – various principles of measurement – expansion, electrical resistance – thermister – thermocouple – pyrometers – temperature indicators.

MEASUREMENT OF PRESSURE: Units – classification – different principles used. manometers, piston, bourdon pressure gauges, bellows – diaphragm gauges. low pressure measurement – thermal conductivity gauges – ionization pressure gauges, Mcleod pressure gauge.

UNIT – III

MEASUREMENT OF LEVEL : Direct method – indirect methods – capacitative, ultrasonic, magnetic, cryogenic fuel level indicators – bubbler level indicators.

FLOW MEASUREMENT: Rotameter, magnetic, ultrasonic, turbine flow meter, hot – wire anemometer, laser Doppler anemometer (LDA).

MEASUREMENT OF SPEED : Mechanical tachometers – electrical tachometers – stroboscope, noncontact type of tachometer

Measurement of Acceleration and Vibration: Different simple instruments – principles of seismic instruments – Vibrometer and accelerometer using this principle.

UNIT – IV

STRESS STRAIN MEASUREMENTS : Various types of stress and strain measurements – electrical strain gauge – gauge factor – method of usage of resistance strain gauge for bending compressive and tensile strains – usage for measuring torque, strain gauge rosettes.

UNIT – V

MEASUREMENT OF HUMIDITY – Moisture content of gases, sling psychrometer, absorption psychrometer, dew point meter.

MEASUREMENT OF FORCE, TORQUE AND POWER- Elastic force meters, load cells, torsion meters, dynamometers.

UNIT – VI

ELEMENTS OF CONTROL SYSTEMS : Introduction, importance – classification – open and closed systems, servomechanisms–examples with block diagrams–temperature, speed & position control systems.

Text Books:

1. Measurement Systems: Applications & design / D.S Kumar/
2. Mechanical Measurements / BeckWith, Marangoni,Linehard, Pearson

References:

1. Measurement systems: Application and design/Doeblin Earnest. O. Adaptation/ TMH
2. Experimental Methods for Engineers / J.P.Holman/McGraw Hill
3. Mechanical and Industrial Measurements / R.K. Jain/ Khanna Publishers.
4. Instrumentation, measurement & analysis / B.C.Nakra & K.K.Choudhary/TMH

Course outcomes:

After undergoing the course the student can select appropriate device for the measurement of parameters like temperature, pressure, speed, stress, humidity, flow velocity etc., and justify its use through characteristics and performance.

III Year - II Semester

L	T	P	C
4	0	0	3

REFRIGERATION & AIR CONDITIONING

(Refrigeration and Psychrometric tables and charts allowed)

Course objectives:

The course is to understand the basic cycles of various refrigerating systems, their performance evaluation along with details of system components and refrigerant properties. The course is also aimed at imparting knowledge of psychrometric properties, processes which are used in air-conditioning systems for comfort and industrial applications.

UNIT – I

INTRODUCTION TO REFRIGERATION: Necessity and applications – unit of refrigeration and C.O.P. – Mechanical refrigeration – types of ideal cycles of refrigeration. air refrigeration: bell coleman cycle - open and dense air systems – refrigeration systems used in air crafts and problems.

UNIT – II

VAPOUR COMPRESSION REFRIGERATION: Working principle and essential components of the plant – simple vapour compression refrigeration cycle – COP – representation of cycle on T-S and p-h charts – effect of sub cooling and super heating – cycle analysis – actual cycle influence of various parameters on system performance – use of p-h charts – numerical problems.

UNIT III

REFRIGERANTS – Desirable properties – classification - refrigerants used – nomenclature – ozone depletion – global warming

VCR SYSTEM COMPONENTS: Compressors – general classification – comparison – advantages and disadvantages. condensers – classification – working principles evaporators – classification – working principles expansion devices – types – working principles

UNIT IV

VAPOR ABSORPTION SYSTEM: Calculation of maximum COP – description and working of NH₃ – water system and Li Br –water (Two shell & Four shell) System, principle of operation three fluid absorption system, salient features.

STEAM JET REFRIGERATION SYSTEM: Working Principle and basic components. principle and operation of (i) thermoelectric refrigerator (ii) vortex tube.

UNIT – V

INTRODUCTION TO AIR CONDITIONING: Psychrometric properties & processes – characterization of sensible and latent heat loads — need for ventilation, consideration of infiltration – load concepts of RSHP, GSHP- problems, concept of ESHF and ADP temperature.

Requirements of human comfort and concept of effective temperature- comfort chart –comfort air conditioning – requirements of industrial air conditioning, air conditioning load calculations.

UNIT – VI

AIR CONDITIONING SYSTEMS: Classification of equipment, cooling, heating humidification and dehumidification, filters, grills and registers, fans and blowers. heat pump – heat sources – different heat pump circuits.

Text Books:

1. A Course in Refrigeration and Air conditioning / SC Arora & Domkundwar / Dhanpatrai
2. Refrigeration and Air Conditioning / CP Arora / TMH.

References:

1. Refrigeration and Air Conditioning / Manohar Prasad / New Age.
2. Principles of Refrigeration /Dossat / Pearson Education.
3. Basic Refrigeration and Air-Conditioning / Ananthanarayanan / TMH

Course outcomes: At the end of the course the students should be able to:

After undergoing the course the student should be in a position to analyze various refrigerating cycles and evaluate their performance. The student also should be able to perform cooling load calculations and select the appropriate process and equipment for the required comfort and industrial air-conditioning.

III Year - II Semester

L	T	P	C
4	0	0	3

HEAT TRANSFER

(Heat transfer data book allowed)

Course Objectives:

This course is intended to impart knowledge of principles of heat transfer and analyze the heat exchange process in various modes for the evaluation of rate of heat transfer and the temperature distribution in different configurations.

UNIT – I

INTRODUCTION: Modes and mechanisms of heat transfer – basic laws of heat transfer –General discussion about applications of heat transfer.

CONDUCTION HEAT TRANSFER: Fourier rate equation – general heat conduction equation in cartesian, cylindrical and Spherical coordinates. Steady, unsteady and periodic heat transfer – initial and boundary conditions.

ONE DIMENSIONAL STEADY STATE CONDUCTION HEAT TRANSFER: Homogeneous slabs, hollow cylinders and spheres – overall heat transfer coefficient – electrical analogy – critical radius of insulation-Variable thermal conductivity – systems with heat sources or heat generation,

UNIT – II

extended surface (fins) heat Transfer – long fin, fin with insulated tip and short fin, application to error measurement of temperature.

ONE DIMENSIONAL TRANSIENT CONDUCTION HEAT TRANSFER: Systems with negligible internal resistance – significance of biot and fourier numbers - chart solutions of transient conduction systems

UNIT – III

CONVECTIVE HEAT TRANSFER: Classification of convective heat transfer – dimensional analysis as a tool for experimental investigation – Buckingham Pi Theorem for forced and free convection, application for developing semi – empirical non- dimensional correlation for convective heat transfer – Significance of non-dimensional numbers – concepts of continuity, momentum and Energy Equations.

UNIT –IV

FORCED CONVECTION

EXTERNAL FLOWS: Concepts about hydrodynamic and thermal boundary layer and use of empirical correlations for convective heat transfer -flat plates and cylinders.

INTERNAL FLOWS: Concepts about hydrodynamic and thermal entry lengths – division of internal flow based on this –use of empirical relations for horizontal pipe flow and annulus flow.

FREE CONVECTION: Development of hydrodynamic and thermal boundary layer along a vertical plate – use of empirical relations for vertical plates and pipes.

UNIT V

HEAT TRANSFER WITH PHASE CHANGE

BOILING: Pool boiling – regimes- calculations on nucleate boiling, critical heat flux and film boiling.

CONDENSATION: Film wise and drop wise condensation –Nusselt’s theory of condensation on a vertical plate
- film condensation on vertical and horizontal cylinders using empirical correlations.

HEAT EXCHANGERS:

Classification of heat exchangers – overall heat transfer coefficient and fouling factor – concepts of LMTD and NTU methods – Problems.

UNIT VI

RADIATION HEAT TRANSFER:

Emission characteristics and laws of black-body radiation – Irradiation – total and monochromatic quantities – laws of Planck, Wien, Kirchoff, Lambert, Stefan and Boltzmann– heat exchange between two black bodies – concepts of shape factor – Emissivity – heat exchange between grey bodies – radiation shields – electrical analogy for radiation networks.

Text Books:

1. Heat Transfer /JP HOLMAN/TMH
2. Heat Transfer /P.K.Nag/ TMH
3. Principles of Heat Transfer /Frank Kreith, RM Manglik & MS Bohn/Cengage learning publishers

References:

1. Heat and Mass Transfer /Arora and Domkundwar/Dhanpatrai & sons
2. Fundamentals of Engg. Heat and Mass Transfer / R.C.Sachdeva / New Age International
3. Heat and Mass Transfer /Cengel/McGraw Hill.
4. Heat and Mass Transfer /D.S.Kumar / S.K.Kataria & Sons
5. A Text book on Heat Transfer-4th Edition/ S.P Sukhatme/Universities Press

Course outcomes:

The student after undergoing this course is expected to know the principles of heat transfer and be able to apply to practical situations where in heat exchange takes place through various modes of heat transfer including phase change.

III Year - II Semester

L	T	P	C
4	0	0	3

ENTREPRENEURSHIP

(OPEN ELECTIVE)

COURSE OBJECTIVE:

To develop and strengthen entrepreneurial quality and motivation in students. To impart basic entrepreneurial skills and understandings to run a business efficiently and effectively.

UNIT I ENTREPRENEURIAL COMPETENCE

Entrepreneurship concept – Entrepreneurship as a Career – Entrepreneurial Personality - Characteristics of Successful, Entrepreneur – Knowledge and Skills of Entrepreneur.

UNIT II ENTREPRENEURIAL ENVIRONMENT

Business Environment - Role of Family and Society - Entrepreneurship Development Training and Other Support Organisational Services –

UNIT III INDUSTRIAL POLACIES

Central and State Government Industrial Policies and Regulations - International Business.

UNIT IV BUSINESS PLAN PREPARATION

Sources of Product for Business - Prefeasibility Study - Criteria for Selection of Product -

Ownership - Capital - Budgeting Project Profile Preparation - Matching Entrepreneur with the Project - Feasibility Report Preparation and Evaluation Criteria.

UNIT V LAUNCHING OF SMALL BUSINESS

Finance and Human Resource Mobilization Operations Planning - Market and Channel Selection - Growth Strategies - Product Launching – Incubation, Venture capital, IT startups.

UNIT VI MANAGEMENT OF SMALL BUSINESS

Monitoring and Evaluation of Business - Preventing Sickness and Rehabilitation of Business

Units- Effective Management of small Business.

COURSE OUTCOME:

Students will gain knowledge and skills needed to run a business.

Text Books:

1. Hisrich, Entrepreneurship, Tata McGraw Hill, New Delhi, 2001.
2. S.S.Khanka, Entrepreneurial Development, S.Chand and Company Limited, New Delhi, 2001.

References

1. Mathew Manimala, Entrepreneurship Theory at the Crossroads, Paradigms & Praxis, Biztrantra ,2nd Edition 2005
2. Prasanna Chandra, Projects – Planning, Analysis, Selection, Implementation and Reviews, Tata McGraw-Hill, 1996.
3. P.Saravanel, Entrepreneurial Development, Ess Pee kay Publishing House, Chennai -1997.
4. Arya Kumar. Entrepreneurship. Pearson. 2012
5. Donald F Kuratko, T.V Rao. Entrepreneurship: A South Asian perspective. Cengage Learning. 2012

DATA BASE MANAGEMENT SYSTEM

(OPEN ELECTIVE)

OBJECTIVES

- To learn the principles of systematically designing and using large scale Database Management Systems for various applications.

UNIT-I: An Overview of Database Management, Introduction- What is Database System- What is Database- Why Database- Data Independence- Relation Systems and Others- Summary,

Database system architecture, Introduction- The Three Levels of Architecture-The External Level- the Conceptual Level- the Internal Level- Mapping- the Database Administrator-The Database Management Systems- Client/Server Architecture.

UNIT-II:

The E/R Models, The Relational Model, Relational Calculus, Introduction to Database Design, Database Design and Er Diagrams-Entities Attributes, and Entity Sets-Relationship and Relationship Sets-Conceptual Design With the Er Models, The Relational Model Integrity Constraints Over Relations- Key Constraints –Foreign Key Constraints-General Constraints, Relational Algebra and Calculus, Relational Algebra- Selection and Projection- Set Operation, Renaming – Joins- Division- More Examples of Queries, Relational Calculus, Tuple Relational Calculus- Domain Relational Calculus

UNIT-III:

Queries, Constraints, Triggers, Overview, The Form of Basic SQL Query, Union, Intersect, and Except, Nested Queries, Aggregate Operators, Null Values, Complex Integrity Constraints in SQL, Triggers and Active Database.

UNIT-IV:

SCHEMA REFINEMENT (NORMALIZATION) : Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency(1NF, 2NF and 3 NF), concept of surrogate key, Boyce-codd normal form(BCNF), Lossless join and dependency preserving decomposition, Fourth normal form(4NF).

UNIT-V:

Transaction Management and Concurrency Control:

Transaction, properties of transactions, transaction log, and transaction management with SQL using commit rollback and savepoint.

Concurrency control for lost updates, uncommitted data, inconsistent retrievals and the Scheduler. Concurrency control with locking methods : lock granularity, lock types, two phase locking for ensuring serializability, deadlocks, Concurrency control with time stamp ordering : Wait/Die and Wound/Wait Schemes, Database Recovery management : Transaction recovery.

UNIT-VI:

Overview of Storages and Indexing, Data on External Storage- File Organization and Indexing –Clustered Indexing – Primary and Secondary Indexes, Index Data Structures, Hash-Based Indexing – Tree-Based Indexing, Comparison of File Organization

OUTCOMES

- Describe a relational database and object-oriented database.
- Create, maintain and manipulate a relational database using SQL
- Describe ER model and normalization for database design.
- Examine issues in data storage and query processing and can formulate appropriate solutions.
- Understand the role and issues in management of data such as efficiency, privacy, security, ethical responsibility, and strategic advantage.
- Design and build database system for a given real world problem

TEXT BOOKS:

1. **Introduction to Database Systems, CJ Date, Pearson**
2. Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, TATA McGraw Hill 3rd Edition
3. Database Systems - The Complete Book, H G Molina, J D Ullman, J Widom Pearson

REFERENCES BOOKS:

1. Data base Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.
2. Fundamentals of Database Systems, Elmasri Navrate Pearson Education
3. Introduction to Database Systems, C.J.Date Pearson Education

WASTE WATER MANAGEMENT OPEN ELECTIVE

Learning Objectives:

- Outline planning and the design of waste water collection ,conveyance and treatment systems for a community/town/city
- Provide knowledge of characterization of waste water generated in a community
- Impart understanding of treatment of sewage and the need for its treatment
- Summarize the appurtenance in sewage systems and their necessity
- Teach planning and design of septic tank and imhoff tank and the disposal of the effluent from these low cost treatment systems
- Effluent disposal method and realize the importance of regulations in the disposal of effluents in rivers

UNIT-I:

Introduction to Sanitation-Systems of sanitation- relative merits and demerits - collection and conveyance of waste water - classification of sewerage systems-Estimation of sewage flow and storm water drainage-fluctuations-types of sewers- Hydraulics of sewers and storm drains-design of sewers- appurtenances in sewerage- cleaning and ventilation of sewers

UNIT-II:

Pumping of wastewater: Pumping stations-location- components- types of pumps and their suitability with regard to wastewaters.

House Plumbing: Systems of plumbing-sanitary fittings and other accessories-one pipe and two pipe systems-Design of building drainage

UNIT-III:

Sewage characteristics-Sampling and analysis of waste water-Physical, chemical and Biological examination-measurement of BOD & COD- BOD equations

Treatment of sewage: Primary treatment- Screens-grit chambers- grease traps- floatation-sedimentation-design of preliminary and primary treatment units.

UNIT-IV:

Secondary treatment: Aerobic and anaerobic treatment process -comparison.

Suspended growth process: Activated sludge process, principles, design and operational problems, modifications of Activated sludge processes, Oxidation ponds, Aerated Lagoons.

Attached Growth process: Trickling Filters-mechanism of impurities removal-classification-design -operation and maintenance problems. RBCs. Fluidized bed reactors

UNIT-V:

Miscellaneous Treatment Methods: Nitrification and Denitrification- Removal of phosphates- UASB- Membrane reactors- Integrated fixed film reactors. Anaerobic Processes: Septic Tanks, Imhoff tanks- working principles and Design-disposal of septic tank effluent-FAB Reactors

UNIT-VI:

Bio-solids (sludge) management: Characteristics- handling and treatment of sludge-thickening-anaerobic digestion of sludge

Disposal of sewage: Methods of disposal- disposal into water bodies- Oxygen sag Curve- Disposal into sea-disposal on land- sewage sickness

Outcomes:

By the end of successful completion of this course, the students will be able to:

- Plan and design the sewerage systems
- Characterization of sewage

- Select the appropriate appurtenances in the sewerage systems
- Select the suitable treatment flow for sewage treatment
- Identify the critical point of pollution in a river for a specific amount of pollutant disposal into the river

Text Book:

1. Waste water Engineering Treatment and Reuse by Metcalf & Eddy, Tata McGraw- Hill edition.
2. Elements of Environmental Engineering by K.N. Duggal, S.Chand & Company Ltd. New Delhi, 2012.
3. Environmental Engineering by Howard S.Peavy , Donald R. Rowe, Teorge George Tchobanoglus- Mc-Graw-Hill Book Company, New Delhi, 1985
4. Wastewater Treatment for pollution control and Reuuse, by soli.J Areivala, sham R Asolekar, Mc-GrawHill, New Delhi; 3rd Edition
5. Industrial water & wastewater management by KVSG MuraliKrishna

Reference Book:

1. Environmental Engineering-II: Sewage disposal and Air pollution Engineering , by Garg, S.K.,: Khanna publishers
2. Sewage treatment and disposal by Dr.P.N.Modi & Sethi.
3. Environmental Engineering, by Ruth F. Weiner and Robin Matthews- 4th Edition Elsevier, 2003
4. Environmental Engineering by D. Srinivasan, PHI Learning private Limited , New Delhi,2011.

COMPUTER GRAPHICS

(OPEN ELECTIVE)

Course objectives:

This course allows the students to:

1. Understand the fundamental concepts and theory of computer graphics
2. Understand modeling, and interactive control of 3D computer graphics applications
3. The underlying parametric surface concepts be understood
4. Learn multimedia authoring tools.

UNIT-I

INTRODUCTION: Application areas of computer graphics, overview of graphic system, video-display devices, raster-scan systems, random scan systems, graphics monitors and work stations and input devices.

UNIT-II

OUTPUT PRIMITIVES: Points and lines, line drawing algorithms, mid-point circle algorithm, Filled area primitives: scan-line polygon fill algorithm, boundary-fill and flood-fill algorithm.

2-D GEOMETRICAL TRANSFORMATIONS: Translation, scaling, rotation, reflection and shear transformation matrix representations and homogeneous co-ordinates, composite transformations, transformations between coordinates

UNIT -III

2-D VIEWING : The viewing pipe-line, viewing coordinate reference frame, window to view-port co-ordinate transformations, viewing function, Cohen-Sutherland and Cyrus-beck line clipping algorithms, Sutherland-Hodgeman polygon clipping algorithm

UNIT -IV

3-D OBJECT REPRESENTATION: spline representation, Hermite curve, Bezier curve and B-spline curve, Polygon surfaces, quadric surfaces, Solid modeling Scalars – wire frame, CSG, B-rep. Bezier and B-spline surfaces, Basic illumination models, shading algorithms

UNIT -V

3-D GEOMETRIC TRANSFORMATIONS: Translation, rotation, scaling, reflection and shear transformation and composite transformations. Visible surface detection methods: Classification, back-face detection, depth-buffer, scan-line, depth sorting

UNIT-VI

COMPUTER ANIMATION: Design of animation sequence, general computer animation functions, raster animation, computer animation language, key frame system, motion specification

Text Books:

1. Computer Graphics C version/ Donald Hearn and M. Pauline Baker/Pearson/PHI
2. Computer Graphics Principles & practice-second edition in C/ Foley, VanDam, Feiner and Hughes/Pearson Education

References:

1. Computer Graphics Second edition/ Zhigand xiang, Roy Plastock, Schaum's outlines/Tata Mc-Graw hill edition.
2. Procedural elements for Computer Graphics/David F Rogers/Tata Mc Graw hill, 2nd edition.
3. Principles of Interactive Computer Graphics/ Neuman and Sproul/TMH.
4. Computer Graphics/ Steven Harrington/TMH

Course outcomes:

Upon successful completion of the course, students will be able to:

1. Use the principles and commonly used paradigms and techniques of computer graphics
2. Write basic graphics application programs including animation
3. Design programs to display graphic images to given specifications

INDUSTRIAL ROBOTICS

(OPEN ELECTIVE)

Course Objectives:

1. To give students practice in applying their knowledge of mathematics, science, and Engineering and to expand this knowledge into the vast area of robotics.
2. The students will be exposed to the concepts of robot kinematics, Dynamics, Trajectory planning.
3. Mathematical approach to explain how the robotic arm motion can be described.
4. The students will understand the functioning of sensors and actuators.

UNIT-I

INTRODUCTION: Automation and Robotics, CAD/CAM and Robotics – An over view of Robotics – present and future applications – classification by coordinate system and control system.

UNIT – II

COMPONENTS OF THE INDUSTRIAL ROBOTICS: Function line diagram representation of robot arms, common types of arms. Components, Architecture, number of degrees of freedom – Requirements and challenges of end effectors, determination of the end effectors, comparison of Electric, Hydraulic and Pneumatic types of locomotion devices.

UNIT – III

MOTION ANALYSIS: Homogeneous transformations as applicable to rotation and translation – problems.

MANIPULATOR KINEMATICS: Specifications of matrices, D-H notation joint coordinates and world coordinates Forward and inverse kinematics – problems.

UNIT – IV

Differential transformation and manipulators, Jacobians – problems

Dynamics: Lagrange – Euler and Newton – Euler formulations – Problems.

UNIT V

General considerations in path description and generation. Trajectory planning and avoidance of obstacles, path planning, Skew motion, joint integrated motion –straight line motion – Robot programming, languages and software packages-description of paths with a robot programming language.

UNIT VI

ROBOT ACTUATORS AND FEED BACK COMPONENTS:

Actuators: Pneumatic, Hydraulic actuators, electric & stepper motors.

Feedback components: position sensors – potentiometers, resolvers, encoders – Velocity sensors.

ROBOT APPLICATIONS IN MANUFACTURING: Material Transfer - Material handling, loading and unloading- Processing - spot and continuous arc welding & spray painting - Assembly and Inspection.

Text Books:

1. Industrial Robotics / Groover M P / Pearson Edu.
2. Robotics and Control / Mittal R K & Nagrath I J / TMH.

References:

1. Robotics / Fu K S/ McGraw Hill.
2. Robotic Engineering / Richard D. Klafter, Prentice Hall
3. Robot Analysis and Control / H. Asada and J.J.E. Slotine / BSP Books Pvt.Ltd.
4. Introduction to Robotics / John J Craig / Pearson Edu.

Course outcomes:

Upon successful completion of this course you should be able to:

1. Identify various robot configuration and components,
2. Select appropriate actuators and sensors for a robot based on specific application
3. Carry out kinematic and dynamic analysis for simple serial kinematic chains
4. Perform trajectory planning for a manipulator by avoiding obstacles.

GREEN ENGINEERING SYSTEMS

(OPEN ELECTIVE)

Course Objective:

The course aims to highlight the significance of alternative sources of energy, green energy systems and processes and provides the theory and working principles of probable sources of renewable and green energy systems that are environmental friendly.

UNIT-I

INTRODUCTION:

SOLAR RADIATION: Role and potential of new and renewable sources, the solar energy option, Environmental impact of solar power, structure of the sun, the solar constant, sun-earth relationships, coordinate systems and coordinates of the sun, extraterrestrial and terrestrial solar radiation, solar radiation on tilted surface, instruments for measuring solar radiation and sun shine, solar radiation data, numerical problems. Photo voltaic energy conversion – types of PV cells, I-V characteristics

SOLAR ENERGY COLLECTION: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

UNIT – II

SOLAR ENERGY STORAGE AND APPLICATIONS: Different methods, sensible, latent heat and stratified storage, solar ponds, solar applications- solar heating/cooling technique, solar distillation and drying, solar cookers, central power tower concept and solar chimney.

WIND ENERGY: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, betz criteria, types of winds, wind data measurement.

UNIT – III

BIO-MASS: Principles of bio-conversion, anaerobic/aerobic digestion, types of bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, bio fuels, I.C. engine operation and economic aspects.

GEOTHERMAL ENERGY: Resources, types of wells, methods of harnessing the energy, potential in India.

OCEAN ENERGY: OTEC, Principles of utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics.

UNIT –IV

ENERGY EFFICIENT SYSTEMS:

(A) **ELECTRICAL SYSTEMS:** Energy efficient motors, energy efficient lighting and control, selection of luminaire, variable voltage variable frequency drives (adjustable speed drives), controls for HVAC (heating, ventilation and air conditioning), demand site management.

(B) **MECHANICAL SYSTEMS:** Fuel cells- principle, thermodynamic aspects, selection of fuels & working of various types of fuel cells, Environmental friendly and Energy efficient compressors and pumps.

UNIT-V

ENERGY EFFICIENT PROCESSES: Environmental impact of the current manufacturing practices and systems, benefits of green manufacturing systems, selection of recyclable and environment friendly materials in manufacturing, design and implementation of efficient and sustainable green production systems with examples like environmental friendly machining, vegetable based cutting fluids, alternate casting and joining techniques, zero waste manufacturing.

UNIT – VI

GREEN BUILDINGS: Definition, features and benefits. Sustainable site selection and planning of buildings for maximum comfort. Environmental friendly building materials like bamboo, timber, rammed earth, hollow blocks, lime & lime pozzolana cement, agro materials and industrial waste, Ferro cement and Ferro-concrete, alternate roofing systems, paints to reduce heat gain of the buildings. Energy management.

Text Books:

1. Solar Energy – Principles of Thermal Collection and Storage/Sukhatme S.P. and J.K.Nayak/ TMH
2. Non-Conventional Energy Resources/ Khan B.H/ Tata McGraw Hill, New Delhi, 2006
3. Green Manufacturing Processes and Systems, Edited / J. Paulo Davim/Springer 2013

References:

1. Alternative Building Materials and Technologies / K.S Jagadeesh, B.V Venkata Rama Reddy and K.S Nanjunda Rao/New age international
2. Principles of Solar Engineering / D.Yogi Goswami, Frank Krieth & John F Kreider / Taylor & Francis
3. Non-Conventional Energy / Ashok V Desai /New Age International (P) Ltd
4. Renewable Energy Technologies /Ramesh & Kumar /Narosa
5. Non conventional Energy Source/ G.D Roy/Standard Publishers
6. Renewable Energy Resources-2nd Edition/ J.Twidell and T. Weir/ BSP Books Pvt.Ltd
7. Fuel Cell Technology –Hand Book / Gregor Hoogers / BSP Books Pvt. Ltd.

Course outcome:

The student shall understand the principles and working of solar, wind, biomass, geo thermal, ocean energies and green energy systems and appreciate their significance in view of their importance in the current scenario and their potential future applications.

III Year - II Semester

L	T	P	C
0	0	3	2

HEAT TRANSFER LAB

Objectives:

The laboratory course is aimed to provide the practical exposure to the students with regard to the determination of amount of heat exchange in various modes of heat transfer including condensation & boiling for several geometries.

1. COP of VCR System with Capillary and thermal expansion valve.
2. Determination of overall heat transfer co-efficient of a composite slab
3. Determination of heat transfer rate through a lagged pipe.
4. Determination of heat transfer rate through a concentric sphere
5. Determination of thermal conductivity of a metal rod.
6. Determination of efficiency of a pin-fin
7. Determination of heat transfer coefficient in natural and forced convection
8. Determination of effectiveness of parallel and counter flow heat exchangers.
9. Determination of emissivity of a given surface.
10. Determination of Stefan Boltzman constant.
11. Determination of heat transfer rate in drop and film wise condensation.
12. Determination of critical heat flux.
13. Determination of Thermal conductivity of liquids and gases.
14. Investigation of Lambert's cosine law.

Outcomes:

The student should be able to evaluate the amount of heat exchange for plane, cylindrical & spherical geometries and should be able to compare the performance of extended surfaces and heat exchangers

METROLOGY & INSTRUMENTATION LAB

Course Objectives:

The Metrology and instrumentation Laboratory course is designed for measuring and gauging instruments for inspection of precision linear, geometric forms, angular and surface finish measurements. The student can learn the measurements with and calibration of instruments. They also understand the machine tool alignment test. Instrumentation lab introduces the students with the theory and methods for conducting experimental work in the laboratory and calibration of various instruments for measuring pressure, temperature, displacement, speed, vibration etc.

Note: The students have to conduct at least 8 experiments from each lab

METROLOGY LAB

1. Measurement of lengths, heights, diameters by vernier calipers, micrometers etc.
2. Measurement of bores by internal micrometers and dial bore indicators.
3. Use of gear tooth vernier caliper for tooth thickness inspection and flange micro meter for checking the chordal thickness of spur gear.
4. Machine tool alignment test on the lathe.
5. Machine tool alignment test on drilling machine.
6. Machine tool alignment test on milling machine.
7. Angle and taper measurements with bevel protractor, Sine bar, rollers and balls.
8. Use of spirit level in finding the straightness of a bed and flatness of a surface.
9. Thread inspection with two wire/ three wire method & tool makers microscope.
10. Surface roughness measurement with roughness measuring instrument.

INSTRUMENTATION LAB

1. Calibration of pressure gauge.
2. Calibration of transducer for temperature measurement.
3. Study and calibration of LVDT transducer for displacement measurement.
4. Calibration of strain gauge.
5. Calibration of thermocouple.
6. Calibration of capacitive transducer.
7. Study and calibration of photo and magnetic speed pickups.
8. Calibration of resistance temperature detector.
9. Study and calibration of a rotameter.
10. Study and use of a seismic pickup for the measurement of vibration amplitude of an engine bed at various loads.
11. Study and calibration of Mcleod gauge for low pressure.

Course outcomes:**Metrology Lab**

Student will become familiar with the different instruments that are available for linear, angular, roundness and roughness measurements they will be able to select and use the appropriate measuring instrument according to a specific requirement (in terms of accuracy, etc)

Instrumentation Lab:

Students will be able to select proper measuring instrument and know requirement of calibration, errors in measurement etc. They can perform accurate measurements.

III Year - II Semester

L	T	P	C
0	0	3	2

COMPUTATIONAL FLUID DYNAMICS LABORATORY

Course Pre-requisites:

- Basic courses of Fluid Mechanics, Heat transfer and Numerical methods are required as pre-requisites
- Knowledge of matrices, differentiation, integration and differential equations are expected

Course Objectives:

- Solving Problems of fluid mechanics and heat transfer by writing programs in C-language and MATLAB.
- Using ANSYS-FLUENT build a geometry, mesh that geometry, Perform CFD method on the mesh, perform the calculation, and post-process the results.
- Understanding the validation of the numerical result by comparison with known analytical results.
- Understanding the numerical result by invoking the physical principles of fluid mechanics and heat transfer.

PART-A

Writing Programs in C and MATLAB for the following:

1. Solution of Transcendental equations
2. Solution of Simultaneous algebraic equations
3. Numerical differentiation and Integration
4. Solution of Ordinary Differential Equation
5. Solution of a Tri-diagonal matrix using Thomas Algorithm.
6. Solution of Partial differential equations related to
 - i) Elliptical Partial differential equations
 - ii) Parabolic Partial differential equations
 - iii) Hyperbolic Partial differential equations
7. Solution of 1-D and 2-D heat conduction with (Finite Difference method)
 - i) Constant temperature boundary conditions
 - ii) Constant heat flux boundary conditions
 - iii) Convective boundary conditions
8. Solution of Incompressible Navier-Stokes equations (Finite difference and Finite Volume methods)
9. Solution of Inviscid incompressible fluid flows.(Finite difference and Finite Volume methods)

PART-B

Using ANSYS-FLUENT solve the following problems of heat transfer analysis

1. steady state conduction
2. Lumped heat transfer
3. Convective heat transfer – Internal flow (study both velocity and thermal boundary layers)
4. Convective heat transfer – External flow (study both velocity and thermal boundary layers)
5. Radiation heat transfer– Emissivity

III Year - II Semester

L	T	P	C
0	3	0	0

PROFESSIONAL ETHICS & HUMAN VALUES

Course Objectives:

**To give basic insights and inputs to the student to inculcate Human values to grow as a responsible human beings with proper personality.*

**Professional Ethics instills the student to maintain ethical conduct and discharge their professional duties.*

UNIT I: Human Values:

Morals, Values and Ethics – Integrity –Trustworthiness - Work Ethics – Service Learning – Civic Virtue – Respect for others – Living Peacefully – Caring – Sharing – Honesty –Courage – Value Time – Co-operation – Commitment – Empathy – Self-confidence – Spirituality- Character.

UNIT II: Principles for Harmony:

Truthfulness – Customs and Traditions -Value Education – Human Dignity – Human Rights – Fundamental Duties - Aspirations and Harmony (I, We & Nature) – Gender Bias - Emotional Intelligence – Salovey – Mayer Model – Emotional Competencies – Conscientiousness.

UNIT III: Engineering Ethics and Social Experimentation:

History of Ethics - Need of Engineering Ethics - Senses of Engineering Ethics- Profession and Professionalism – –Self Interest - Moral Autonomy – Utilitarianism – Virtue Theory - Uses of Ethical Theories - Deontology- Types of Inquiry –Kohlberg’s Theory - Gilligan’s Argument –Heinz’s Dilemma - Comparison with Standard Experiments — Learning from the Past –Engineers as Managers – Consultants and Leaders – Balanced Outlook on Law - Role of Codes – Codes and Experimental Nature of Engineering.

UNIT IV: Engineers’ Responsibilities towards Safety and Risk:

Concept of Safety - Safety and Risk – Types of Risks – Voluntary v/s Involuntary Risk – Consequences - Risk Assessment – Accountability – Liability - Reversible Effects - Threshold Levels of Risk - Delayed v/s Immediate Risk - Safety and the Engineer – Designing for Safety – Risk-Benefit Analysis-Accidents.

UNIT V: Engineers’ Duties and Rights:

Concept of Duty - Professional Duties – Collegiality - Techniques for Achieving Collegiality – Senses of Loyalty - Consensus and Controversy - Professional and Individual Rights –Confidential and Proprietary Information - Conflict of Interest-Ethical egoism - Collective Bargaining – Confidentiality - Gifts and Bribes - Problem solving-Occupational Crimes- Industrial Espionage- Price Fixing-Whistle Blowing.

UNIT VI: Global Issues:

Globalization and MNCs –Cross Culture Issues - Business Ethics – Media Ethics - Environmental Ethics – Endangering Lives - Bio Ethics - Computer Ethics - War Ethics – Research Ethics -Intellectual Property Rights.

- Related Cases Shall be dealt where ever necessary.

Outcome:

**It gives a comprehensive understanding of a variety issues that are encountered by every professional in discharging professional duties.*

**It provides the student the sensitivity and global outlook in the contemporary world to fulfill the professional obligations effectively.*

References:

1. Professional Ethics by R. Subramaniam – Oxford Publications, New Delhi.
2. Ethics in Engineering by Mike W. Martin and Roland Schinzinger - Tata McGraw-Hill – 2003.
3. Professional Ethics and Morals by Prof.A.R.Aryasri, DharanikotaSuyodhana - Maruthi Publications.
4. Engineering Ethics by Harris, Pritchard and Rabins, Cengage Learning, New Delhi.
5. Human Values & Professional Ethics by S. B. Gogate, Vikas Publishing House Pvt. Ltd., Noida.
6. Engineering Ethics & Human Values by M.Govindarajan, S.Natarajan and V.S.SenthilKumar-PHI Learning Pvt. Ltd – 2009.
7. Professional Ethics and Human Values by A. Alavudeen, R.Kalil Rahman and M. Jayakumaran – University Science Press.
8. Professional Ethics and Human Values by Prof.D.R.Kiran-Tata McGraw-Hill - 2013
9. Human Values And Professional Ethics by Jayashree Suresh and B. S. Raghavan, S.Chand Publications

IV Year - I Semester

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MECHATRONICS

Course Objective

The main objective of this course is to introduce the integrative nature of Mechatronics. To describe the different components and devices of mechatronics systems.

UNIT-I

Mechatronics systems – elements & levels of mechatronics system, Mechatronics design process, system, measurement systems, control systems, microprocessor-based controllers, advantages and disadvantages of mechatronics systems. Sensors and transducers, types, displacement, position, proximity, velocity, motion, force, acceleration, torque, fluid pressure, liquid flow, liquid level, temperature and light sensors.

UNIT-II

Solid state electronic devices - PN junction diode, BJT, FET, DIAC, TRIAC and LEDs. Analog signal conditioning, operational amplifiers, noise reduction, filtering.

UNIT-III

Hydraulic and pneumatic actuating systems - Fluid systems, Hydraulic systems, and pneumatic systems, components, control valves, electro-pneumatic, hydro-pneumatic, electro-hydraulic servo systems. Mechanical actuating systems and electrical actuating systems – basic principles and elements.

UNIT-IV

Digital electronics and systems, digital logic control, micro processors and micro controllers, programming, process controllers, programmable logic controllers, PLCs versus computers, application of PLCs for control.

UNIT-V

System and interfacing and data acquisition – Data Acquisition Systems, Analog to Digital and Digital to Analog conversions; Digital Signal Processing – data flow in DSPs, block diagrams, typical layouts, Interfacing motor drives.

UNIT -VI

Dynamic models and analogies, System response. Process Controllers – Digital Controllers, Programmable Logic Controllers, Design of mechatronics systems & future trends.

Text Books:

1. MECHATRONICS Integrated Mechanical Electronics Systems/KP Ramachandran, GK Vijaya Raghavan & MS Balasundaram/WILEY India Edition

References:

- 1 Mechatronics /Smaili A, Mrad F/ Oxford Higher Education, Oxford University Press
- 2 Mechatronics Source Book / Newton C Braga/Thomson Publications,Chennai.
- 3 Mechatronics – N. Shanmugam / Anuradha Agencies Publishers.
- 4 Mechatronics System Design / Devdas shetty/Richard/Thomson.
- 5 Mechatronics/M.D.Singh/J.G.Joshi/PHI.
- 6 Mechatronics – Electronic Control Systems in Mechanical and Electrical Engg. 4th Edition / W. Bolton/ Pearson, 2012
- 7 Mechatronics – Principles and Application / Godfrey C. Onwubolu/Elsevier, Indian print

Course outcomes:

After completion of this course, the student shall be able to use the various mechatronics systems devices and components in the design of electro mechanical systems.

CAD/CAM**Course Objectives:**

The general objectives of the course are to enable the students to

1. Understand the basic fundamentals of computer aided design and manufacturing.
2. To learn 2D & 3D transformations of the basic entities like line, circle, ellipse etc
3. To understand the different geometric modeling techniques like solid modeling, surface modeling, feature based modeling etc. and to visualize how the components look like before its manufacturing or fabrication
4. To learn the part programming, importance of group technology, computer aided process planning, computer aided quality control
5. To learn the overall configuration and elements of computer integrated manufacturing systems.

UNIT – I

Computers in industrial manufacturing, product cycle, CAD / CAM Hardware, basic structure, CPU, memory types, input devices, display devices, hard copy devices, storage devices.

COMPUTER GRAPHICS: Raster scan graphics coordinate system, database structure for graphics modeling, transformation of geometry, 3D transformations, mathematics of projections, clipping, hidden surface removal.

UNIT – II

GEOMETRIC MODELING: Requirements, geometric models, geometric construction models, curve representation methods, surface representation methods, modeling facilities desired.

DRAFTING AND MODELING SYSTEMS: Basic geometric commands, layers, display control commands, editing, dimensioning, solid modelling.

UNIT – III

PART PROGRAMMING FOR NC MACHINES: NC, NC modes, NC elements, CNC machine tools, structure of CNC machine tools, features of Machining center, turning center, CNC Part Programming: fundamentals, manual part programming methods, Computer Aided Part Programming. Direct Numerical Control, Adaptive Control.

UNIT – IV

GROUP TECHNOLOGY: Part family, coding and classification, production flow analysis, types and advantages. Computer aided processes planning – importance, types. FMS-Introduction, Equipment, Tool management systems, Layouts, FMS Control

UNIT – V

COMPUTER AIDED QUALITY CONTROL: Terminology used in quality control, use of computers in Quality control. Inspection methods- contact and noncontact types, computer aided testing, integration of CAQC with CAD/CAM.

UNIT – VI

COMPUTER INTEGRATED MANUFACTURING SYSTEMS: Types of manufacturing systems, machine tools and related equipment, material handling systems, material requirement planning, computer control systems, human labor in manufacturing systems, CIMS benefits.

Text Books:

1. CAD / CAM Principles and Applications/PN Rao / McGraw-Hill
2. Automation, Production systems & Computer integrated Manufacturing/ M.P. Groover/Pearson Education

References:

1. Mastering CAD / CAM / Ibrahim Zeid / McGraw-Hill
2. Principles of Computer Aided Design and Manufacturing / Farid Amirouche / Pearson
3. Computer Numerical Control Concepts and programming / Warren S Seames / Thomson learning, Inc
4. Product manufacturing and cost estimation using CAD/CAE/ Kuang Hua Chang/Elsevier Publishers

Course Outcome:

At the end of the course the students shall be able to:

1. Describe the mathematical basis in the technique of representation of geometric entities including points, lines, and parametric curves, surfaces and solid, and the technique of transformation of geometric entities using transformation matrix
2. Describe the use of GT and CAPP for the product development
3. Identify the various elements and their activities in the Computer Integrated Manufacturing Systems.

IV Year - I Semester

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FINITE ELEMENT METHODS

Course Objectives:

1. To learn basic principles of finite element analysis procedure
2. To learn the theory and characteristics of finite elements that represent engineering structures
3. To learn and apply finite element solutions to structural, thermal, dynamic problem to develop the knowledge and skills needed to effectively evaluate finite element analyses performed by others
4. Learn to model complex geometry problems and solution techniques.

UNIT-I

Introduction to finite element method, stress and equilibrium, strain – displacement relations, stress – strain relations, plane stress and plane strain conditions, variational and weighted residual methods, concept of potential energy, one dimensional problems.

UNIT – II

Discretization of domain, element shapes, discretization procedures, assembly of stiffness matrix, band width, node numbering, mesh generation, interpolation functions, local and global coordinates, convergence requirements, treatment of boundary conditions.

UNIT – III

Analysis of Trusses: Finite element modelling, coordinates and shape functions, assembly of global stiffness matrix and load vector, finite element equations, treatment of boundary conditions, stress, strain and support reaction calculations. Analysis of Beams: Element stiffness matrix for Hermite beam element, derivation of load vector for concentrated and UDL, simple problems on beams.

UNIT – IV

Finite element modelling of two dimensional stress analysis with constant strain triangles and treatment of boundary conditions, formulation of axisymmetric problems.

UNIT-V

Higher order and isoparametric elements: One dimensional quadratic and cubic elements in natural coordinates, two dimensional four noded isoparametric elements and numerical integration.

UNIT – VI

Steady state heat transfer analysis : one dimensional analysis of a fin and two dimensional analysis of thin plate, analysis of a uniform shaft subjected to torsion. Dynamic Analysis: Formulation of finite element model, element consistent and lumped mass matrices, evaluation of eigen values and eigen vectors, free vibration analysis.

Text Books:

1. The Finite Element Methods in Engineering / SS Rao / Pergamon.

References:

1. Finite Element Method with applications in Engineering / YM Desai, Eldho & Shah /Pearson publishers
2. An introduction to Finite Element Method / JN Reddy / McGraw Hill
3. The Finite Element Method for Engineers – Kenneth H. Huebner, Donald L. Dewhirst, Douglas E. Smith and Ted G. Byrom / John Wiley & sons (ASIA) Pte Ltd.
4. Finite Element Analysis: Theory and Application with Ansys, Saeed Moaveniu, Pearson Education
5. Finite Element Methods / Chen
6. Finite Element Analysis: for students & Practicing Engineers / G.Lakshmi Narasaiah / BSP Books Pvt. Ltd.

Course outcomes:

Upon successful completion of this course you should be able to:

1. Understand the concepts behind variational methods and weighted residual methods in FEM
2. Identify the application and characteristics of FEA elements such as bars, beams, plane and isoparametric elements, and 3-D element .
3. Develop element characteristic equation procedure and generation of global stiffness equation will be applied.
4. Able to apply Suitable boundary conditions to a global structural equation, and reduce it to a solvable form.
5. Able to identify how the finite element method expands beyond the structural domain, for problems involving dynamics, heat transfer, and fluid flow.

POWER PLANT ENGINEERING**Course Objectives:**

The course is aimed at providing knowledge of power generation through different prime movers viz steam, ICGT, Hydro, nuclear and hybrid systems along with their economics and environmental considerations.

UNIT – I

Introduction to the sources of energy – resources and development of power in india.

STEAM POWER PLANT: Plant layout, working of different circuits, fuel and handling equipments, types of coals, coal handling, choice of handling equipment, coal storage, ash handling systems. Combustion: properties of coal – overfeed and underfeed fuel beds, traveling grate stokers, spreader stokers, retort stokers, pulverized fuel burning system and its components, combustion needs and draught system, cyclone furnace, design and construction, dust collectors, cooling towers and heat rejection. corrosion and feed water treatment.

UNIT – II**INTERNAL COMBUSTION AND GAS TURBINE POWER PLANTS:**

DIESEL POWER PLANT: Plant layout with auxiliaries – fuel supply system, air starting equipment, super charging.

GAS TURBINE PLANT: Introduction – classification - construction – layout with auxiliaries, combined cycle power plants and comparison.

UNIT – III

HYDRO ELECTRIC POWER PLANT: Water power – hydrological cycle / flow measurement – drainage area characteristics – hydrographs – storage and pondage – classification of dams and spill ways.

HYDRO PROJECTS AND PLANT: Classification – typical layouts – plant auxiliaries – plant operation pumped storage plants.

UNIT – IV

NUCLEAR POWER STATION: Nuclear fuel – breeding and fertile materials – nuclear reactor – reactor operation.

TYPES OF REACTORS: Pressurized water reactor, boiling water reactor, sodium-graphite reactor, fast breeder reactor, homogeneous reactor, gas cooled reactor, radiation hazards and shielding – radioactive waste disposal.

UNIT – V

COMBINED OPERATIONS OF DIFFERENT POWER PLANTS: Introduction, advantages of combined working, load division between power stations, storage type hydro-electric plant in combination with steam plant, run-of-river plant in combination with steam plant, pump storage plant in combination with steam or nuclear power plant, co-ordination of hydro-electric and gas turbine stations, co-ordination of hydro-electric and nuclear power stations, co-ordination of different types of power plants.

POWER PLANT INSTRUMENTATION AND CONTROL: Importance of measurement and instrumentation in power plant, measurement of water purity, gas analysis, O₂ and CO₂ measurements, measurement of smoke and dust, measurement of moisture in carbon dioxide circuit, nuclear measurements.

UNIT – VI

POWER PLANT ECONOMICS AND ENVIRONMENTAL CONSIDERATIONS: Capital cost, investment of fixed charges, operating costs, general arrangement of power distribution, load curves, load duration curve, definitions of connected load, maximum demand, demand factor, average load, load factor, diversity factor – related exercises. effluents from power plants and Impact on environment – pollutants and pollution standards – methods of pollution control.

Text Books:

1. A course in Power Plant Engineering /Arora and Domkundwar/Dhanpatrai & Co.
2. Power Plant Engineering /P.C.Sharma / S.K.Kataria Pub

References:

1. Power Plant Engineering: P.K.Nag/ II Edition /TMH.
2. Power station Engineering – ElWakil / McGrawHill.
3. An Introduction to Power Plant Technology / G.D. Rai/Khanna Publishers

Course outcomes:

After undergoing this course the student can understand various conventional methods of power generation and principle of operation and performance of respective prime movers along with their economics and their impact on environment.

IV Year - I Semester

L	T	P	C
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COMPUTATIONAL FLUID DYNAMICS

(ELECTIVE – I)

Course Objectives:

The course aims at providing required numerical and software techniques for solving various engineering problems involving fluid flow.

UNIT-I

ELEMENTARY DETAILS IN NUMERICAL TECHNIQUES: Number system and errors, representation of integers, fractions, floating point arithmetic, loss of significance and error propagation, condition and instability, computational methods for error estimation, convergence of sequences.

UNIT – II

APPLIED NUMERICAL METHODS: Solution of a system of simultaneous linear algebraic equations, iterative schemes of matrix inversion, direct methods for matrix inversion, direct methods for banded matrices.

REVIEW OF EQUATIONS GOVERNING FLUID FLOW AND HEAT TRANSFER: Introduction, conservation of mass, Newton's second law of motion, expanded forms of Navier-Stokes equations, conservation of energy principle, special forms of the Navier-Stokes equations.

UNIT – III

Steady flow, dimensionless form of momentum and energy equations, Stokes equation, conservative body force fields, stream function - vorticity formulation.

Finite difference applications in heat conduction and convection – heat conduction, steady heat conduction in a rectangular geometry, transient heat conduction, finite difference application in convective heat transfer, closure.

UNIT – IV

Finite differences, discretization, consistency, stability, and fundamentals of fluid flow modelling: introduction, elementary finite difference quotients, implementation aspects of finite-difference equations, consistency, explicit and implicit methods.

UNIT – V

Introduction to first order wave equation, stability of hyperbolic and elliptic equations, fundamentals of fluid flow modelling, conservative property, the upwind scheme.

UNIT –VI

FINITE VOLUME METHOD: Approximation of surface integrals, volume integrals, interpolation and differentiation practices, upwind interpolation, linear interpolation and quadratic interpolation.

Text Books:

1. Numerical heat transfer and fluid flow / Suhas V. Patankar/Butter-worth Publishers
2. Computational fluid dynamics - Basics with applications /John. D. Anderson / Mc Graw Hill.

References:

1. Computational Fluid Flow and Heat Transfer/ Niyogi/Pearson Publications
2. Fundamentals of Computational Fluid Dynamics /Tapan K. Sengupta / Universities Press.
3. Computational fluid dynamics: An introduction, 3rd edition/John.F Wendt/Springer publishers

Course Outcomes:

After undergoing the course the student shall be able to apply various numerical tools like finite volume, finite difference etc for solving the different fluid flow heat transfer problems.

CONDITION MONITORING

(ELECTIVE – I)

Course Objectives:

- This course is designed to introduce the benefits and opportunities of health Monitoring and covers a range of techniques
- The students will be exposed to a range of techniques from Vibration based methods, Thermography, Oil conditions, Debris and ultrasonic monitoring
- Using overall vibration, vibration limit zones, broadband vibration bandwidth, alert levels, typical severity guidelines, recording overall vibration, using overall vibration for fault finding, trending overall vibration.
- Identifying Resonance, Hammer Test, Self Excitation, Exciter Testing. Reducing Resonance - Effects of Frequency, Stiffness, Mass, Damping, Isolation

UNIT-I

BASICS OF VIBRATION: Basic motion: amplitudes, period, frequency, basic parameters: displacement, velocity, acceleration, units (including dB scales) and conversions, Mass, spring and damper concept, Introduction to SDOF and MDOF systems, Natural frequencies and resonance, Forced response.

UNIT-II

VIBRATION MEASUREMENTS AND ANALYSIS: Transducers and mounting methods, data acquisition using instrumentation recorders/data loggers, time domain signal analysis, orbit analysis, Filters, Frequency domain analysis (Narrow band FFT analysis), Nyquist criteria, Sampling, aliasing, windowing and averaging.

VIBRATION MEASUREMENT AND ANALYSIS: Use of phase; bode, polar and water fall plots, constant percentage band width analysis (1/3 and 1/1 Octave analysis), envelope detection /spike energy analysis, cepstral analysis, advances in analysis (PC based and portable instruments for vibration analysis).

UNIT-III

Fault Diagnosis, Interpreting vibration measurements for common machine faults , imbalance, misalignment, mechanical looseness, bearing and gearing faults, faults in induction motors, resonances, some case studies, static and dynamic balancing, international standards for vibration condition monitoring.

UNIT-IV

THERMOGRAPHY: The basics of infrared thermography, differences in equipment and specific wave length limitations, application of ir to: electrical inspection, mechanical inspection, energy conservation, how to take good thermal images, hands-on demonstrations focusing on proper camera settings and image interpretation, analysis of thermal images and report generation, study of thermo graphy applications

UNIT-V

OIL AND WEAR DEBRIS ANALYSIS: Basics of oil analysis, monitoring condition of oil, lubricant analysis, physio – chemical properties, moisture, tan tbn, wear debris analysis, particle counting, spectroscopy, uses & limitations, ferrography wear particle analysis, concept of ferrography, principle particle classification, size, shape, composition, concentration, analysis procedure, sampling & analytical ferrography equipments, severity rating.

UNIT-VI

ULTRASONIC MONITORING AND ANALYSIS: Ultrasonic monitoring (leak, crack and thickness) basics of ultrasonic monitoring , ultrasonic theory, test taking philosophy, ultrasonic theory, mathematics of ultrasound, equipment and transducers, inspection parameters and calibration, immersion theory, equipment quality control, flaw origins and inspection methods, UT Procedure familiarization, and study recommendations, application of ultrasound to: air leaks, steam trap testing, bearing lubrication, electrical inspection, case studies.

Text Books:

1. The Vibration Analysis Handbook/J I Taylor (1994)/Vibration consultants Incorporate Publishers
2. Machinery Vibration Condition Monitoring/Lynn/Butterworth(1989)

References:

1. Machinery Vibration: Measurement and Analysis/Victor Wowk/Mc GrawHill Professional
2. Mechanical fault diagnosis and condition monitoring/RA Collacott(1977) /Chapman and Hall
3. The Vibration Monitoring Handbook/Charles W Reeves/Coxmoor publishing company

Course outcomes:

- Gaining invaluable insights into the benefits of Condition Monitoring
- Understanding the reasons for selecting particular maintenance strategies
- Understanding effective methodologies for implementing Condition Monitoring Techniques
- Identifying the optimum maintenance strategy for different types of equipment
- Gaining practical approaches to minimize the risk of plant and machinery breakdowns
- Awareness of International Standards covering asset management

ADDITIVE MANUFACTURING

(ELECTIVE – I)

Course Objectives:

The course aims at the importance of Additive Manufacturing, classifications, models, specifications of various Additive Manufacturing Techniques. To learn the different tools, soft-wares required and the applications of Additive Manufacturing.

UNIT – I

INTRODUCTION: Prototyping fundamentals, historical development, fundamentals of rapid prototyping, advantages and limitations of rapid prototyping, commonly used terms, classification of RP process.

LIQUID-BASED RAPID PROTOTYPING SYSTEMS: Stereo lithography Apparatus (SLA): models and specifications, process, working principle, photopolymers, photo polymerization, layering technology, laser and laser scanning, applications, advantages and disadvantages, case studies. Solid Ground Curing (SGC): models and specifications, process, working principle, applications, advantages and disadvantages, case studies.

UNIT-II

SOLID-BASED RAPID PROTOTYPING SYSTEMS: Laminated object manufacturing (LOM) - models and specifications, process, working principle, applications, advantages and disadvantages, case studies. Fused deposition modelling (FDM) - models and specifications, process, working principle, applications, advantages and disadvantages, case studies.

UNIT – III

POWDER BASED RAPID PROTOTYPING SYSTEMS: Selective laser sintering (SLS): models and specifications, process, working principle, applications, advantages and disadvantages, case studies. three dimensional printing (3DP): models and specifications, process, working principle, applications, advantages and disadvantages, case studies.

UNIT-IV

RAPID TOOLING: Introduction to rapid tooling (RT), conventional tooling Vs RT, Need for RT. rapid tooling classification: indirect rapid tooling methods: spray metal deposition, RTV epoxy tools, Ceramic tools, investment casting, spin casting, die casting, sand casting, 3D Keltool process. Direct rapid tooling: direct AIM, LOM Tools, DTM Rapid Tool Process, EOS Direct Tool Process and Direct Metal Tooling using 3DP.

UNIT – V

RAPID PROTOTYPING DATA FORMATS: STL Format, STL File Problems, consequence of building valid and invalid tessellated models, STL file Repairs: Generic Solution, other Translators, Newly Proposed Formats.

RAPID PROTOTYPING SOFTWARE'S: Features of various RP software's like Magics, Mimics, Solid View, View Expert, 3 D View, Velocity 2, Rhino, STL View 3 Data Expert and 3 D doctor.

UNIT –VI

RP APPLICATIONS: Application in engineering, analysis and planning, aerospace industry, automotive industry, jewelry industry, coin industry, GIS application, arts and architecture. RP medical and bioengineering applications: planning and simulation of complex surgery, customized implants & prosthesis, design and production of medical devices, forensic science and anthropology, visualization of bimolecular.

Text Books:

1. Rapid prototyping: Principles and Applications /Chua C.K., Leong K.F. and LIM C.S/World Scientific publications

References:

1. Rapid Manufacturing / D.T. Pham and S.S. Dimov/Springer
2. Wohlers Report 2000 /Terry T Wohlers/Wohlers Associates
3. Rapid Prototyping & Manufacturing / Paul F.Jacobs/ASME Press
4. Rapid Prototyping / Chua & Liou

Course Outcomes:

The student shall be able to identify the use of Rapid Prototyping Techniques in the manufacturing of complex components that are otherwise very difficult to manufacture.

IV Year - I Semester

L	T	P	C
4	0	0	3

ADVANCED MATERIALS
(ELECTIVE – II)

Course Objectives

The objective for this course is to understand the mechanics of different materials. This understanding will include concepts such as anisotropic material behaviour, constituent properties and manufacturing processes of different composites. Suitability of smart and nano materials for engineering applications.

UNIT-I

INTRODUCTION TO COMPOSITE MATERIALS: Introduction, classification: polymer matrix composites, metal matrix composites, ceramic matrix composites, carbon-carbon composites, fiber-reinforced composites and nature-made composites, and applications .

REINFORCEMENTS: Fibres- glass, silica, kevlar, carbon, boron, silicon carbide, and boron carbide fibres.

UNIT-II

Polymer composites, thermoplastics, thermosetting plastics, manufacturing of PMC, MMC & CCC and their applications.

UNIT-III

MANUFACTURING METHODS: Autoclave, tape production, moulding methods, filament winding, hand layup, pultrusion, RTM.

UNIT-IV

MACROMECHANICAL ANALYSIS OF A LAMINA: Introduction, generalized Hooke's law, reduction of Hooke's law in three dimensions to two dimensions, relationship of compliance and stiffness matrix to engineering elastic constants of an orthotropic lamina, laminate-laminate code.

UNIT-V

FUNCTIONALLY GRADED MATERIALS: Types of functionally graded materials-classification-different systems-preparation-properties and applications of functionally graded materials.

SHAPE MEMORY ALLOYS: Introduction-shape memory effect-classification of shape memory alloys-composition-properties and applications of shape memory alloys.

UNIT-VI

NANO MATERIALS: Introduction-properties at nano scales-advantages & disadvantages-applications in comparison with bulk materials (nano – structure, wires, tubes, composites). state of art nano advanced- topic delivered by student.

Text Books:

1. Nano material /A.K. Bandyopadyay/New age Publishers
2. Material science and Technology: A comprehensive treatment/Robert W.Cahn,/VCH
3. Engineering Mechanics of Composite Materials / Isaac and M Daniel/Oxford University Press

References:

1. Mechanics of Composite Materials / R. M. Jones/ Mc Graw Hill Company, New York, 1975.
2. Analysis of Laminated Composite Structures / L. R. Calcote/Van Nostrand Rainfold,NY 1969
3. Analysis and performance of fibre Composites /B. D. Agarwal and L. J. Broutman /Wiley-Interscience, New York, 1980
4. Mechanics of Composite Materials - Second Edition (Mechanical Engineering) /Autar K.Kaw / CRC Press

DESIGN FOR MANUFACTURE (ELECTIVE – II)

Course Objectives:

1. Understand the design rules and considerations with reference to various manufacturing processes
2. To discuss capabilities and limitations of each manufacturing process in relation to part design and cost
3. To examine DFM principles including how the design affects manufacturing cost, lean manufacturing, six sigma, etc.

UNIT - I

Introduction: Design philosophy-steps in design process-general design rules for manufacturability-basic principles of designing for economical production-creativity in design. Design for the life cycle total product life of consumer goods-design considerations.

UNIT – II

Machining processes: Overview of various machining processes-general design rules for machining-dimensional tolerance and surface roughness-Design for machining – ease –redesigning of components for machining ease with suitable examples. General design recommendations for machined parts.

UNIT - III

Metal casting: Appraisal of various casting processes, selection of casting process,-general design considerations for casting-casting tolerance-use of solidification, simulation in casting design-product design rules for sand casting.

UNIT – IV

Metal joining: Appraisal of various welding processes, factors in design of weldments – general design guidelines-pre and post treatment of welds-effects of thermal stresses in weld joints-design of brazed joints. Forging: Design factors for forging – closed die forging design – parting lines of dies – drop forging die design – general design recommendations.

UNIT – V

Extrusion & Sheet metal work: Design guide lines extruded sections-design principles for punching, blanking, bending, deep drawing-Keeler Goodman forging line diagram – component design for blanking.

UNIT – VI

Plastics: Visco elastic and creep behavior in plastics-design guidelines for plastic components-design considerations for injection moulding – design guidelines for machining and joining of plastics.

Text Books:

1. Design for manufacture / John cobert / Adisson Wesley. 1995
2. Design for Manufacture / Boothroyd/CRC Press
3. Design for manufacture/ James Bralla/McGrawHill Edition

Reference:

1. ASM Hand book Vol.20

Course outcomes:

Upon completion of the course, the student will be able to:

1. Design components for machining
2. Simulate the casting design and choose the best casting process for a specific product.
3. Evaluate the effect of thermal stresses in weld joints
4. Design components for sheet metal work by understanding in depth the sheet metal processes and their formation mechanisms
5. Design plastic components for machining and joining and selecting a proper processes for different joining cases

GAS DYNAMICS AND JET PROPULSION

(ELECTIVE – II)

Course objectives:

The purpose of this course is to provide the student with the knowledge of basic principles of gas dynamics and its importance in jet propulsion applications.

UNIT-I

Introduction to gas dynamics: control volume and system approaches acoustic waves and sonic velocity - mach number - classification of fluid flow based on mach number - mach cone-compressibility factor - general features of one dimensional flow of a compressible fluid - continuity and momentum equations for a control volume.

UNIT-II

Isentropic flow of an ideal gas: basic equation - stagnation enthalpy, temperature, pressure and density-stagnation, acoustic speed - critical speed of sound- dimensionless velocity-governing equations for isentropic flow of a perfect gas - critical flow area - stream thrust and impulse function.

Steady one dimensional isentropic flow with area change-effect of area change on flow parameters- choking-convergent nozzle - performance of a nozzle under decreasing back pressure -De laval nozzle - optimum area ratio effect of back pressure - nozzle discharge coefficients - nozzle efficiencies.

UNIT- III

Simple frictional flow: adiabatic flow with friction in a constant area duct-governing equations - fanno line limiting conditions - effect of wall friction on flow properties in an Isothermal flow with friction in a constant area duct-governing equations - limiting conditions.

Steady one dimensional flow with heat transfer in constant area ducts- governing equations - Rayleigh line entropy change caused by heat transfer - conditions of maximum enthalpy and entropy.

UNIT-IV

Effect of heat transfer on flow parameters: Intersection of Fanno and Rayleigh lines. Shock waves in perfect gas-properties of flow across a normal shock - governing equations - Rankine Hugoniat equations - Prandtl's velocity relationship - converging diverging nozzle flow with shock thickness - shock strength.

UNIT- V

Propulsion: Air craft propulsion: - types of jet engines - energy flow through jet engines, thrust, thrust power and propulsive efficiency turbojet components-diffuser, compressor, combustion chamber, turbines, exhaust systems.

UNIT-VI

Performance of turbo propeller engines, ramjet and pulsejet, scramjet engines. Rocket propulsion - rocket engines, Basic theory of equations - thrust equation - effective jet velocity - specific impulse - rocket engine performance - solid and liquid propellant rockets - comparison of various propulsion systems.

Text Books:

1. Compressible fluid flow /A. H. Shapiro / Ronald Press Co., 1953
2. Fundamentals of compressible flow with aircraft and rocket propulsion/S. M. Yahya/New Age international Publishers
3. Fundamental of Gas dynamics-2nd edition/ M J Zucker/ Wiley publishers

References:

1. Elements of gas dynamics / HW Liepman & A Roshko/Wiley
2. Aircraft & Missile propulsion /MJ Zucrow/Wiley
3. Gas dynamics / M.J. Zucrow & Joe D.Holfman / Krieger Publishers

Course outcomes:

Up on successful completion of this course the student should be able to analyze the gas flow in different situations with and without friction, with and without heat transfer in particular jet propulsion and rocket engineering applications.

IV Year - I Semester

L	T	P	C
0	0	2	2

CAD/CAM LAB

Course Objectives:

1. To impart the fundamental knowledge on using various analytical tools like ANSYS, FLUENT, etc., for Engineering Simulation
 2. To know various fields of engineering where these tools can be effectively used to improve the output of a product.
 3. To impart knowledge on how these tools are used in Industries by solving some real time problems using these tools..
-
1. **DRAFTING:** Development of part drawings for various components in the form of orthographic and isometric representation of dimensioning and tolerances scanning and plotting. study of script, DXE and IGES files.
 2. **PART MODELING:** Generation of various 3D models through protrusion, revolve, shell sweep. creation of various features. study of parent child relation. feature based and boolean based modelling surface and assembly modelling. study of various standard translators. design simple components.
 3. a). Determination of deflection and stresses in 2D and 3D trusses and beams.
b). Determination of deflections component and principal and Von-mises stresses in plane stress, plane strain and Axisymmetric components.
c). Determination of stresses in 3D and shell structures (at least one example in each case)
d). Estimation of natural frequencies and mode shapes, Harmonic response of 2D beam.
e). Steady state heat transfer Analysis of plane and Axisymmetric components.
 4. a). Study of various post processors used in NC Machines.
b). Machining of simple components on NC lathe and Mill by transferring NC Code / from a CAM package. Through RS 232.
c) Practice on CNC Sinutrain Turning
d) Practice on CNC Sinutrain Milling
e) CNC programming for turned components using FANUC Controller
f) CNC programming for milled components using FANUC Controller
g) Automated CNC Tool path & G-Code generation using Pro/E/MasterCAM

Packages to be provided to cater to drafting, modeling & analysis from the following:

CATIA, Pro-E, I-DEAS, ANSYS, NISA, CAEFEM, Gibbs CAM, Master CAM etc.

Course outcomes:

Upon successful completion of this course student should be able to:

1. The student will be able to appreciate the utility of the tools like ANSYS or FLUENT in solving real time problems and day to day problems.
2. Use of these tools for any engineering and real time applications
3. Acquire knowledge on utilizing these tools for a better project in their curriculum as well as they will be prepared to handle industry problems with confidence when it matters to use these tools in their Employment

IV Year - I Semester

L	T	P	C
0	0	3	2

MECHATRONICS LAB

Course Outcomes: At the end of the course, the student will be able to:

- 1 Measure load, displacement and temperature using analogue and digital sensors.
- 2 Develop PLC programs for control of traffic lights, water level, lifts and conveyor belts.
- 3 Simulate and analyse PID controllers for a physical system using MATLAB.
- 4 Develop pneumatic and hydraulic circuits using Automaton studio.

List of Experiments

1. DYNA 1750 Transducers Kit :-
 - a. Characteristics of LVDT
 - b. Principle & Characteristics of Strain Gauge
 - c. Characteristics of Summing Amplifier
 - d. Characteristics of Reflective Opto Transducer
2. PLC PROGRAMMING
 - a. Ladder programming on Logic gates ,Timers & counters
 - b. Ladder Programming for digital & Analogy sensors
 - c. Ladder programming for Traffic Light control, Water level control and Lift control Modules
3. AUTOMATION STUDIO software
 - a. Introduction to Automation studio & its control
 - b. Draw & Simulate the Hydraulic circuit for series & parallel cylinders connection
 - c. Draw & Simulate Meter-in, Meter-out and hydraulic press and clamping.
4. MATLAB Programming
 - a. Sample programmes on Matlab
 - b. Simulation and analysis of PID controller using SIMULINK

IV Year - II Semester

L	T	P	C
4	0	0	3

PRODUCTION PLANNING AND CONTROL

Course objectives:

This subject provides students with

1. An understanding of the concepts of production and service systems;
2. The ability to apply principles and techniques in the design, planning and control of these systems to optimise/make best use of resources in achieving their objectives.
3. Identify different strategies employed in manufacturing and service industries to plan production and control inventory.
4. Measure the effectiveness, identify likely areas for improvement, develop and implement improved planning and control methods for production systems.

UNIT – I

Introduction: Definition – objectives and functions of production planning and control – elements of production control – types of production – organization of production planning and control department – internal organization of department.

UNIT – II

Forecasting – importance of forecasting – types of forecasting, their uses – general principles of forecasting – forecasting techniques – qualitative methods and quantitative methods.

UNIT – III

Inventory management – functions of inventories – relevant inventory costs – ABC analysis – VED analysis – EOQ model – Inventory control systems – P-Systems and Q-Systems Introduction to MRP I, MRP II, ERP, LOB (Line of Balance), JIT and KANBAN system.

UNIT – IV

Routing – definition – routing procedure – route sheets – bill of material – factors affecting routing procedure, schedule – definition – difference with loading

UNIT – V

Scheduling policies – techniques, standard scheduling methods.
Line Balancing, aggregate planning, chase planning, expediting, controlling aspects.

UNIT – VI

Dispatching – activities of dispatcher – dispatching procedure – follow up – definition – reason for existence of functions – types of follow up, applications of computer in production planning and control.

Text Books:

1. Elements of Production Planning and Control / Samuel Eilon/Universal Book Corp.
2. Manufacturing, Planning and Control/Partik Jonsson Stig-Arne Mattsson/TataMcGrawHill

References:

1. Inventory Control Theory and Practice / Martin K. Starr and David W. Miller/Prentice-Hall
2. Production Planning and Control/Mukhopadhyay/PHI.
3. Production Control A Quantitative Approach / John E. Biegel/Prentice-Hall
4. Production Control / Franklin G Moore & Ronald Jablonski/ Mc-GrawHill
5. Production and Operations Management/Shailendra Kale/McGraw Hill
6. Production and Operations Management/Ajay K Garg/McGraw Hill

IV Year - II Semester

L	T	P	C
4	0	0	3

UNCONVENTIONAL MACHINING PROCESSES

Course Objectives:

- The course aims in identifying the classification of unconventional machining processes.
- To understand the principle, mechanism of metal removal of various unconventional machining processes.
- To study the various process parameters and their effect on the component machined on various unconventional machining processes.
- To understand the applications of different processes.

UNIT – I

INTRODUCTION: Need for non-traditional machining methods-classification of modern machining processes – considerations in process selection, applications.

Ultrasonic machining – Elements of the process, mechanics of material removal, MRR process parameters, economic considerations, applications and limitations.

UNIT – II

ELECTRO – CHEMICAL MACHINING: Fundamentals of electro chemical machining, electrochemical grinding, electro chemical honing and deburring process, metal removal rate in ECM, Tool design, Surface finish and accuracy, economic aspects of ECM – Simple problems for estimation of metal removal rate, fundamentals of chemical, machining, advantages and applications.

UNIT - III

THERMAL METAL REMOVAL PROCESSES: General principle and applications of Electric Discharge Machining, Electric Discharge Grinding and wire EDM – Power circuits for EDM, Mechanics of metal removal in EDM, Process parameters, selection of tool electrode and dielectric fluids, surface finish and machining accuracy, characteristics of spark eroded surface

UNIT – VI

Electron Beam Machining, Laser Beam Machining - Basic principle and theory, mechanics of material removal, process parameters, efficiency & accuracy, applications

UNIT-V

Plasma Machining: Application of plasma for machining, metal removal mechanism, process parameters, accuracy and surface finish and other applications of plasma in manufacturing industries.

UNIT – VI

Abrasive jet machining, Water jet machining and abrasive water jet machining: Basic principles, equipments, process variables, mechanics of material removal, MRR, application and limitations, agnetic abrasive finishing, abrasive flow finishing, Electrostream drilling, shaped tube electrolytic machining.

Text Books:

1. Fundamentals of Machining Processes-Conventional and non – conventional processes/Hassan Abdel – Gawad El-Hafy/CRC Press-2016.

References:

1. Modern Machining Process / Pandey P.C. and Shah H.S./ TMH.
2. New Technology / Bhattacharya A/ the Institution of Engineers, India 1984.
3. Non Traditional Manufacturing Processes / Benedict /

Course outcomes:

After completion of course, the student shall understand the principle of working, mechanism of metal removal in the various unconventional machining process. The student is able to identify the process parameters, their effect and applications of different processes.

AUTOMOBILE ENGINEERING

Course Objectives:

The course imparts the principles of automobile systems and provides the salient features of safety, emission and service of automobiles.

UNIT – I

INTRODUCTION: Components of four wheeler automobile – chassis and body – power unit – power transmission – rear wheel drive, front wheel drive, 4 wheel drive – types of automobile engines, engine construction, turbo charging and super charging – engine lubrication, splash and pressure lubrication systems, oil filters, oil pumps – crank case ventilation – engine service, reborning, decarbonisation, Nitriding of crank shaft.

UNIT – II

TRANSMISSION SYSTEM: Clutches, principle, types, cone clutch, single plate clutch, multi plate clutch, magnetic and centrifugal clutches, fluid fly wheel – gear boxes, types, sliding mesh, construct mesh, synchro mesh gear boxes, epicyclic gear box, over drive torque converter. propeller shaft – Hotch – Kiss drive, Torque tube drive, universal joint, differential rear axles – types – wheels and tyres.

UNIT – III

STEERING SYSTEM: Steering geometry – camber, castor, king pin rake, combined angle toein, center point steering. types of steering mechanism – Ackerman steering mechanism, Davis steering mechanism, steering gears – types, steering linkages.

UNIT – IV

SUSPENSION SYSTEM: Objects of suspension systems – rigid axle suspension system, torsion bar, shock absorber, Independent suspension system.

BRAKING SYSTEM: Mechanical brake system, hydraulic brake system, master cylinder, wheel cylinder tandem master cylinder requirement of brake fluid, pneumatic and vacuum brakes.

ELECTRICAL SYSTEM: Charging circuit, generator, current – voltage regulator – starting system, bendix drive mechanism solenoid switch, lighting systems, horn, wiper, fuel gauge – oil pressure gauge, engine temperature indicator etc.

UNIT – V

ENGINE SPECIFICATION AND SAFETY SYSTEMS: Introduction- engine specifications with regard to power, speed, torque, no. of cylinders and arrangement, lubrication and cooling etc.

Safety: Introduction, safety systems - seat belt, air bags, bumper, anti lock brake system (ABS), wind shield, suspension sensors, traction control, mirrors, central locking and electric windows, speed control.

UNIT – VI

ENGINE EMISSION CONTROL: Introduction – types of pollutants, mechanism of formation, concentration measurement, methods of controlling-engine modification, exhaust gas treatment-thermal and catalytic converters-use of alternative fuels for emission control – National and International pollution standards

ENGINE SERVICE: Introduction, service details of engine cylinder head, valves and valve mechanism, piston-connecting rod assembly, cylinder block, crank shaft and main bearings, engine reassembly-precautions.

Text Books:

1. Automotive Mechanics – Vol. 1 & Vol. 2 / Kirpal Singh/standard publishers
2. Automobile Engineering / William Crouse/TMH Distributors
3. Automobile Engineering/P.S Gill/S.K. Kataria & Sons/New Delhi.

References:

1. Automotive Engines Theory and Servicing/James D. Halderman and Chase D. Mitchell Jr./ Pearson education inc.
2. Automotive Engineering / K Newton, W.Steeds & TK Garrett/SAE
3. Automotive Mechanics : Principles and Practices/ Joseph Heitner/Van Nostrand Reinhold
4. Automobile Engineering / C Srinivasan/McGrawHill

Course Outcomes:

The student after undergoing the course, shall visualize the layout of an automobile and its systems like transmission, steering, suspension, braking, safety etc and should know the vehicle troubleshooting.

THERMAL EQUIPMENT DESIGN**(ELECTIVE – III)****UNIT - I:**

Classification of heat exchangers: Introduction, Recuperation & Regeneration – Tubular heat exchangers: double pipe, shell & tube heat exchanger, Plate heat exchangers, Gasketed plate heat exchanger, spiral plate heat exchanger, Lamella heat exchanger, extended surface heat exchanger, Plate fin, and Tubular fin.

UNIT - II:

Basic Design Methods of Heat Exchanger: Introduction, Basic equations in design, Overall heat transfer coefficient – LMTD method for heat exchanger analysis – parallel flow, counter flow, multipass, cross flow heat exchanger design calculations.

Double Pipe Heat Exchanger: Film Coefficient for fluids in annulus, fouling factors, calorific temperature, average fluid temperature, the calculation of double pipe exchanger, Double pipe exchangers in series-parallel arrangements.

UNIT - III:

Shell & Tube Heat Exchangers: Tube layouts for exchangers, baffle Heat exchangers, calculation of shell and tube heat exchangers – shell side film coefficients, Shell side equivalent diameter, the true temperature difference in a 1-2 heat exchanger, influence of approach temperature on correction factor, shell side pressure drop, tube side pressure drop, Analysis of performance of 1-2 heat exchanger, and design calculation of shell & tube heat exchangers. Flow arrangements for increased heat recovery, the calculations of 2-4 exchangers.

UNIT - IV:

Condensation of single vapors: Calculation of a horizontal condenser, vertical condenser, De-super heater condenser, vertical condenser – sub-cooler, horizontal condenser – subcooler, vertical reflux type condenser, condensation of steam.

UNIT – V:

Vaporizers, Evaporators and Reboilers: Vaporizing processes, forced circulation vaporizing exchangers, natural circulation vaporizing exchangers, calculations of a reboiler.

Extended Surfaces: Longitudinal fins, weighted fin efficiency curve, calculation of a double pipe fin efficiency curve, calculation of a double pipe finned exchanger, calculation of a longitudinal fin shell and tube exchanger.

UNIT - VI:

Direct Contact Heat Exchanger: Cooling towers, relation between wet bulb & dew point temperatures, the Lewis number, and classification of cooling towers, cooling tower internals and the roll of fill, Heat balance, heat transfer by simultaneous diffusion and convection. Analysis of cooling tower requirements, Design of cooling towers, Determination of the number of diffusion units, calculation of cooling tower performance.

Text Books:

1. Process Heat Transfer – D.Q. Kern, TMH.
2. Cooling Towers by J.D. Gurney
3. Heat Exchanger Design – A.P.Fraas and M.N. Ozisick. John Wiley & sons, New York.

NON - DESTRUCTIVE EVALUATION

(ELECTIVE – III)

Course Objectives

- The students are to be exposed to the concepts of various NDE techniques using radiography, ultrasonics, liquid penetrates, magnetic patches and Eddy currents
- They will learn basic principles of these methods and will be able to select a testing process
- They will understand the advantages and disadvantages of these techniques.

UNIT – I

Introduction to non-destructive testing: Radiographic test, Sources of X and Gamma Rays and their interaction with Matter, Radiographic equipment, Radiographic Techniques, Safety Aspects of Industrial Radiography

UNIT – II

Ultrasonic test: Principle of Wave Propagation, Reflection, Refraction, Diffraction, Mode Conversion and Attenuation, Sound Field, Piezo-electric Effect , Ultrasonic Transducers and their Characteristics, Ultrasonic Equipment and Variables Affecting Ultrasonic Test, Ultrasonic Testing, Interpretations and Guidelines for Acceptance, Rejection - Effectiveness and Limitations of Ultrasonic Testing.

UNIT – III

Liquid Penetrant Test: Liquid Penetrant Test, Basic Concepts, Liquid Penetrant System, Test Procedure, Effectiveness and Limitations of Liquid Penetrant Testing,

Eddy Current Test: Principle of Eddy Current, Eddy Current Test System, Applications of Eddy Current Testing Effectiveness of Eddy Current Testing

UNIT – IV

Magnetic Particle Test: Magnetic Materials, Magnetization of Materials , Demagnetization of Materials, Principle of Magnetic Particle Test, Magnetic Particle Test Equipment, Magnetic Particle Test Procedure, Standardization and Calibration, Interpretation and Evaluation, Effective Applications and Limitations of the Magnetic Particle Test

UNIT – V

Infrared And Thermal Testing: Introduction and fundamentals to infrared and thermal testing–Heat transfer –Active and passive techniques –Lock in and pulse thermography–Contact and non contact thermal inspection methods–Heat sensitive paints –Heat sensitive papers –thermally quenched phosphors liquid crystals –techniques for applying liquid crystals –other temperature sensitive coatings –Inspection methods –Infrared radiation and infrared detectors–thermo mechanical behavior of materials–IR imaging in aerospace applications, electronic components, Honey comb and sandwich structures–Case studies.

UNIT – VI

Industrial Applications of NDE: Span of NDE Activities Railways, Nuclear, Non-nuclear and Chemical Industries, Aircraft and Aerospace Industries, Automotive Industries, Offshore Gas and Petroleum Projects, Coal Mining Industry, NDE of pressure vessels, castings, welded constructions

Text Books:

1. Non destructive test and evaluation of Materials/J Prasad, GCK Nair/TMH Publishers
2. Ultrasonic testing of materials/ H Krautkramer/Springer
3. Non destructive testing/Warren, J Mc Gonnagle / Godan and Breach Science publishers
4. Nondestructive evaluation of materials by infrared thermography / X. P. V. Maldague, Springer-Verlag, 1st edition, (1993)

References:

1. Ultrasonic inspection training for NDT/ E. A. Gingel/Prometheus Press,
2. ASTM Standards, Vol 3.01, Metals and alloys
3. Non-destructive, Hand Book – R. Hamchand

Course Outcomes

1. Comprehensive, theory based understanding of the techniques and methods of non destructive testing
2. Apply methods knowledge of non destructive testing to evaluate products of railways, automobiles, aircrafts, chemical industries etc.

QUALITY AND RELIABILITY ENGINEERING

(ELECTIVE – III)

Course objectives:

1. The aim of this course is to provide students with a basic understanding of the approaches and techniques to assess and improve process and/or product quality and reliability.
2. The objectives are to introduce the principles and techniques of Statistical Quality Control and their practical uses in product and/or process design and monitoring
3. To understand techniques of modern reliability engineering tools.

UNIT-I

Quality value and engineering – quality systems – quality engineering in product design and production process – system design – parameter design – tolerance design, quality costs – quality improvement.

UNIT-II

Statistical process control \bar{X} , R, p, c charts, other types of control charts, process capability, process capability analysis, process capability index. (SQC tables can be used in the examination)

UNIT-III

Acceptance sampling by variables and attributes, design of sampling plans, single, double, sequential and continuous sampling plans, design of various sampling plans.

UNIT-IV

Loss function, tolerance design – N type, L type, S type; determination of tolerance for these types. online quality control – variable characteristics, attribute characteristics, parameter design.

Quality function deployment – house of quality, QFD matrix, total quality management concepts. quality information systems, quality circles, introduction to ISO 9000 standards.

UNIT-V

Reliability – Evaluation of design by tests - Hazard Models, Linear, Releigh, Weibull. Failure Data Analysis, reliability prediction based on weibull distribution, Reliability improvement.

UNIT-VI

Complex system, reliability, reliability of series, parallel & standby systems & complex systems & reliability prediction and system effectiveness.

Maintainability, availability, economics of reliability engineering, replacement of items, maintenance costing and budgeting, reliability testing.

Text Books:

1. Quality Engineering in Production Systems / G Taguchi /McGraw Hill
2. Reliability Engineering/ E.Bala Guruswamy/Tata McGraw Hill,
3. Statistical Quality Control : A Modern Introduction/ Montgomery/Wiley

References:

1. Jurans Quality planning & Analysis/ Frank.M.Gryna Jr. / McGraw Hill.
2. Taguchi Techniques for Quality Engineering/ Philippos/ McGraw Hill,
3. Reliability Engineering / LS Srinath / Affiliated East West Pvt. Ltd.,
4. Statistical Process Control/ Eugene Grant, Richard Leavenworth / McGraw Hill.
5. Optimization & Variation Reduction in Quality / W.A. Taylor / Tata McGraw Hill
6. Quality and Performance Excellence/ James R Evans/ Cengage learning

IV Year - II Semester

L	T	P	C
0	3	0	2

SEMINAR

IV Year - II Semester

L	T	P	C
0	0	0	10

PROJECT

COURSE STRUCTURE AND SYLLABUS

For

ELECTRONICS AND COMMUNICATION ENGINEERING

(Applicable for batches admitted from 2016-2017)



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India

I Year - I Semester

S.No.	Subjects	L	T	P	Credits
1-HS	English – I	4	--	--	3
2-BS	Mathematics - I	4	--	--	3
3-ES	Mathematics -II (Numerical Methods and Complex Variables)	4	--	--	3
4-BS	Applied Physics	4	--	--	3
5-ES	Computer Programming	4	--	--	3
6-ES	Engineering Drawing	1	--	3	3
7-HS	English - Communication Skills Lab -1	--	--	3	2
8-BS	Applied / Engineering Physics Laboratory	--	--	3	2
9-BS	Applied / Engineering Physics – Virtual Labs - Assignments	--	--	2	--
10-ES	Engineering Workshop & IT Workshop	--	--	3	2
Total Credits					24

I Year - II Semester

S.No.	Subjects	L	T	P	Credits
1-HS	English – II	4	--	--	3
2-BS	Mathematics -III	4	--	--	3
3-BS	Applied Chemistry	4	--	--	3
4-ES	Electrical and Mechanical Technology	4	--	--	3
5-HS	Environmental Studies	4	--	--	3
6-ES	Data Structures	4	--	--	3
7-BS	Applied / Engineering Chemistry Laboratory	--	--	3	2
8-HS	English - Communication Skills Lab -2	--	--	3	2
9-ES	Computer Programming Lab	--	--	3	2
Total Credits					24

II Year - I Semester

S.No.	Subjects	L	T	P	Credits
1	Electronic Devices and Circuits	4	--	--	3
2	Switching Theory and Logic Design	4	--	--	3
3	Signals and Systems	4	--	--	3
4	Network Analysis	4	--	--	3
5	Random Variables and Stochastic Process	4	--	--	3
6	Managerial Economics & Financial Analysis	4	--	--	3
7	Electronic Devices and Circuits Lab	--	--	3	2
8	Networks & Electrical Technology Lab	--	--	3	2
Total Credits					22

II Year - II Semester

S.No.	Subjects	L	T	P	Credits
1	Electronic Circuit Analysis	4	--	--	3
2	Control Systems	4	--	--	3
3	Electromagnetic Waves and Transmission Lines	4	--	--	3
4	Analog Communications	4	--	--	3
5	Pulse and Digital Circuits	4	--	--	3
6	Management Science	4	--	--	3
7	Electronic Circuit Analysis Lab	--	--	3	2
8	Analog Communications Lab	--	--	3	2
Total Credits					22

III Year - I Semester

S.No.	Subjects	L	T	P	Credits
1	Computer Architecture and Organization	4	--	--	3
2	Linear I C Applications	4	--	--	3
3	Digital I C Applications	4	--	--	3
4	Digital Communications	4	--	--	3
5	Antenna and Wave Propagation	4	--	--	3
6	Pulse and Digital Circuits Lab	--	--	3	2
7	Linear I C Applications Lab	--	--	3	2
8	Digital I C Applications Lab	--	--	3	2
MC	Professional Ethics & Human Values	--	3	--	--
Total Credits					21

III Year - II Semester

S.No.	Subjects	L	T	P	Credits
1	Micro Processors & Micro Controllers	4	--	--	3
2	Micro Wave Engineering	4	--	--	3
3	VLSI Design	4	--	--	3
4	Digital Signal Processing	4	--	--	3
5	OPEN ELECTIVE 1. OOPs through Java 2. Data Mining 3. Industrial Robotics 4. Power Electronics 5. Bio-Medical Engineering 6. Artificial Neural Networks	4	--	--	3
6	Micro Processors & Micro Controllers Lab	--	--	3	2
7	VLSI Lab	--	--	3	2
8	Digital Communications Lab	--	--	3	2
MC	IPR & Patents	--	2	--	--
Total Credits					21

IV Year - I Semester

S.No.	Subjects	L	T	P	Credits
1	Radar Systems	4	--	--	3
2	Digital Image Processing	4	--	--	3
3	Computer Networks	4	--	--	3
4	Optical Communications	4	--	--	3
5	Elective I 1. TV Engineering 2. Electronic Switching Systems 3. System Design through Verilog	4	--	--	3
6	Elective II 1.Embedded Systems 2. Analog IC Design 3.Network Security & Cryptography	4	--	--	3
7	Micro Wave Engineering & Optical Lab	--	--	2	2
8	Digital Signal Processing Lab	--	--	2	2
Total Credits					22

IV Year - II Semester

S.No.	Subjects	L	T	P	Credits
1	Cellular Mobile Communications	4	--	--	3
2	Electronic Measurements and Instrumentation	4	--	--	3
3	Satellite Communications	4	--	--	3
4	Elective III 1.Wireless sensors & Networks 2. Digital IC Design 3. Operating Systems	4	--	--	3
5	Seminar	--	3	--	2
6	Project	--	--	--	10
Total Credits					24

Total Course Credits = 48+44 + 42 + 46 = 180

Syllabus

I Year - I Semester

L	T	P	C
4	0	0	3

ENGLISH - I

Introduction:

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training the students to acquire communicative competence, the syllabus has been designed to develop linguistic and communicative competence of the students of Engineering.

As far as the detailed Textbooks are concerned, the focus should be on the skills of listening, speaking, reading and writing. The nondetailed Textbooks are meant for extensive reading for pleasure and profit.

Thus the stress in the syllabus is primarily on the development of communicative skills and fostering of ideas.

Objectives:

1. To improve the language proficiency of the students in English with emphasis on LSRW skills.
2. To enable the students to study and comprehend the prescribed lessons and subjects more effectively relating to their theoretical and practical components.
3. To develop the communication skills of the students in both formal and informal situations.

LISTENING SKILLS:

Objectives:

1. To enable the students to appreciate the role of listening skill and improve their pronunciation.
2. To enable the students to comprehend the speech of people belonging to different backgrounds and regions.
3. To enable the students to listen for general content, to fill up information and for specific information.

SPEAKING SKILLS:

Objectives:

1. To make the students aware of the importance of speaking for their personal and professional communication.
2. To enable the students to express themselves fluently and accurately in social and professional success.
3. To help the students describe objects, situations and people.
4. To make the students participate in group activities like roleplays, discussions and debates.
5. To make the students participate in Just a Minute talks.

READING SKILLS:

Objectives:

1. To enable the students to comprehend a text through silent reading.
2. To enable the students to guess the meanings of words, messages and inferences of texts in given contexts.
3. To enable the students to skim and scan a text.

4. To enable the students to identify the topic sentence.
5. To enable the students to identify discourse features.
6. To enable the students to make intensive and extensive reading.

WRITING SKILLS:

Objectives:

1. To make the students understand that writing is an exact formal skills.
2. To enable the students to write sentences and paragraphs.
3. To make the students identify and use appropriate vocabulary.
4. To enable the students to narrate and describe.
5. To enable the students capable of note-making.
6. To enable the students to write coherently and cohesively.
7. To make the students to write formal and informal letters.
8. To enable the students to describe graphs using expressions of comparison.
9. To enable the students to write technical reports.

Methodology:

1. The class are to be learner-centered where the learners are to read the texts to get a comprehensive idea of those texts on their own with the help of the peer group and the teacher.
2. Integrated skill development methodology has to be adopted with focus on individual language skills as per the tasks/exercise.
3. The tasks/exercises at the end of each unit should be completed by the learners only and the teacher intervention is permitted as per the complexity of the task/exercise.
4. The teacher is expected to use supplementary material wherever necessary and also generate activities/tasks as per the requirement.
5. The teacher is permitted to use lecture method when a completely new concept is introduced in the class.

Assessment Procedure: Theory

1. The formative and summative assessment procedures are to be adopted (mid exams and end semester examination).
2. Neither the formative nor summative assessment procedures should test the memory of the content of the texts given in the textbook. The themes and global comprehension of the units in the present day context with application of the language skills learnt in the unit are to be tested.
3. Only new unseen passages are to be given to test reading skills of the learners. Written skills are to be tested from sentence level to essay level. The communication formats—emails, letters and reports-- are to be tested along with appropriate language and expressions.
4. Examinations:

I mid exam + II mid exam (15% for descriptive tests+10% for online tests)= 25%

(80% for the best of two and 20% for the other)

Assignments= 5%

End semester exams=70%

5. Three take home assignments are to be given to the learners where they will have to read texts from the reference books list or other sources and write their gist in their own words.

The following text books are recommended for study in I B.Tech I Semester (Common for all branches)and I B.Pharma I Sem of JNTU Kakinada from the academic year 2016-17

(R-16 Regulations)

DETAILED TEXTBOOK:

ENGLISH FOR ENGINEERS AND TECHNOLOGISTS, Published by **Orient Blackswan Pvt Ltd**

NON-DETAILED TEXTBOOK:

PANORAMA: A COURSE ON READING, Published by **Oxford University Press India**

The course content along with the study material is divided into six units.

UNIT I:

1. 'Human Resources' from English for Engineers and Technologists.

OBJECTIVE:

To develop human resources to serve the society in different ways.

OUTCOME:

The lesson motivates the readers to develop their knowledge different fields and serve the society accordingly.

2. 'An Ideal Family' from Panorama: A Course on Reading

OBJECTIVE:

To develop extensive reading skill and comprehension for pleasure and profit.

OUTCOME:

Acquisition of writing skills

UNIT 2:

1. 'Transport: Problems and Solutions' from English for Engineers and Technologists.

OBJECTIVE:

To highlight road safety measures whatever be the mode of transport.

OUTCOME:

The lesson motivates the public to adopt road safety measures.

2. 'War' from 'Panorama : A Course on Reading'

OBJECTIVE:

To develop extensive reading skill and comprehension for pleasure and profit.

OUTCOME:

Acquisition of writing skills

UNIT 3:

1. 'Evaluating Technology' from English for Engineers and Technologists.

OBJECTIVE:

To highlight the advantages and disadvantages of technology.

OUTCOME:

The lesson creates an awareness in the readers that mass production is ultimately detrimental to biological survival.

2. 'The Verger' from 'Panorama : A Course on Reading'

OBJECTIVE:

To develop extensive reading skill and comprehension for pleasure and profit.

OUTCOME:

Acquisition of writing skills

UNIT 4:

1. 'Alternative Sources of Energy' from English for Engineers and Technologists.

OBJECTIVE:

To bring into focus different sources of energy as alternatives to the depleting sources.

OUTCOME:

The lesson helps to choose a source of energy suitable for rural India.

2. 'The Scarecrow' from Panorama : A Course on Reading

OBJECTIVE:

To develop extensive reading skill and comprehension for pleasure and profit.

OUTCOME:

Acquisition of writing skills

UNIT 5:

1. 'Our Living Environment' from English for Engineers and Technologists.

OBJECTIVE:

To highlight the fact that animals must be preserved because animal life is precious.

OUTCOME:

The lesson creates an awareness in the reader as to the usefulness of animals for the human society.

2. 'A Village Host to Nation' from Panorama : A Course on Reading

OBJECTIVE:

To develop extensive reading skill and comprehension for pleasure and profit.

OUTCOME:

Acquisition of writing skills

UNIT 6:

1. ' Safety and Training' from English for Engineers and Technologists.

OBJECTIVE:

To highlight the possibility of accidents in laboratories, industries and other places and to follow safety measures.

OUTCOME:

The lesson helps in identifying safety measures against different varieties of accidents at home and in the workplace.

2. 'Martin Luther King and Africa' from Panorama : A Course on Reading

OBJECTIVE:

To develop extensive reading skill and comprehension for pleasure and profit.

OUTCOME:

Acquisition of writing skills

NOTE:

All the exercises given in the prescribed lessons in both detailed and non-detailed textbooks relating to the theme and language skills must be covered.

OVERALL COURSE OUTCOME:

1. Using English languages, both written and spoken, competently and correctly.
2. Improving comprehension and fluency of speech.
3. Gaining confidence in using English in verbal situations.

MODEL QUESTION PAPER FOR THEORY**PART- I**

Six short answer questions on 6 unit themes

One question on eliciting student's response to any of the themes

PART-II

Each question should be from one unit and the last question can be a combination of two or more units.

Each question should have 3 sub questions: A,B & C

A will be from the main text: 5 marks

B from non-detailed text: 3 marks

C on grammar and Vocabulary: 6 marks

I Year - I Semester

L	T	P	C
4	0	0	3

MATHEMATICS-I

Course Objectives:

1. The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course.
2. The skills derived from the course will help the student from a necessary base to develop analytic and design concepts.

Course Outcomes: At the end of the Course, Student will be able to:

1. Solve linear differential equations of first, second and higher order.
2. Determine Laplace transform and inverse Laplace transform of various functions and use Laplace transforms to determine general solution to linear ODE.
3. Calculate total derivative, Jacobian and minima of functions of two variables.

UNIT I: Differential equations of first order and first degree:

Linear-Bernoulli-Exact-Reducible to exact.

Applications: Newton's Law of cooling-Law of natural growth and decay-Orthogonal trajectories- Electrical circuits- Chemical reactions.

UNIT II: Linear differential equations of higher order:

Non-homogeneous equations of higher order with constant coefficients with RHS term of the type e^{ax} , $\sin ax$, $\cos ax$, polynomials in x , $e^{ax} V(x)$, $xV(x)$ - Method of Variation of parameters.

Applications: LCR circuit, Simple Harmonic motion.

UNIT III: Laplace transforms:

Laplace transforms of standard functions-Shifting theorems - Transforms of derivatives and integrals – Unit step function –Dirac's delta function- Inverse Laplace transforms– Convolution theorem (with out proof).

Applications: Solving ordinary differential equations (initial value problems) using Laplace transforms.

UNIT IV: Partial differentiation:

Introduction- Homogeneous function-Euler's theorem-Total derivative-Chain rule-Generalized Mean value theorem for single variable (without proof)-Taylor's and Mc Laurent's series expansion of functions of two variables– Functional dependence- Jacobian.

Applications: Maxima and Minima of functions of two variables without constraints and Lagrange's method (with constraints).

UNIT V: First order Partial differential equations:

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions –solutions of first order linear (Lagrange) equation and nonlinear (standard types) equations.

UNIT VI: Higher order Partial differential equations:

Solutions of Linear Partial differential equations with constant coefficients. RHS term of the type e^{ax+by} , $\sin(ax+by)$, $\cos(ax+by)$, $x^m y^n$. Classification of second order partial differential equations.

Text Books:

1. **B.S.Grewal**, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. **N.P.Bali**, Engineering Mathematics, Lakshmi Publications.

Reference Books:

1. **Erwin Kreyszig**, Advanced Engineering Mathematics, 10th Edition, Wiley-India
2. **Micheael Greenberg**, Advanced Engineering Mathematics, 9th edition, Pearson edn
3. **Dean G. Duffy**, Advanced engineering mathematics with MATLAB, CRC Press
4. **Peter O'neil**, Advanced Engineering Mathematics, Cengage Learning.
5. **Srimanta Pal, Subodh C.Bhunia**, Engineering Mathematics, Oxford University Press.
6. **Dass H.K., Rajnish Verma. Er.**, Higher Engineering Mathematics, S. Chand Co. Pvt. Ltd, Delhi.

I Year - I Semester

L	T	P	C
4	0	0	3

MATHEMATICS-II (Numerical Methods and Complex Variables)

UNIT I: Solution of Algebraic and Transcendental Equations:

Introduction- Bisection method – Method of false position – Iteration method – Newton-Raphson method (One variable and simultaneous Equations).

UNIT II: Interpolation:

Introduction- Errors in polynomial interpolation – Finite differences- Forward differences- Backward differences –Central differences – Symbolic relations and separation of symbols - Differences of a polynomial-Newton's formulae for interpolation – Interpolation with unequal intervals - Lagrange's interpolation formula.

UNIT III: Numerical Integration and solution of Ordinary Differential equations:

Trapezoidal rule- Simpson's $1/3^{\text{rd}}$ and $3/8^{\text{th}}$ rule-Solution of ordinary differential equations by Taylor's series-Picard's method of successive approximations-Euler's method - Runge-Kutta method (second and fourth order).

Unit-IV: Functions of a complex variable

Complex function , Real and Imaginary parts of Complex function, Limit, Continuity and Derivative of complex function, Cauchy-Riemann equations, Analytic function, entire function, singular point, conjugate function, $C-R$ equations in polar form, Harmonic functions, Milne-Thomson method, Simple applications to flow problems,

Unit-V: Series Expansion and Complex Integration

Line integral of a complex function, Cauchy's theorem(only statement) , Cauchy's Integral Formula. Absolutely convergent and uniformly convergent of series of complex terms, Radius of convergence, Taylor's series, Maclaurin's series expansion, Laurent's series.

Unit-VI: Singularities and Residue Theorem

Zeros of an analytic function, Singularity, Isolated singularity, Removable singularity, Essential singularity, pole of order m , simple pole, Residues, Residue theorem, Calculation of residues, Residue at a pole of order m , Evaluation of real definite integrals: Integration around the unit circle, Integration around semi circle, Indenting the contours having poles on the real axis.

Text Books:

1. **B.S.GREWAL**, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. **N.P.Bali**, Engineering Mathematics, Lakshmi Publications.

Reference Books:

1. **DEAN G. DUFFY**, Advanced engineering mathematics with MATLAB, CRC Press
2. **V.RAVINDRANATH and P.VIJAYALAKSHMI**, Mathematical Methods, Himalaya Publishing House.
3. **ERWIN KREYSZIG**, Advanced Engineering Mathematics, 10th Edition, Wiley-India
4. **DAVID KINCAID, WARD CHENEY**, Numerical Analysis-Mathematics of Scientific Computing, 3rd Edition, Universities Press.

I Year - I Semester

L	T	P	C
4	0	0	3

APPLIED PHYSICS

OBJECTIVES: *Physics curriculum which is re-oriented to the needs of Circuital branches of graduate engineering courses offered by JNTUniv.Kkd. that serves as a transit to understand the branch specific advanced topics. The courses are designed to:*

- *Impart Knowledge of Physical Optics phenomena like Interference, Diffraction and Polarization involving required to design instruments with higher resolution.*
- *Teach Concepts of coherent sources, its realization and utility optical instrumentation.*
- *Study the concepts regarding the bulk response of materials to the EM fields and their analytically study in the back-drop of basic quantum mechanics.*
- *Understand the physics of Semiconductors and their working mechanism for their utility in sensors.*

UNIT-I

INTERFERENCE: Principle of Superposition – Coherent Sources – Interference in thin films (reflection geometry) – Newton's rings – construction and basic principle of Interferometers.

UNIT-II

DIFFRACTION: Fraunhofer diffraction at single slit - Cases of double slit, N-slits & Circular Aperture (Qualitative treatment only)-Grating equation - Resolving power of a grating, Telescope and Microscopes.

UNIT-III

POLARIZATION: Types of Polarization – Methods of production - Nicol Prism -Quarter wave plate and Half Wave plate – Working principle of Polarimeter (Sacharimeter).

LASERS: Characteristics– Stimulated emission – Einstein's Transition Probabilities- Pumping schemes - Ruby laser – Helium Neon laser.

UNIT-IV

ELECTROMAGNETIC FIELDS: Scalar and Vector Fields – Electric Potential- Gradient, Divergence of fields – Gauss and Stokes theorems-Propagation of EM waves through dielectric medium.

UNIT-V

QUANTUM MECHANICS: Introduction - Matter waves – Schrödinger Time Independent and Time Dependent wave equations – Particle in a box.

FREE ELECTRON THEORY: Defects of Classical free electron theory –Quantum Free electron theory - concept of Fermi Energy.

UNIT-VI

BAND THEORY OF SOLIDS: Bloch's theorem (qualitative) – Kronig – Penney model – energy bands in crystalline solids – classification of crystalline solids– effective mass of electron & concept of hole.

SEMICONDUCTOR PHYSICS: Conduction – Density of carriers in Intrinsic and Extrinsic semiconductors – Drift & Diffusion – relevance of Einstein's equation- Hall effect in semiconductors

Outcome: *Construction and working details of instruments, ie., Interferometer, Diffractometer and Polarimeter are learnt. Study EM-fields and semiconductors under the concepts of Quantum mechanics paves way for their optimal utility.*

List of Text Books:

1. A Text book of Engineering Physics – by Dr. M.N.Avadhanulu and Dr.P.G.Kshira
sagar, S.Chand & Company Ltd., (2014)
2. ‘Solid State Physics’ by A.J.Dekker, Mc Millan Publishers (2011)

List of Reference Books:

1. Engineering Physics by D.K.Bhattacharya and Poonam Tandon, Oxford press (2015)
2. Applied Physics by P.K.Palanisamy, Scitech publications (2014)
3. Lasers and Non-Linear optics by B.B.Laud, New Age International Publishers (2008).

I Year - I Semester

L	T	P	C
4	0	0	3

COMPUTER PROGRAMMING

Learning objectives:

Formulating algorithmic solutions to problems and implementing algorithms in C.

- Notion of Operation of a CPU, Notion of an algorithm and computational procedure, editing and executing programs in Linux.
- Understanding branching, iteration and data representation using arrays.
- Modular programming and recursive solution formulation.
- Understanding pointers and dynamic memory allocation.
- Understanding miscellaneous aspects of C.
- Comprehension of file operations.

UNIT-I:

History and Hardware - Computer Hardware, Bits and Bytes, Components, Programming Languages - Machine Language, Assembly Language, Low- and High-Level Languages, Procedural and Object-Oriented Languages, Application and System Software, The Development of C Algorithms The Software Development Process.

UNIT-II:

Introduction to C Programming- Identifiers, The main () Function, The printf () Function

Programming Style - Indentation, Comments, Data Types, Arithmetic Operations, Expression Types, Variables and Declarations, Negation, Operator Precedence and Associativity, Declaration Statements, Initialization.

Assignment - Implicit Type Conversions, Explicit Type Conversions (Casts), Assignment Variations, Mathematical Library Functions, Interactive Input, Formatted Output, Format Modifiers.

UNIT -III:

Control Flow-Relational Expressions - Logical Operators:

Selection: if-else Statement, nested if, examples, Multi-way selection: switch, else-if, examples.

Repetition: Basic Loop Structures, Pretest and Posttest Loops, Counter-Controlled and Condition-Controlled Loops, The while Statement, The for Statement, Nested Loops, The do-while Statement.

UNIT-IV

Modular Programming: Function and Parameter Declarations, Returning a Value, Functions with Empty Parameter Lists, Variable Scope, Variable Storage Class, Local Variable Storage Classes, Global Variable Storage Classes, Pass by Reference, Passing Addresses to a Function, Storing Addresses, Using Addresses, Declaring and Using Pointers, Passing Addresses to a Function.

Case Study: Swapping Values, Recursion - Mathematical Recursion, Recursion versus Iteration.

UNIT-V:

Arrays & Strings

Arrays: One-Dimensional Arrays, Input and Output of Array Values, Array Initialization, Arrays as Function Arguments, Two-Dimensional Arrays, Larger Dimensional Arrays- Matrices

Strings: String Fundamentals, String Input and Output, String Processing, Library Functions

UNIT-VI:

Pointers, Structures, Files

Pointers: Concept of a Pointer, Initialisation of pointer variables, pointers as function arguments, passing by address, Dangling memory, address arithmetic, character pointers and functions, pointers to pointers, Dynamic memory management functions, command line arguments.

Structures: Derived types, Structures declaration, Initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self referential structures, unions, typedef, bit-fields.

Data Files: Declaring, Opening, and Closing File Streams, Reading from and Writing to Text Files, Random File Access

Outcomes:

- Understand the basic terminology used in computer programming
- Write, compile and debug programs in C language.
- Use different data types in a computer program.
- Design programs involving decision structures, loops and functions.
- Explain the difference between call by value and call by reference
- Understand the dynamics of memory by the use of pointers
- Use different data structures and create/update basic data files.

Text Books:

1. ANSI C Programming, Gary J. Bronson, Cengage Learning.
2. Programming in C, BI Juneja Anita Seth, Cengage Learning.
3. The C programming Language, Dennis Richie and Brian Kernighan, Pearson Education.

Reference Books:

1. C Programming-A Problem Solving Approach, Forouzan, Gilberg, Cengage.
2. Programming with C, Bichkar, Universities Press.
3. Programming in C, Reema Thareja, OXFORD.
4. C by Example, Noel Kalicharan, Cambridge.

I Year - I Semester

L	T	P	C
1	0	3	3

ENGINEERING DRAWING

Objective: Engineering drawing being the principle method of communication for engineers, the objective is to introduce the students, the techniques of constructing the various types of polygons, curves and scales. The objective is also to visualize and represent the 3D objects in 2D planes with proper dimensioning, scaling etc.

Unit I

Objective: To introduce the students to use drawing instruments and to draw polygons, Engg. Curves.

Polygons: Constructing regular polygons by general methods, inscribing and describing polygons on circles.

Curves: Parabola, Ellipse and Hyperbola by general methods, cycloids, involutes, tangents & normals for the curves.

Unit II

Objective: To introduce the students to use scales and orthographic projections, projections of points & simple lines.

Scales: Plain scales, diagonal scales and vernier scales

Orthographic Projections: Horizontal plane, vertical plane, profile plane, importance of reference lines, projections of points in various quadrants, projections of lines, lines parallel either to of the reference planes (HP, VP or PP)

Unit III

Objective: The objective is to make the students draw the projections of the lines inclined to both the planes.

Projections of straight lines inclined to both the planes, determination of true lengths, angle of inclination and traces- HT, VT

Unit IV

Objective: The objective is to make the students draw the projections of the plane inclined to both the planes.

Projections of planes: regular planes perpendicular/parallel to one plane and inclined to the other reference plane; inclined to both the reference planes.

Unit V

Objective: The objective is to make the students draw the projections of the various types of solids in different positions inclined to one of the planes.

Projections of Solids – Prisms, Pyramids, Cones and Cylinders with the axis inclined to one of the planes.

Unit VI

Objective: The objective is to represent the object in 3D view through isometric views. The student will be able to represent and convert the isometric view to orthographic view and vice versa.

Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

Text Books:

1. Engineering Drawing by N.D. Butt, Chariot Publications
2. Engineering Drawing by Agarwal & Agarwal, Tata McGraw Hill Publishers

Reference Books:

1. Engineering Drawing by K.L.Narayana & P. Kannaiah, Scitech Publishers
2. Engineering Graphics for Degree by K.C. John, PHI Publishers
3. Engineering Graphics by PI Varghese, McGrawHill Publishers
4. Engineering Drawing + AutoCad – K Venugopal, V. Prabhu Raja, New Age

I Year - I Semester

L	T	P	C
0	0	3	2

ENGLISH - COMMUNICATION SKILLS LAB- 1

PRESCRIBED LAB MANUAL FOR SEMESTER I:

'**INTERACT**: English Lab Manual for Undergraduate Students' Published by **Orient Blackswan Pvt Ltd.**

OBJECTIVES:

To enable the students to learn through practice the communication skills of listening, speaking, reading and writing.

OUTCOME:

A study of the communicative items in the laboratory will help the students become successful in the competitive world.

The course content along with the study material is divided into six units.

UNIT 1:

1. WHY study Spoken English?
2. Making Inquiries on the phone, thanking and responding to Thanks
Practice work.

UNIT 2:

1. Responding to Requests and asking for Directions
Practice work.

UNIT 3:

1. Asking for Clarifications, Inviting, Expressing Sympathy, Congratulating
2. Apologising, Advising, Suggesting, Agreeing and Disagreeing
Practice work.

UNIT 4:

1. Letters and Sounds
Practice work.

UNIT 5:

1. The Sounds of English
Practice work.

UNIT 6:

1. Pronunciation
 2. Stress and Intonation
- Practice work.

Assessment Procedure: Laboratory

1. Every lab session (150 minutes) should be handled by not less than two teachers (three would be ideal) where each faculty has to conduct a speaking activity for 20/30 students.
2. The teachers are to assess each learner in the class for not less than 10 speaking activities, each one to be assessed for 10 marks or 10%. The average of 10 day-to-day activity assessments is to be calculated for 10 marks for internal assessment.

The rubric given below has to be filled in for all the students for all activities.

The rubric to assess the learners:

Body language		Fluency & Audibility	Clarity in Speech	Neutralization of accent	Appropriate Language		Total 10 marks	Remarks
Gestures & Postures	Eye Contact				Grammar	Vocabulary & expressions		

- **Lab Assessment: Internal (25 marks)**

1. Day-to-Day activities: 10 marks
2. Completing the exercises in the lab manual: 5 marks
3. Internal test (5 marks written and 5 marks oral)

- **Lab Assessment: External (50 marks)**

1. Written test: 20 marks (writing a dialogue, note-taking and answering questions on listening to an audio recording).
2. Oral: Reading aloud a text or a dialogue- 10 marks
3. Viva-Voce by the external examiner: 20 marks

Reference Books:

1. Strengthen your communication skills by Dr M Hari Prasad, Dr Salivendra Raju and Dr G Suvarna Lakshmi, Maruti Publications.
2. English for Professionals by Prof Eliah, B.S Publications, Hyderabad.
3. Unlock, Listening and speaking skills 2, Cambridge University Press
4. Spring Board to Success, Orient BlackSwan
5. A Practical Course in effective english speaking skills, PHI
6. Word power made handy, Dr shalini verma, Schand Company
7. Let us hear them speak, Jayashree Mohanraj, Sage texts
8. Professional Communication, Aruna Koneru, Mc Grawhill Education
9. Cornerstone, Developing soft skills, Pearson Education

I Year - I Semester	L	T	P	C
	0	0	3	2

APPLIED / ENGINEERING PHYSICS LAB

(Any 10 of the following listed experiments)

Objective: *Training field oriented Engineering graduates to handle instruments and their design methods to improve the accuracy of measurements.*

LIST OF EXPERIMENTS:

1. Determination of wavelength of a source-Diffraction Grating-Normal incidence.
2. Newton's rings – Radius of Curvature of Plano - Convex Lens.
3. Determination of thickness of a spacer using wedge film and parallel interference fringes.
4. Determination of Rigidity modulus of a material- Torsional Pendulum.
5. Determination of Acceleration due to Gravity and Radius of Gyration- Compound Pendulum.
6. Melde's experiment – Transverse and Longitudinal modes.
7. Verification of laws of vibrations in stretched strings – Sonometer.
8. Determination of velocity of sound – Volume Resonator.
9. L- C- R Series Resonance Circuit.
10. Study of I/V Characteristics of Semiconductor diode.
11. I/V characteristics of Zener diode.
12. Characteristics of Thermistor – Temperature Coefficients.
13. Magnetic field along the axis of a current carrying coil – Stewart and Gee's apparatus.
14. Energy Band gap of a Semiconductor p - n junction.
15. Hall Effect in semiconductors.
16. Time constant of CR circuit.
17. Determination of wavelength of laser source using diffraction grating.
18. Determination of Young's modulus by method of single cantilever oscillations.
19. Determination of lattice constant – lattice dimensions kit.
20. Determination of Planck's constant using photocell.
21. Determination of surface tension of liquid by capillary rise method.

Outcome: *Physics lab curriculum gives fundamental understanding of design of an instrument with targeted accuracy for physical measurements.*

I Year - I Semester

L	T	P	C
0	0	2	0

APPLIED / ENGINEERING PHYSICS VIRTUAL LABS - ASSIGNMENTS

(Constitutes 5% marks of 30marks of Internal-component)

Objective: *Training Engineering students to prepare a technical document and improving their writing skills.*

LIST OF EXPERIMENTS

1. Hall Effect
2. Crystal Structure
3. Hysteresis
4. Brewster's angle
5. Magnetic Levitation / SQUID
6. Numerical Aperture of Optical fiber
7. Photoelectric Effect
8. Simple Harmonic Motion
9. Damped Harmonic Motion
10. LASER – Beam Divergence and Spot size
11. B-H curve
12. Michelson's interferometer
13. Black body radiation

URL: www.vlab.co.in

Outcome: *Physics Virtual laboratory curriculum in the form of assignment ensures an engineering graduate to prepare a /technical/mini-project/ experimental report with scientific temper.*

I Year - I Semester	L	T	P	C
	0	0	3	2

ENGINEERING WORKSHOP & IT WORKSHOP

ENGINEERING WORKSHOP:

Course Objective: To impart hands-on practice on basic engineering trades and skills.

Note: At least two exercises to be done from each trade.

Trade:

Carpentry	1. T-Lap Joint 2. Cross Lap Joint 3. Dovetail Joint 4. Mortise and Tenon Joint
Fitting	1. Vee Fit 2. Square Fit 3. Half Round Fit 4. Dovetail Fit
Black Smithy	1. Round rod to Square 2. S-Hook 3. Round Rod to Flat Ring 4. Round Rod to Square headed bolt
House Wiring	1. Parallel / Series Connection of three bulbs 2. Stair Case wiring 3. Florescent Lamp Fitting 4. Measurement of Earth Resistance
Tin Smithy	1. Taper Tray 2. Square Box without lid 3. Open Scoop 4. Funnel

IT WORKSHOP:

OBJECTIVES:

- Understand the basic components and peripherals of a computer.
- To become familiar in configuring a system.
- Learn the usage of productivity tools.
- Acquire knowledge about the netiquette and cyber hygiene.
- Get hands on experience in trouble shooting a system?

1. **System Assembling, Disassembling and identification of Parts / Peripherals**
2. **Operating System Installation**-Install Operating Systems like Windows, Linux along with necessary Device Drivers.

3. MS-Office / Open Office

- a. **Word** - Formatting, Page Borders, Reviewing, Equations, symbols.
- b. **Spread Sheet** - organize data, usage of formula, graphs, charts.
- c. **Power point** - features of power point, guidelines for preparing an effective presentation.
- d. **Access**- creation of database, validate data.

4. **Network Configuration & Software Installation**-Configuring TCP/IP, proxy and firewall settings. Installing application software, system software & tools.

5. **Internet and World Wide Web**-Search Engines, Types of search engines, netiquette, cyber hygiene.

6. Trouble Shooting-Hardware trouble shooting, Software trouble shooting.

7. **MATLAB**- basic commands, subroutines, graph plotting.

8. **LATEX**-basic formatting, handling equations and images.

OUTCOMES:

- Common understanding of concepts, patterns of decentralization implementation in Africa †
- Identified opportunities for coordinated policy responses, capacity building and implementation of best practices †
- Identified instruments for improved decentralization to the local level †
- Identified strategies for overcoming constraints to effective decentralization and sustainable management at different levels

Text Books:

1. Computer Hardware, Installation, Interfacing, Troubleshooting and Maintenance, K.L. James, Eastern Economy Edition.
2. Microsoft Office 2007: Introductory Concepts and Techniques, Windows XP Edition by Gary B. Shelly, Misty E. Vermaat and Thomas J. Cashman (2007, Paperback).
3. LATEX- User's Guide and Reference manual, Leslie Lamport, Pearson, LPE, 2/e.
4. Getting Started with MATLAB: A Quick Introduction for Scientists and Engineers, Rudraprathap, Oxford University Press, 2002.
5. Scott Mueller's Upgrading and Repairing PCs, 18/e, Scott. Mueller, QUE, Pearson, 2008
6. The Complete Computer upgrade and repair book, 3/e, Cheryl A Schmidt, Dreamtech.
7. Comdex Information Technology course tool kit Vikas Gupta, WILEY Dreamtech.
8. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.

I Year - II Semester

L	T	P	C
4	0	0	3

ENGLISH -II

Introduction:

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training the students to acquire communicative competence, the syllabus has been designed to develop linguistic and communicative competence of the students of Engineering.

As far as the detailed Textbooks are concerned, the focus should be on the skills of listening, speaking, reading and writing. The nondetailed Textbooks are meant for extensive reading for pleasure and profit.

Thus the stress in the syllabus is primarily on the development of communicative skills and fostering of ideas.

Objectives:

1. To improve the language proficiency of the students in English with emphasis on LSRW skills.
2. To enable the students to study and comprehend the prescribed lessons and subjects more effectively relating to their theoretical and practical components.
3. To develop the communication skills of the students in both formal and informal situations.

LISTENING SKILLS:

Objectives:

1. To enable the students to appreciate the role of listening skill and improve their pronunciation.
2. To enable the students to comprehend the speech of people belonging to different backgrounds and regions.
3. To enable the students to listen for general content, to fill up information and for specific information.

SPEAKING SKILLS:

Objectives:

1. To make the students aware of the importance of speaking for their personal and professional communication.
2. To enable the students to express themselves fluently and accurately in social and professional success.
3. To help the students describe objects, situations and people.
4. To make the students participate in group activities like roleplays, discussions and debates.
5. To make the students participate in Just a Minute talks.

READING SKILLS:

Objectives:

1. To enable the students to comprehend a text through silent reading.
2. To enable the students to guess the meanings of words, messages and inferences of texts in given contexts.
3. To enable the students to skim and scan a text.
4. To enable the students to identify the topic sentence.
5. To enable the students to identify discourse features.
6. To enable the students to make intensive and extensive reading.

WRITING SKILLS:

Objectives:

1. To make the students understand that writing is an exact formal skills.
2. To enable the students to write sentences and paragraphs.
3. To make the students identify and use appropriate vocabulary.
4. To enable the students to narrate and describe.
5. To enable the students capable of note-making.
6. To enable the students to write coherently and cohesively.
7. To make the students to write formal and informal letters.
8. To enable the students to describe graphs using expressions of comparison.
9. To enable the students to write technical reports.

Methodology:

1. The class are to be learner-centered where the learners are to read the texts to get a comprehensive idea of those texts on their own with the help of the peer group and the teacher.
2. Integrated skill development methodology has to be adopted with focus on individual language skills as per the tasks/exercise.
3. The tasks/exercises at the end of each unit should be completed by the learners only and the teacher intervention is permitted as per the complexity of the task/exercise.
4. The teacher is expected to use supplementary material wherever necessary and also generate activities/tasks as per the requirement.
5. The teacher is permitted to use lecture method when a completely new concept is introduced in the class.

Assessment Procedure: Theory

1. The formative and summative assessment procedures are to be adopted (mid exams and end semester examination).
2. Neither the formative nor summative assessment procedures should test the memory of the content of the texts given in the textbook. The themes and global comprehension of the units in the present day context with application of the language skills learnt in the unit are to be tested.
3. Only new unseen passages are to be given to test reading skills of the learners. Written skills are to be tested from sentence level to essay level. The communication formats—emails, letters and reports-- are to be tested along with appropriate language and expressions.
4. Examinations:

I mid exam + II mid exam (15% for descriptive tests+10% for online tests)= 25%

(80% for the best of two and 20% for the other)

Assignments= 5%

End semester exams=70%

5. Three take home assignments are to be given to the learners where they will have to read texts from the reference books list or other sources and write their gist in their own words.

The following text books are recommended for study in I B.Tech II Semester (Common for all branches)and I B.Pharma II Sem of JNTU Kakinada from the academic year 2016-17 (**R-16 Regulations**)

DETAILED TEXTBOOK: ENGLISH ENCOUNTERS Published by **Maruthi Publishers**.

DETAILED NON-DETAIL:THE GREAT INDIAN SCIENTISTS Published by **Cengage learning**

The course content along with the study material is divided into six units.

UNIT 1:

1. ' The Greatest Resource- Education' from English Encounters

OBJECTIVE:

Schumacher describes the education system by saying that it was mere training, something more than mere knowledge of facts.

OUTCOME:

The lesson underscores that the ultimate aim of Education is to enhance wisdom.

2. ' A P J Abdul Kalam' from The Great Indian Scientists.

OBJECTIVE:

The lesson highlights Abdul Kalam's contributions to Indian science and the awards he received.

OUTCOME:

Abdul Kalam's simple life and service to the nation inspires the readers to follow in his footsteps.

UNIT 2:

1. ' A Dilemma' from English Encounters

OBJECTIVE: The lesson centres on the pros and cons of the development of science and technology.

OUTCOME: The lesson enables the students to promote peaceful co-existence and universal harmony among people and society.

2. 'C V Raman' from The Great Indian Scientists.

OBJECTIVE:

The lesson highlights the dedicated research work of C V Raman and his achievements in Physics.

OUTCOME:

The Achievements of C V Raman are inspiring and exemplary to the readers and all scientists.

UNIT 3:

1. 'Cultural Shock': Adjustments to new Cultural Environments from English Encounters.

OBJECTIVE:

The lesson depicts of the symptoms of Cultural Shock and the aftermath consequences.

OUTCOME:

The lesson imparts the students to manage different cultural shocks due to globalization.

2. 'Homi Jehangir Bhabha' from The Great Indian Scientists.

OBJECTIVE:

The lesson highlights Homi Jehangir Bhabha's contributions to Indian nuclear programme as architect.

OUTCOME:

The seminal contributions of Homi Jehangir Bhabha to Indian nuclear programme provide an aspiration to the readers to serve the nation and strengthen it.

UNIT 4:

1. 'The Lottery' from English Encounters.

OBJECTIVE:

The lesson highlights insightful commentary on cultural traditions.

OUTCOME:

The theme projects society's need to re examine its traditions when they are outdated.

2. 'Jagadish Chandra Bose' from The Great Indian Scientists.

OBJECTIVE:

The lesson gives an account of the unique discoveries and inventions of Jagadish Chandra Bose in Science.

OUTCOME: The Scientific discoveries and inventions of Jagadish Chandra Bose provide inspiration to the readers to make their own contributions to science and technology, and strengthen the nation.

UNIT 5:

1. ' The Health Threats of Climate Change' from English Encounters.

OBJECTIVE:

The essay presents several health disorders that spring out due to environmental changes

OUTCOME:

The lesson offers several inputs to protect environment for the sustainability of the future generations.

2. ' Prafulla Chandra Ray' from The Great Indian Scientists.

OBJECTIVE:

The lesson given an account of the experiments and discoveries in Pharmaceuticals of Prafulla Chandra Ray.

OUTCOME:

Prafulla Chandra Ray's scientific achievements and patriotic fervour provide inspiration to the reader.

UNIT 6:

1. ' The Chief Software Architect' from English Encounters

OBJECTIVE:

The lesson supports the developments of technology for the betterment of human life.

OUTCOME:

Pupil get inspired by eminent personalities who toiled for the present day advancement of software development.

2. ' Srinivasa Ramanujan' from The Great Indian Scientists.

OBJECTIVE:

The lesson highlights the extraordinary achievements of Srinivasa Ramanujan, a great mathematician and the most romantic figure in mathematics.

OUTCOME:

The lesson provides inspiration to the readers to think and tap their innate talents.

NOTE:

All the exercises given in the prescribed lessons in both detailed and non-detailed textbooks relating to the theme and language skills must be covered.

MODEL QUESTION PAPER FOR THEORY

PART- I

Six short answer questions on 6 unit themes

One question on eliciting student's response to any of the themes

PART-II

Each question should be from one unit and the last question can be a combination of two or more units.

Each question should have 3 sub questions: A,B & C

A will be from the main text: 5 marks

B from non-detailed text: 3 marks

C on grammar and Vocabulary: 6 marks

I Year - II Semester

L	T	P	C
4	0	0	3

MATHEMATICS-III

Course Objectives:

1. The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course.
2. The skills derived from the course will help the student from a necessary base to develop analytic and design concepts.
3. Understand the most basic numerical methods to solve simultaneous linear equations.

Course Outcomes: At the end of the Course, Student will be able to:

1. Determine rank, Eigenvalues and Eigen vectors of a given matrix and solve simultaneous linear equations.
2. Solve simultaneous linear equations numerically using various matrix methods.
3. Determine double integral over a region and triple integral over a volume.
4. Calculate gradient of a scalar function, divergence and curl of a vector function. Determine line, surface and volume integrals. Apply Green, Stokes and Gauss divergence theorems to calculate line, surface and volume integrals.

UNIT I: Linear systems of equations:

Rank-Echelon form-Normal form – Solution of linear systems – Gauss elimination - Gauss Jordan- Gauss Jacobi and Gauss Seidal methods.Applications: Finding the current in electrical circuits.

UNIT II: Eigen values - Eigen vectors and Quadratic forms:

Eigen values - Eigen vectors– Properties – Cayley-Hamilton theorem - Inverse and powers of a matrix by using Cayley-Hamilton theorem- Diagonalization- Quadratic forms- Reduction of quadratic form to canonical form – Rank - Positive, negative and semi definite - Index – Signature.
Applications: Free vibration of a two-mass system.

UNIT III: Multiple integrals:

Curve tracing: Cartesian, Polar and Parametric forms.
Multiple integrals: Double and triple integrals – Change of variables – Change of order of integration.
Applications: Finding Areas and Volumes.

UNIT IV: Special functions:

Beta and Gamma functions- Properties - Relation between Beta and Gamma functions- Evaluation of improper integrals.
Applications: Evaluation of integrals.

UNIT V: Vector Differentiation:

Gradient- Divergence- Curl - Laplacian and second order operators -Vector identities.
Applications: Equation of continuity, potential surfaces

UNIT VI: Vector Integration:

Line integral – Work done – Potential function – Area- Surface and volume integrals Vector integral theorems: Greens, Stokes and Gauss Divergence theorems (without proof) and related problems.
Applications: Work done, Force.

Text Books:

1. **B.S.Grewal**, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. **N.P.Bali**, Engineering Mathematics, Lakshmi Publications.

Reference Books:

1. **Greenberg**, Advanced Engineering Mathematics, 2nd edition, Pearson edn
2. **Erwin Kreyszig**, Advanced Engineering Mathematics, 10th Edition, Wiley-India
3. **Peter O'Neil**, Advanced Engineering Mathematics, 7th edition, Cengage Learning.
4. **D.W. Jordan and T.Smith**, Mathematical Techniques, Oxford University Press.
5. **Srimanta Pal, Subodh C.Bhunia**, Engineering Mathematics, Oxford University Press.
6. **Dass H.K., Rajnish Verma. Er.**, Higher Engineering Mathematics, S. Chand Co. Pvt. Ltd, Delhi.

I Year - II Semester

L	T	P	C
4	0	0	3

APPLIED CHEMISTRY
(Common to EEE, ECE, CSE, IT, EIE, E.Com.E,)

Knowledge of basic concepts of Chemistry for Engineering students will help them as professional engineers later in design and material selection, as well as utilizing the available resources.

Learning Objectives:

- Plastics are nowadays used in household appliances; also they are used as composites (FRP) in aerospace industries (Unit I).
- Fuels as a source of energy are a basic need of any industry, particularly industries like thermal power stations, steel industry, fertilizer industry etc., and hence they are introduced (Unit II).
- The basics for the construction of galvanic cells as well as some of the sensors used in instruments are introduced. Also if corrosion is to be controlled, one has to understand the mechanism of corrosion which itself is explained by electrochemical theory (Unit III).
- With the increase in demand, a wide variety of materials are coming up; some of them have excellent engineering properties and a few of these materials are introduced (Unit IV).
- Understanding of crystal structures will help to understand the conductivity, semiconductors and superconductors. Magnetic properties are also studied (Unit V).
- With the increase in demand for power and also with depleting sources of fossil fuels, the demand for alternative sources of fuels is increasing. Some of the prospective fuel sources are introduced (Unit VI).

UNIT I: HIGH POLYMERS AND PLASTICS

Polymerisation : Introduction- Mechanism of polymerization - Stereo regular polymers – methods of polymerization (emulsion and suspension) -Physical and mechanical properties – Plastics as engineering materials : advantages and limitations – Thermoplastics and Thermosetting plastics – Compounding and fabrication (4/5 techniques)- Preparation, properties and applications of polyethene, PVC, Bakelite Teflon and polycarbonates
Elastomers – Natural rubber- compounding and vulcanization – Synthetic rubbers : Buna S, Buna N, Thiokol and polyurethanes – Applications of elastomers.
Composite materials & Fiber reinforced plastics – Biodegradable polymers – Conducting polymers.

UNIT II: FUEL TECHNOLOGY

Fuels:- Introduction – Classification – Calorific value - HCV and LCV – Dulong’s formula – Bomb calorimeter – Numerical problems – Coal — Proximate and ultimate analysis – Significance of the analyses – Liquid fuels – Petroleum- Refining – Cracking – Synthetic petrol –Petrol knocking – Diesel knocking - Octane and Cetane ratings – Anti-knock agents – Power alcohol – Bio-diesel – Gaseous fuels – Natural gas. LPG and CNG – Combustion – Calculation of air for the combustion of a fuel – Flue gas analysis – Orsat apparatus – Numerical problems on combustion.

Explosives:- Introduction, classification, examples: RDX, TNT and ammonium nitrite - rocket fuels.

UNIT III: ELECTROCHEMICAL CELLS AND CORROSION

Galvanic cells - Reversible and irreversible cells – Single electrode potential – Electro chemical series and uses of this series- Standard electrodes (Hydrogen and Calomel electrodes) - Concentration Cells – Batteries: Dry Cell - Ni-Cd cells - Ni-Metal hydride cells - Li cells - Zinc – air cells.

Corrosion:- Definition – Theories of Corrosion (electrochemical) – Formation of galvanic cells by different metals, by concentration cells, by differential aeration and waterline corrosion – Passivity of metals – Pitting corrosion - Galvanic series – Factors which influence the rate of corrosion - Protection from corrosion – Design and material selection – Cathodic protection - Protective coatings: – Surface preparation – Metallic (cathodic and anodic) coatings - Methods of application on metals (Galvanizing, Tinning, Electroplating, Electroless plating)

UNIT IV: CHEMISTRY OF ADVANCED MATERIALS

Nano materials:- Introduction – Sol-gel method & chemical reduction method of preparation – Characterization by BET method and TEM methods - Carbon nano tubes and fullerenes: Types, preparation, properties and applications

Liquid crystals:- Introduction – Types – Applications

Superconductors :- Type-I & Type-2, properties & applications

Green synthesis:- Principles - 3 or 4 methods of synthesis with examples – R_4M_4 principles

UNIT V: SOLID STATE CHEMISTRY

Types of solids - close packing of atoms and ions - BCC , FCC, structures of rock salt - cesium chloride- spinel - normal and inverse spinels,

Non-elemental **semiconducting Materials:-** Stoichiometric, controlled valency & Chalcogen photo/semiconductors, Preparation of Semiconductors - Semiconductor Devices:- p-n junction diode as rectifier – junction transistor.

Insulators (electrical and electronic applications)

Magnetic materials:- Ferro and ferri magnetism. Hall effect and its applications.

UNIT VI: NON CONVENTIONAL ENERGY SOURCES AND STORAGE DEVICES

Solar Energy: - Introduction, application of solar energy, conversion of solar energy (Thermal conversion & photo conversion) – photovoltaic cell: design, working and its importance

Non-conventional energy sources:

- (i) Hydropower include setup a hydropower plant (schematic diagram)
- (ii) Geothermal energy: Introduction-schematic diagram of a geothermal power plant
- (iii) Tidal and wave power: Introduction- Design and working-movement of tides and their effect on sea level.
- (iv) Ocean thermal energy: Introduction, closed-cycle, ocean thermal energy conversion (OTEC), open cycle OTEC, hybrid OTEC, schematic diagram and explanation.
- (v) Biomass and biofuels

Fuel cells:- Introduction - cell representation, H_2-O_2 fuel cell: Design and working, advantages and limitations. Types of fuel cells: Alkaline fuel cell - methanol-oxygen - phosphoric acid fuel cells - molten carbonate fuel cells.

Outcomes: The advantages and limitations of plastic materials and their use in design would be understood. Fuels which are used commonly and their economics, advantages and limitations are discussed. Reasons for corrosion and some methods of corrosion control would be understood. The students would be now aware of materials like nano-materials and fullerenes and their uses. Similarly liquid crystals and superconductors are understood. The importance of green synthesis is well understood and how they are different from conventional methods is also explained. Conductance phenomenon is better understood. The students are exposed to some of the alternative fuels and their advantages and limitations.

Standard Books:

1. Engineering Chemistry by Jain and Jain; Dhanpat Rai Publishing Co.
2. Engineering Chemistry by Shikha Agarwal; Cambridge University Press, 2015 edition.

Reference Books:

1. Engineering Chemistry of Wiley India Pvt. Ltd., Vairam and others, 2014 edition (second).
2. Engineering Chemistry by Prasanth Rath, Cengage Learning, 2015 edition.
3. A text book of engineering Chemistry by S. S. Dara; S. Chand & Co Ltd., Latest Edition
4. Applied Chemistry by H.D. Gesser, Springer Publishers
5. Text book of Nano-science and nanotechnology by B.S. Murthy, P. Shankar and others, University Press, IIM

I Year - II Semester

L	T	P	C
4	0	0	3

ELECTRICAL & MECHANICAL TECHNOLOGY

ELECTRICAL TECHNOLOGY:

Preamble:

This course covers the topics related to analysis of various electrical circuits, operation of various electrical machines, various electronic components to perform well in their respective fields.

Learning Objectives:

- To learn the basic principles of electrical law's and analysis of networks.
- To understand the principle of operation and construction details of DC machines.
- To understand the principle of operation and construction details of transformer.
- To understand the principle of operation and construction details of alternator and 3-Phase induction motor.
- To Understand the principles and construction of various measuring instruments.

Unit - I

DC Machines:

Principle of operation of DC generator – emf equation – types of DC machine – torque equation of DC motor – applications – three point starter, speed control methods – OCC of DC generator

Transformers: Principle of operation of single phase transformers – e.m.f equation – losses –efficiency and regulation.

Unit - II

AC Rotating Machines:

Principle of operation of alternators – regulation by synchronous impedance method –principle of operation of 3-Phase induction motor – slip-torque characteristics - efficiency – applications.

Unit III

Measuring Instruments:

Classification – Deflection, controlling, damping torque, ammeter, voltmeter, wattmeter, MI, MC instruments – Energy meter – Construction of CRO.

Learning Outcomes:

- Able to analyse the various electrical networks.
- Able to understand the operation of DC generator, DC Motor ,3-point starter and Speed control methods.
- Able to analyse the performance of transformer.
- Able to explain the operation of 3-phase alternator and 3-phase induction motors.
- Able to explain the working principle of various measuring instruments.

MECHANICAL TECHNOLOGY

Learning Objectives: The content of this course shall provide the student the basic concepts of various mechanical systems and exposes the student to a wide range of equipment and their utility in a practical situation. It shall provide the fundamental principles of fuels, I.C. Engines, transmission systems, heat transfer fundamentals and various manufacturing operations usually exist in any process plant.

UNIT-IV:

Energy Sources: Renewable and non renewable energy resources, renewable energy forms and conversions. Thermodynamic principles and laws.

Internal combustion engines: classification – working principle - engine components. Four stroke and two stroke petrol and diesel engines, comparisons. Performance parameters: IP, BP, FP, SFC, BTE, ITE, ME.

UNIT-V:

Heat Transfer: Modes of heat transfer- heat transfer parameters, various thermo physical properties. Conduction - heat transfer for extended surfaces, Types of fins, Fin equation for rectangular fin, Fin efficiency, Fin effectiveness. Convection – Mechanism, Natural and Forced Convection. Heat Transfer in laminar and turbulent flow over a flat plate. Radiation heat transfer: Thermal radiation, Blackbody radiation, Radiation intensity, Radiative properties, Basic laws of radiation.

UNIT-VI:

Transmission of power and manufacturing methods:

Belt, rope and chain drives- Different types - power transmission by belts and ropes, initial tensions in the belt.

Gears: classification of gears, applications.

Metal joining: arc welding, resistance welding, gas welding, brazing and soldering

Metal forming: forging – operations, rolling and extrusion principles

Machine tool: lathe classification, specifications, and operations.

Outcomes:

After completing the course, the student shall be able to understand:

- Working of I.C. Engines
- Modes of Heat transfer
- Power transmission by drives and different manufacturing methods.

Text Books:

1. Electrical Technology by Surinder Pal Bali, Pearson Publications.
2. Electrical Circuit Theory and Technology by John Bird, Routledge Taylor & Francis Group
3. Mechanical Engineering Science K R Gopala Krishna, Subhas publications
4. Elements of Mechanical Engineering, M.L. Mathur, F.S.Metha & R.P.Tiwari Jain Brothers Pubs., 2009.
5. Heat transfer by P.K. Nag, Tata McGraw-Hill

Reference Books:

1. Basic Electrical Engineering by M.S.Naidu and S.Kamakshiah, TMH Publications
2. Fundamentals of Electrical Engineering by Rajendra Prasad, PHI Publications, 2nd edition
3. Basic Electrical Engineering by Nagsarkar, Sukhija, Oxford Publications, 2nd edition
4. Electrical Engineering – Prasad, Sivanagaraju, Cengage Learning
5. Theory of machines by Rattan McGraw-Hill publications
6. Production Technology by P.N.Rao by I & II McGraw-Hill publications

I Year - II Semester

L	T	P	C
4	0	0	3

ENVIRONMENTAL STUDIES

Course Learning Objectives:

The objectives of the course is to impart

- Overall understanding of the natural resources
- Basic understanding of the ecosystem and its diversity
- Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities
- An understanding of the environmental impact of developmental activities
- Awareness on the social issues, environmental legislation and global treaties

Course Outcomes:

The student should have knowledge on

- The natural resources and their importance for the sustenance of the life and recognize the need to conserve the natural resources
- The concepts of the ecosystem and its function in the environment. The need for protecting the producers and consumers in various ecosystems and their role in the food web
- The biodiversity of India and the threats to biodiversity, and conservation practices to protect the biodiversity
- Various attributes of the pollution and their impacts and measures to reduce or control the pollution along with waste management practices
- Social issues both rural and urban environment and the possible means to combat the challenges
- The environmental legislations of India and the first global initiatives towards sustainable development.
- About environmental assessment and the stages involved in EIA and the environmental audit.
- Self Sustaining Green Campus with Environment Friendly aspect of – Energy, Water and Wastewater reuse Plantation, Rain water Harvesting, Parking Curriculum.

Syllabus:

UNIT – I Multidisciplinary nature of Environmental Studies: Definition, Scope and Importance –Sustainability: Stockholm and Rio Summit–Global Environmental Challenges: Global warming and climate change, Carbon Credits, acid rains, ozone layer depletion, population growth and explosion, effects. Role of information Technology in Environment and human health.

Ecosystems: Concept of an ecosystem. - Structure and function of an ecosystem. - Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession. - Food chains, food webs and ecological pyramids. - Introduction, types, characteristic features, structure and function of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems.

UNIT – II Natural Resources: Natural resources and associated problems

Forest resources – Use and over – exploitation, deforestation – Timber extraction – Mining, dams and other effects on forest and tribal people

Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems

Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, Sustainable mining of Granite, Lignite, Coal, Sea and River sands.

Food resources: World food problems, changes caused by non-agriculture activities-effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity

Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources Vs Oil and Natural Gas Extraction.

Land resources: Land as a resource, land degradation, Wasteland reclamation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

UNIT – III Biodiversity and its conservation: Definition: genetic, species and ecosystem diversity- classification - Value of biodiversity: consumptive use, productive use, social-Biodiversity at national and local levels. India as a mega-diversity nation - Hot-spots of biodiversity - Threats to biodiversity: habitat loss, man-wildlife conflicts - Endangered and endemic species of India – Conservation of biodiversity: conservation of biodiversity.

UNIT – IV Environmental Pollution: Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies, Sustainable Life Studies.

Solid Waste Management: Sources, Classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products, Biomedical, Hazardous and e – waste management.

UNIT – V Social Issues and the Environment: Urban problems related to energy -Water conservation, rain water harvesting-Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Environmental Protection Act -Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act -Wildlife Protection Act -Forest Conservation Act-Issues involved in enforcement of environmental legislation. -Public awareness.

UNIT – VI Environmental Management: Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS, Environmental audit. Ecotourism, Green Campus – Green business and Green politics.

The student should Visit an Industry/Ecosystem and submit a report individually on any issues related to Environmental Studies course and make a power point presentation.

Text Books:

1. Environmental Studies, K.V. S. G. Murali Krishna, VGS Publishers, Vijayawada
2. Environmental Studies , R. Rajagopalan, 2nd Edition, 2011, Oxford University Press.
3. Environmental Studies, P.N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; Pearson Education, Chennai

Reference:

1. Text Book of Environmental Studies, Deeshita Dave & P. Udaya Bhaskar, Cengage Learning.
2. A Textbook of Environmental Studies, Shaashi Chawla, TMH, New Delhi
3. Environmental Studies, Benny Joseph, Tata McGraw Hill Co, New Delhi
4. "Perspectives in Environment Studies" Anubha Kaushik, C P Kaushik, New Age International Publishers, 2014

I Year - II Semester

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DATA STRUCTURES

OBJECTIVES:

- To be familiar with basic techniques handling problems with Data structures
- Solve problems using data structures such as linear lists, stacks, queues, hash tables

UNIT-I: ARRAYS

Abstract Data Type, The Array as an Abstract Data Type, The Polynomial Abstract Data type-Polynomial Representation- Polynomial Addition. Sparse Matrices, Introduction- Sparse Matrix Representation- Transposing a Matrix- Matrix Multiplication, Representation of Arrays.

UNIT-II: STACKS AND QUEUES

The Stack Abstract Data Type, The Queue Abstract Data Type, Evaluation of Expressions, Expression- Postfix Notation- Infix to Postfix.

UNIT-III: LINKED LISTS

Single Linked List and Chains, Circular Lists, Available Space Lists, Linked Stacks and Queues, Polynomials, Polynomial Representation- Adding Polynomials- Circular List Representation of Polynomials, Equivalence Classes, Sparse Matrices, Sparse Matrix Representation- Sparse Matrix Input- Deleting a Sparse Matrix, Doubly Linked Lists, Generalized Lists, Representation of Generalized Lists- Recursive Algorithms for Lists- Reference Counts, Shared and Recursive Lists

UNIT-IV: TREES

Representation of Trees, Binary Trees, The Abstract Data Type, Properties of Binary Trees, Binary Tree Representations, Binary Tree Traversal, Introduction, Inorder Traversal Preorder Traversal, Postorder Traversal, Thread Binary Trees, Threads, Inorder Traversal of a Threaded Binary Tree, Inserting a Node into a Threaded Binary Tree, Heaps, Priority Queues, Definition of a Max Heap, Insertion into a Max Heap, Deletion from a Max Heap, Binary Search Trees, Definition, Searching a Binary Search Tree, Insertion into a Binary Search Tree, Deletion from a Binary Search Tree, Height of Binary Search Tree.

UNIT-V: GRAPHS

The Graph Abstract Data Type, Introduction, Definition, Graph Representation, Elementary Graph Operation, Depth First Search, Breadth First Search, Connected Components, Spanning Trees, Biconnected Components, Minimum Cost Spanning Trees, Kruskal S Algorithm, Prim s Algorithm, Sollin's Algorithm, Shortest Paths and Transitive Closure, Single Source/All Destination: Nonnegative Edge Cost, Single Source/All Destination: General Weights, All-Pairs Shortest Path, Transitive Closure.

UNIT-VI: SORTING

Insertion Sort, Quick Sort, Merge Sort Merging, Iterative Merge Sort, Recursive Merge Sort, Heap Sort, Summary of Internal Sorting

OUTCOMES:

- Apply advanced data structure strategies for exploring complex data structures.
- Compare and contrast various data structures and design techniques in the area Of Performance.
- Implement all data structures like stacks, queues, trees, lists and graphs and compare their Performance and trade offs

Text Books:

1. Data structures, Algorithms and Applications in C++, S.Sahni, University Press (India) Pvt.Ltd, 2nd edition, Universities Press Orient Longman Pvt. Ltd.
2. Data structures and Algorithm Analysis in C++, Mark Allen Weiss, Pearson Education. Ltd., Second Edition.
3. Data structures and algorithms in C++, 3rd Edition, Adam Drozdek, Thomson□

Reference Books:

1. Data structures and Algorithm Analysis in C++, Mark Allen Weiss, Pearson Education. Ltd., Second Edition.□
2. Data structures using C and C++, Langsam, Augenstein and Tanenbaum, PHI.□
3. Problem solving with C++, The OOP, Fourth edition, W.Savitch, Pearson education.

I Year - II Semester

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APPLIED/ENGINEERING CHEMISTRY LABORATORY

1. Introduction to Chemistry laboratory – Molarity, Normality, Primary, secondary standard solutions, Volumetric titrations, Quantitative analysis, Qualitative analysis, etc.
2. Trial experiment - Determination of HCl using standard Na₂CO₃ solution.
3. Determination of alkalinity of a sample containing Na₂CO₃ and NaOH.
4. Determination of KMnO₄ using standard Oxalic acid solution.
5. Determination of Ferrous iron using standard K₂Cr₂O₇ solution.
6. Determination of Copper using standard K₂Cr₂O₇ solution.
7. Determination of temporary and permanent hardness of water using standard EDTA solution.
8. Determination of Copper using standard EDTA solution.
9. Determination of Iron by a Colorimetric method using thiocyanate as reagent.
10. Determination of pH of the given sample solution using pH meter.
11. Conductometric titration between strong acid and strong base.
12. Conductometric titration between strong acid and weak base.
13. Potentiometric titration between strong acid and strong base.
14. Potentiometric titration between strong acid and weak base.
15. Determination of Zinc using standard EDTA solution.
16. Determination of Vitamin – C.

Outcomes: The students entering into the professional course have practically very little exposure to lab classes. The experiments introduce volumetric analysis; redox titrations with different indicators; EDTA titrations; then they are exposed to a few instrumental methods of chemical analysis. Thus at the end of the lab course, the student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills.

Reference Books

1. A Textbook of Quantitative Analysis, Arthur J. Vogel.
2. Dr. Jyotsna Cherukuris (2012) *Laboratory Manual of engineering chemistry-II*, VGS Techno Series
3. Chemistry Practical Manual, Lorven Publications K. Mukkanti (2009) *Practical Engineering Chemistry*, B.S. Publication.

I Year - II Semester

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ENGLISH - COMMUNICATION SKILLS LAB - 2

PRESCRIBED LAB MANUAL FOR SEMESTER II:

'**INTERACT**: English Lab Manual for Undergraduate Students' Published by **Orient Blackswan Pvt Ltd.**

OBJECTIVES:

To enable the students to learn demonstratively the communication skills of listening, speaking, reading and writing.

OUTCOME:

A study of the communicative items in the laboratory will help the students become successful in the competitive world.

The course content along with the study material is divided into six units.

UNIT 1:

1. Debating - Practice work

UNIT 2:

1. Group Discussions -- Practice work

UNIT 3:

1. Presentation Skills - Practice work

UNIT 4:

1. Interview Skills - Practice work

UNIT 5:

1. Email, Curriculum Vitae - Practice work

UNIT 6:

1. Idiomatic Expressions
2. Common Errors in English - Practice work

Reference Books:

1. Strengthen your communication skills by Dr M Hari Prasad, Dr Salivendra Raju and Dr G Suvarna Lakshmi, Maruti Publications.
2. English for Professionals by Prof Eliah, B.S Publications, Hyderabad.
3. Unlock, Listening and speaking skills 2, Cambridge University Press
4. Spring Board to Success, Orient BlackSwan
5. A Practical Course in effective english speaking skills, PHI
6. Word power made handy, Dr shalini verma, Schand Company
7. Let us hear them speak, Jayashree Mohanraj, Sage texts
8. Professional Communication, Aruna Koneru, Mc Grawhill Education
9. Cornerstone, Developing soft skills, Pearson Education

I Year - II Semester

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COMPUTER PROGRAMMING LAB

OBJECTIVES:

- Understand the basic concept of C Programming, and its different modules that includes conditional and looping expressions, Arrays, Strings, Functions, Pointers, Structures and File programming.
- Acquire knowledge about the basic concept of writing a program.
- Role of constants, variables, identifiers, operators, type conversion and other building blocks of C Language.
- Use of conditional expressions and looping statements to solve problems associated with conditions and repetitions.
- Role of Functions involving the idea of modularity.

Programming

Exercise - 1 Basics

- a) What is an OS Command, Familiarization of Editors - vi, Emacs
- b) Using commands like mkdir, ls, cp, mv, cat, pwd, and man
- c) C Program to Perform Adding, Subtraction, Multiplication and Division of two numbers From Command line

Exercise - 2 Basic Math

- a) Write a C Program to Simulate 3 Laws at Motion
- b) Write a C Program to convert Celsius to Fahrenheit and vice versa

Exercise - 3 Control Flow - I

- a) Write a C Program to Find Whether the Given Year is a Leap Year or not.
- b) Write a C Program to Add Digits & Multiplication of a number

Exercise – 4 Control Flow - II

- a) Write a C Program to Find Whether the Given Number is
 - i) Prime Number
 - ii) Armstrong Number
- b) Write a C program to print Floyd Triangle
- c) Write a C Program to print Pascal Triangle

Exercise – 5 Functions

- a) Write a C Program demonstrating of parameter passing in Functions and returning values.
- b) Write a C Program illustrating Fibonacci, Factorial with Recursion without Recursion

Exercise – 6 Control Flow - III

- a) Write a C Program to make a simple Calculator to Add, Subtract, Multiply or Divide Using switch...case
- b) Write a C Program to convert decimal to binary and hex (using switch call function the function)

Exercise – 7 Functions - Continued

Write a C Program to compute the values of $\sin x$ and $\cos x$ and e^x values using Series expansion. (use factorial function)

Exercise – 8 Arrays

Demonstration of arrays

- a) Search-Linear.
- b) Sorting-Bubble, Selection.
- c) Operations on Matrix.

Exercises - 9 Structures

- a) Write a C Program to Store Information of a Movie Using Structure
- b) Write a C Program to Store Information Using Structures with Dynamically Memory Allocation
- c) Write a C Program to Add Two Complex Numbers by Passing Structure to a Function

Exercise - 10 Arrays and Pointers

- a) Write a C Program to Access Elements of an Array Using Pointer
- b) Write a C Program to find the sum of numbers with arrays and pointers.

Exercise – 11 Dynamic Memory Allocations

- a) Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc () function.
- b) Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc () function.

Understand the difference between the above two programs

Exercise – 12 Strings

- a) Implementation of string manipulation operations **with** library function.
 - i) copy
 - ii) concatenate
 - iii) length
 - iv) compare
- b) Implementation of string manipulation operations **without** library function.
 - i) copy
 - ii) concatenate
 - iii) length
 - iv) compare

Exercise -13 Files

- a) Write a C programming code to open a file and to print its contents on screen.
- b) Write a C program to copy files

Exercise - 14 Files Continued

- a) Write a C program that merges two files and stores their contents in another file.
- b) Write a C program to delete a file.

OUTCOMES:

- Apply and practice logical ability to solve the problems.
- Understand C programming development environment, compiling, debugging, and linking and executing a program using the development environment
- Analyzing the complexity of problems, Modularize the problems into small modules and then convert them into programs
- Understand and apply the in-built functions and customized functions for solving the problems.
- Understand and apply the pointers, memory allocation techniques and use of files for dealing with variety of problems.
- Document and present the algorithms, flowcharts and programs in form of user-manuals
- Identification of various computer components, Installation of software

Note:

- a) **All the Programs must be executed in the Linux Environment. (Mandatory)**
- b) **The Lab record must be a print of the LATEX (.tex) Format.**

II Year - I Semester

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ELECTRONIC DEVICES AND CIRCUITS

Objectives:

The main objectives of this course are:

- The basic concepts of semiconductor physics are to be reviewed.
- Study the physical phenomena such as conduction, transport mechanism and electrical characteristics of different diodes.
- The application of diodes as rectifiers with their operation and characteristics with and without filters are discussed.
- The principal of working and operation of Bipolar Junction Transistor and Field Effect Transistor and their characteristics are explained.
- The need of transistor biasing and its significance is explained. The quiescent point or operating point is explained.
- Small signal equivalent circuit analysis of BJT and FET transistor amplifiers in different configuration is explained.

Syllabus:

UNIT-I:Semi Conductor Physics : Insulators, Semi conductors, and Metals classification using energy band diagrams, mobility and conductivity, electrons and holes in intrinsic semi conductors, extrinsic semi conductors, drift and diffusion, charge densities in semiconductors, Hall effect, continuity equation, law of junction, Fermi Dirac function, Fermi level in intrinsic and extrinsic Semiconductors

UNIT- II: Junction Diode Characteristics : Open circuited p-n junction, Biased p-n junction, p-n junction diode, current components in PN junction Diode, diode equation, V-I Characteristics, temperature dependence on V-I characteristics, Diode resistance, Diode capacitance, energy band diagram of PN junction Diode.

Special Semiconductor Diodes: Zener Diode, Breakdown mechanisms, Zener diode applications, LED, Photo diode, Tunnel Diode, SCR, UJT. Construction, operation and characteristics of all the diodes are required to be considered.

UNIT- III: Rectifiers and Filters: Basic Rectifier setup, half wave rectifier, full wave rectifier, bridge rectifier, derivations of characteristics of rectifiers, rectifier circuits-operation, input and output waveforms, Filters, Inductor filter, Capacitor filter, comparison of various filter circuits in terms of ripple factors.

UNIT- IV: Transistor Characteristics:

BJT: Junction transistor, transistor current components, transistor equation, transistor configurations, transistor as an amplifier, characteristics of transistor in Common Base, Common Emitter and Common Collector configurations, Ebers-Moll model of a transistor, punch through/ reach through, Photo transistor, typical transistor junction voltage values.

FET: FET types, construction, operation, characteristics, parameters, MOSFET-types, construction, operation, characteristics, comparison between JFET and MOSFET.

UNIT- V: Transistor Biasing and Thermal Stabilization : Need for biasing, operating point, load line analysis, BJT biasing- methods, basic stability, fixed bias, collector to base bias, self bias, Stabilization against variations in V_{BE} , I_c , and β , Stability factors, (S , S' , S''), Bias compensation, Thermal runaway, Thermal stability.

FET Biasing- methods and stabilization.

UNIT- VI: Small Signal Low Frequency Transistor Amplifier Models:

BJT: Two port network, Transistor hybrid model, determination of h-parameters, conversion of h-parameters, generalized analysis of transistor amplifier model using h-parameters, Analysis of CB, CE and CC amplifiers using exact and approximate analysis, Comparison of transistor amplifiers.

FET: Generalized analysis of small signal model, Analysis of CG, CS and CD amplifiers, comparison of FET amplifiers.

Text Books:

1. Electronic Devices and Circuits- J. Millman, C. Halkias, Tata Mc-Graw Hill, Second Edition.
2. Integrated Electronics- Jacob Millman, C. Halkies, C.D.Parikh, Tata Mc-Graw Hill, 2009.

References:

1. Electronic Devices and Circuits-K. Satya Prasad, VGS Book Links.
2. Electronic Devices and Circuits-Salivahanan, Kumar, Vallavaraj, Tata Mc-Graw Hill, Second Edition
3. Electronic Devices and Circuits – Bell, Oxford

Outcomes:

At the end of this course the student can able to:

- Understand the basic concepts of semiconductor physics.
- Understand the formation of p-n junction and how it can be used as a p-n junction as diode in different modes of operation.
- Know the construction, working principle of rectifiers with and without filters with relevant expressions and necessary comparisons.
- Understand the construction, principle of operation of transistors, BJT and FET with their V-I characteristics in different configurations.
- Know the need of transistor biasing, various biasing techniques for BJT and FET and stabilization concepts with necessary expressions.
- Perform the analysis of small signal low frequency transistor amplifier circuits using BJT and FET in different configurations.

II Year - I Semester

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SWITCHING THEORY AND LOGIC DESIGN

UNIT – I: REVIEW OF NUMBER SYSTEMS & CODES:

- i) Representation of numbers of different radix, conversion from one radix to another radix, $r-1$'s complements and r 's complements of signed members, problem solving.
- ii) 4 bit codes, BCD, Excess-3, 2421, 84-2-1 9 's complement code etc.,
- iii) Logic operations and error detection & correction codes; Basic logic operations -NOT, OR, AND, Universal building blocks, EX-OR, EX-NOR - Gates, Standard SOP and POS, Forms, Gray code, error detection, error correction codes (parity checking, even parity, odd parity, Hamming code) NAND-NAND and NOR-NOR realizations.

UNIT – II: MINIMIZATION TECHNIQUES

Boolean theorems, principle of complementation & duality, De-morgan theorems, minimization of logic functions using Boolean theorems, minimization of switching functions using K-Map up to 6 variables, tabular minimization, problem solving (code-converters using K-Map etc..).

UNIT – III: COMBINATIONAL LOGIC CIRCUITS DESIGN

Design of Half adder, full adder, half subtractor, full subtractor, applications of full adders, 4-bit binary subtractor, adder-subtractor circuit, BCD adder circuit, Excess 3 adder circuit, look-a-head adder circuit, Design of decoder, demultiplexer, 7 segment decoder, higher order demultiplexing, encoder, multiplexer, higher order multiplexing, realization of Boolean functions using decoders and multiplexers, priority encoder, 4-bit digital comparator.

UNIT – IV: INTRODUCTION OF PLD's

PROM, PAL, PLA-Basics structures, realization of Boolean function with PLDs, programming tables of PLDs, merits & demerits of PROM, PAL, PLA comparison, realization of Boolean functions using PROM, PAL, PLA, programming tables of PROM, PAL, PLA.

UNIT – V: SEQUENTIAL CIRCUITS I

Classification of sequential circuits (synchronous and asynchronous); basic flip-flops, truth tables and excitation tables (nand RS latch, nor RS latch, RS flip-flop, JK flip-flop, T flip-flop, D flip-flop with reset and clear terminals). Conversion from one flip-flop to flip-flop. Design of ripple counters, design of synchronous counters, Johnson counter, ring counter. Design of registers - Buffer register, control buffer register, shift register, bi-directional shift register, universal shift register.

UNIT – VI: SEQUENTIAL CIRCUITS II

Finite state machine; Analysis of clocked sequential circuits, state diagrams, state tables, reduction of state tables and state assignment, design procedures. Realization of circuits using various flip-flops. Mealy to Moore conversion and vice-versa.

TEXT BOOKS:

1. Switching Theory and Logic Design by Hill and Peterson Mc-Graw Hill TMH edition.
2. Switching Theory and Logic Design by A. Anand Kumar
3. Digital Design by Mano PHI.

REFERENCE BOOKS:

1. Modern Digital Electronics by RP Jain, TMH
2. Fundamentals of Logic Design by Charles H. Roth Jr, Jaico Publishers
3. Micro electronics by Milliman MH edition.

II Year - I Semester

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SIGNALS & SYSTEMS

OBJECTIVES:

The main objectives of this course are given below:

- To introduce the terminology of signals and systems.
- To introduce Fourier tools through the analogy between vectors and signals.
- To introduce the concept of sampling and reconstruction of signals.
- To analyze the linear systems in time and frequency domains.
- To study z-transform as mathematical tool to analyze discrete-time signals and systems.

UNIT- I: INTRODUCTION: Definition of Signals and Systems, Classification of Signals, Classification of Systems, Operations on signals: time-shifting, time-scaling, amplitude-shifting, amplitude-scaling. Problems on classification and characteristics of Signals and Systems. Complex exponential and sinusoidal signals, Singularity functions and related functions: impulse function, step function signum function and ramp function. Analogy between vectors and signals, orthogonal signal space, Signal approximation using orthogonal functions, Mean square error, closed or complete set of orthogonal functions, Orthogonality in complex functions.

UNIT –II: FOURIER SERIES AND FOURIER TRANSFORM:

Fourier series representation of continuous time periodic signals, properties of Fourier series, Dirichlet's conditions, Trigonometric Fourier series and Exponential Fourier series, Complex Fourier spectrum. Deriving Fourier transform from Fourier series, Fourier transform of arbitrary signal, Fourier transform of standard signals, Fourier transform of periodic signals, properties of Fourier transforms, Fourier transforms involving impulse function and Signum function. Introduction to Hilbert Transform.

UNIT –III: SAMPLING THEOREM – Graphical and analytical proof for Band Limited Signals, impulse sampling, Natural and Flat top Sampling, Reconstruction of signal from its samples, effect of under sampling – Aliasing, Introduction to Band Pass sampling.

UNIT-IV: ANALYSIS OF LINEAR SYSTEMS: Linear system, impulse response, Response of a linear system, Linear time invariant (LTI) system, Linear time variant (LTV) system, Concept of convolution in time domain and frequency domain, Graphical representation of convolution, Transfer function of a LTI system. Filter characteristics of linear systems. Distortion less transmission through a system, Signal bandwidth, system bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Poly-Wiener criterion for physical realization, relationship between bandwidth and rise time.

Cross-correlation and auto-correlation of functions, properties of correlation function, Energy density spectrum, Parseval's theorem, Power density spectrum, Relation between auto correlation function and energy/power spectral density function. Relation between convolution and correlation, Detection of periodic signals in the presence of noise by correlation, Extraction of signal from noise by filtering.

UNIT –V: LAPLACE TRANSFORMS : Review of Laplace transforms, Partial fraction expansion, Inverse Laplace transform, Concept of region of convergence (ROC) for Laplace transforms, constraints on ROC for various classes of signals, Properties of L.T's, Relation between L.T's, and F.T. of a signal. Laplace transform of certain signals using waveform synthesis.

UNIT –VI: Z–TRANSFORMS : Fundamental difference between continuous-time and discrete-time signals, discrete time signal representation using complex exponential and sinusoidal components, Periodicity of discrete time using complex exponential signal, Concept of Z- Transform of a discrete sequence. Distinction between Laplace, Fourier and Z transforms. Region of convergence in Z-Transform, constraints on ROC for various classes of signals, Inverse Z-transform, properties of Z-transforms.

TEXT BOOKS:

1. Signals, Systems & Communications - B.P. Lathi, BS Publications, 2003.
2. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawab, PHI, 2nd Edn.
3. Signals & Systems- Narayan Iyer and K Satya Prasad, Cenage Pub.

REFERENCE BOOKS:

1. Signals & Systems - Simon Haykin and Van Veen, Wiley, 2nd Edition.
2. Principles of Linear Systems and Signals – BP Lathi, Oxford University Press, 2015
3. Signals and Systems – K Raja Rajeswari, B VisweswaraRao, PHI, 2009
4. Fundamentals of Signals and Systems- Michel J. Robert, MGH International Edition, 2008.
5. Signals and Systems – T K Rawat , Oxford University press, 2011

OUTCOMES:

At the end of this course the student will able to:

- Characterize the signals and systems and principles of vector spaces, Concept of orthogonality.
- Analyze the continuous-time signals and continuous-time systems using Fourier series, Fourier transform and Laplace transform.
- Apply sampling theorem to convert continuous-time signals to discrete-time signal and reconstruct back.
- Understand the relationships among the various representations of LTI systems
- Understand the Concepts of convolution, correlation, Energy and Power density spectrum and their relationships.
- Apply z-transform to analyze discrete-time signals and systems.

II Year - I Semester

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NETWORK ANALYSIS

UNIT – I

Introduction to Electrical Circuits : Network elements classification, Electric charge and current, Electric energy and potential, Resistance parameter – series and parallel combination, Inductance parameter – series and parallel combination, Capacitance parameter – series and parallel combination. Energy sources: Ideal, Non-ideal, Independent and dependent sources, Source transformation, Kirchoff's laws, Mesh analysis and Nodal analysis problem solving with resistances only including dependent sources also. (Text Books: 1,2,3, Reference Books: 3)

A.C Fundamentals and Network Topology: Definitions of terms associated with periodic functions: Time period, Angular velocity and frequency, RMS value, Average value, Form factor and peak factor- problem solving, Phase angle, Phasor representation, Addition and subtraction of phasors, mathematical representation of sinusoidal quantities, explanation with relevant theory, problem solving. Principal of Duality with examples.

Network Topology: Definitions of branch, node, tree, planar, non-planar graph, incidence matrix, basic tie set schedule, basic cut set schedule. (Text Books: 2,3, Reference Books: 3)

UNIT – II

Steady State Analysis of A.C Circuits : Response to sinusoidal excitation - pure resistance, pure inductance, pure capacitance, impedance concept, phase angle, series R-L, R-C, R-L-C circuits problem solving. Complex impedance and phasor notation for R-L, R-C, R-L-C problem solving using mesh and nodal analysis, Star-Delta conversion, problem solving. (Text Books: 1,2, Reference Books: 3)

UNIT – III

Coupled Circuits : Coupled Circuits: Self inductance, Mutual inductance, Coefficient of coupling, analysis of coupled circuits, Natural current, Dot rule of coupled circuits, Conductively coupled equivalent circuits- problem solving.

Resonance: Introduction, Definition of Q, Series resonance, Bandwidth of series resonance, Parallel resonance, Condition for maximum impedance, current in anti resonance, Bandwidth of parallel resonance, general case-resistance present in both branches, anti resonance at all frequencies. (Text Books:2,3, Reference Books: 3)

UNIT – IV

Network Theorems: Thevinin's, Norton's, Milliman's, Reciprocity, Compensation, Substitution, Superposition, Max Power Transfer, Tellegens- problem solving using dependent sources also. (Text Books: 1,2,3, Reference Books: 2)

UNIT – V

Two-port networks : Relationship of two port networks, Z-parameters, Y-parameters, Transmission line parameters, h-parameters, Inverse h-parameters, Inverse Transmission line parameters, Relationship between parameter sets, Parallel connection of two port networks, Cascading of two port networks, series connection of two port networks, problem solving including dependent sources also. (Text Books: 1,2, Reference Books: 1,3)

UNIT – VI

Transients : First order differential equations, Definition of time constants, R-L circuit, R-C circuit with DC excitation, Evaluating initial conditions procedure, second order differential equations, homogeneous, non-homogenous, problem solving using R-L-C elements with DC excitation and AC excitation, Response as related to s-plane rotation of roots. Solutions using Laplace transform method. (Text Books: 1,2,3, Reference Books: 1,3)

TEXT BOOKS:

1. Network Analysis – ME Van Valkenburg, Prentice Hall of India, 3rd Edition, 2000.
2. Network Analysis by K.Satya Prasad and S Sivanagaraju, Cengage Learning
3. Electric Circuit Analysis by Hayt and Kimmarle, TMH

REFERENCES:

1. Network lines and Fields by John. D. Ryder 2nd edition, Asia publishing house.
2. Basic Circuit Analysis by DR Cunningham, Jaico Publishers.
3. Network Analysis and Filter Design by Chadha, Umesh Publications.

COURSE OBJECTIVES:

1. To understand the basic concepts on RLC circuits.
2. To know the behavior of the steady states and transients states in RLC circuits.
3. To know the basic Laplace transforms techniques in periods' waveforms.
4. To understand the two port network parameters.
5. To understand the properties of LC networks and filters.

COUSE OUTCOME:

1. gain the knowledge on basic network elements.
2. will analyze the RLC circuits behavior in detailed.
3. analyze the performance of periodic waveforms.
4. gain the knowledge in characteristics of two port network parameters (Z, Y, ABCD, h & g).
5. analyze the filter design concepts in real world applications.

II Year - I Semester

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RANDOM VARIABLES & STOCHASTIC PROCESSES

OBJECTIVES:

- To give students an introduction to elementary probability theory, in preparation for courses on statistical analysis, random variables and stochastic processes.
- To mathematically model the random phenomena with the help of probability theory concepts.
- To introduce the important concepts of random variables and stochastic processes.
- To analyze the LTI systems with stationary random process as input.
- To introduce the types of noise and modelling noise sources.

UNIT I

THE RANDOM VARIABLE : Introduction, Review of Probability Theory, Definition of a Random Variable, Conditions for a Function to be a Random Variable, Discrete, Continuous and Mixed Random Variables, Distribution and Density functions, Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh, Conditional Distribution, Conditional Density, Properties.

UNIT II

OPERATION ON ONE RANDOM VARIABLE – EXPECTATIONS : Introduction, Expected Value of a Random Variable, Function of a Random Variable, Moments about the Origin, Central Moments, Variance and Skew, Chebychev's Inequality, Characteristic Function, Moment Generating Function, Transformations of a Random Variable: Monotonic Transformations for a Continuous Random Variable, Nonmonotonic Transformations of Continuous Random Variable.

UNIT III

MULTIPLE RANDOM VARIABLES : Vector Random Variables, Joint Distribution Function, Properties of Joint Distribution, Marginal Distribution Functions, Conditional Distribution and Density, Statistical Independence, Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem: Unequal Distribution, Equal Distributions.

OPERATIONS ON MULTIPLE RANDOM VARIABLES: Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variables case, Properties, Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables.

UNIT IV

RANDOM PROCESSES – TEMPORAL CHARACTERISTICS: The Random Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, Concept of Stationarity and Statistical Independence. First-Order Stationary Processes, Second-order and Wide-Sense Stationarity, N^{th} -order and Strict-Sense Stationarity, Time Averages and Ergodicity, Autocorrelation Function and its Properties, Cross-Correlation Function and its Properties, Covariance Functions, Gaussian Random Processes, Poisson Random Process.

UNIT V

RANDOM PROCESSES – SPECTRAL CHARACTERISTICS: The Power Density Spectrum: Properties, Relationship between Power Density Spectrum and Autocorrelation Function, The Cross-Power Density Spectrum, Properties, Relationship between Cross-Power Density Spectrum and Cross-Correlation Function.

UNIT VI

LINEAR SYSTEMS WITH RANDOM INPUTS : Random Signal Response of Linear Systems: System Response – Convolution, Mean and Mean-squared Value of System Response, Autocorrelation Function of Response, Cross-Correlation Functions of Input and Output, Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Density Spectra of Input and Output, Band pass, Band-Limited and Narrowband Processes, Properties, Modeling of Noise Sources: Resistive (Thermal) Noise Source, Arbitrary Noise Sources, Effective Noise Temperature, Average Noise Figure, Average Noise Figure of cascaded networks.

TEXT BOOKS:

1. Probability, Random Variables & Random Signal Principles, Peyton Z. Peebles, TMH, 4th Edition, 2001.
2. Probability, Random Variables and Stochastic Processes, Athanasios Papoulis and S.Unnikrishna, PHI, 4th Edition, 2002.

REFERENCE BOOKS:

1. Probability Theory and Stochastic Processes – B. Prabhakara Rao, BS Publications
2. Probability and Random Processes with Applications to Signal Processing, Henry Stark and John W. Woods, Pearson Education, 3rd Edition.
3. Schaum's Outline of Probability, Random Variables, and Random Processes.
4. An Introduction to Random Signals and Communication Theory, B.P. Lathi, International Textbook, 1968.
5. Random Process – Ludeman , John Wiley
6. Probability Theory and Random Processes, P. Ramesh Babu, McGrawHill, 2015.

OUTCOMES:

After completion of the course, the student will be able to

- Mathematically model the random phenomena and solve simple probabilistic problems.
- Identify different types of random variables and compute statistical averages of these random variables.
- Characterize the random processes in the time and frequency domains.
- Analyze the LTI systems with random inputs.
- Apply these techniques to analyze the systems in the presence of different types of noise.

II Year - I Semester

L	T	P	C
4	0	0	3

MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

(Common to all Branches)

• Course Objectives:

- The Learning objectives of this paper is to understand the concept and nature of Managerial Economics and its relationship with other disciplines and also to understand the Concept of Demand and Demand forecasting, Production function, Input Output relationship, Cost-Output relationship and Cost-Volume-Profit Analysis.
- To understand the nature of markets, Methods of Pricing in the different market structures and to know the different forms of Business organization and the concept of Business Cycles.
- To learn different Accounting Systems, preparation of Financial Statement and uses of different tools for performance evaluation. Finally, it is also to understand the concept of Capital, Capital Budgeting and the techniques used to evaluate Capital Budgeting proposals.

UNIT-I

Introduction to Managerial Economics and demand Analysis:

Definition of Managerial Economics –Scope of Managerial Economics and its relationship with other subjects – Concept of Demand, Types of Demand, Determinants of Demand- Demand schedule, Demand curve, Law of Demand and its limitations- Elasticity of Demand, Types of Elasticity of Demand and Measurement- Demand forecasting and Methods of forecasting..

UNIT – II

Production and Cost Analyses:

Concept of Production function- Cobb-Douglas Production function- Leontief production function - Law of Variable proportions-Isoquants and Isocosts and choice of least cost factor combination-Concepts of Returns to scale and Economies of scale-Different cost concepts: opportunity costs, explicit and implicit costs- Fixed costs, Variable Costs and Total costs –Cost –Volume-Profit analysis-Determination of Breakeven point(simple problems)- Managerial significance and limitations of Breakeven point.

UNIT – III

Introduction to Markets, Theories of the Firm & Pricing Policies:

Market Structures: Perfect Competition, Monopoly, Monopolistic competition and Oligopoly – Features – Price and Output Determination – Managerial Theories of firm: Marris and Williamson's models – other Methods of Pricing: Average cost pricing, Limit Pricing, Market Skimming Pricing, Internet Pricing: Flat Rate Pricing, Usage sensitive pricing and Priority Pricing.

UNIT – IV

Types of Business Organization and Business Cycles:

Features and Evaluation of Sole Trader, Partnership, Joint Stock Company – State/Public Enterprises and their forms – Business Cycles : Meaning and Features – Phases of Business Cycle.

UNIT – V

Introduction to Accounting & Financing Analysis:

Introduction to Double Entry Systems – Preparation of Financial Statements-Analysis and Interpretation of Financial Statements-Ratio Analysis – Preparation of Funds flow and cash flow statements (Simple Problems)

UNIT – VI

Capital and Capital Budgeting: Capital Budgeting: Meaning of Capital-Capitalization-Meaning of Capital Budgeting-Time value of money- Methods of appraising Project profitability: Traditional Methods(pay back period, accounting rate of return) and modern methods(Discounted cash flow method, Net Present Value method, Internal Rate of Return Method and Profitability Index)

Course Outcome:

- *The Learner is equipped with the knowledge of estimating the Demand and demand elasticities for a product and the knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs.
- * One is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units.
- *The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis and to evaluate various investment project proposals with the help of capital budgeting techniques for decision making.

TEXT BOOKS

1. Dr. N. AppaRao, Dr. P. Vijay Kumar: 'Managerial Economics and Financial Analysis', Cengage Publications, New Delhi – 2011
2. Dr. A. R. Aryasri – Managerial Economics and Financial Analysis, TMH 2011
3. Prof. J.V.Prabhakararao, Prof. P. Venkatarao. 'Managerial Economics and Financial Analysis', Ravindra Publication.

REFERENCES:

1. Dr. B. Kuberudu and Dr. T. V. Ramana: Managerial Economics & Financial Analysis, Himalaya Publishing House, 2014.
2. V. Maheswari: Managerial Economics, Sultan Chand.2014
3. Suma Damodaran: Managerial Economics, Oxford 2011.
4. VanithaAgarwal: Managerial Economics, Pearson Publications 2011.
5. Sanjay Dhameja: Financial Accounting for Managers, Pearson.
6. Maheswari: Financial Accounting, Vikas Publications.
7. S. A. Siddiqui& A. S. Siddiqui: Managerial Economics and Financial Analysis, New Age International Publishers, 2012
8. Ramesh Singh, Indian Economy, 7th Edn., TMH2015
9. Pankaj Tandon A Text Book of Microeconomic Theory, Sage Publishers, 2015
10. Shailaja Gajjala and Usha Munipalle, Univerties press, 2015

II Year - I Semester

L	T	P	C
0	0	3	2

ELECTRONIC DEVICES AND CIRCUITS LAB

Note: The students are required to perform the experiment to obtain the V-I characteristics and to determine the relevant parameters from the obtained graphs.

Electronic Workshop Practice:

1. Identification, Specifications, Testing of R, L, C Components (Colour Codes), Potentiometers, Coils, Gang Condensers, Relays, Bread Boards.
2. Identification, Specifications and Testing of active devices, Diodes, BJTs, JFETs, LEDs, LCDs, SCR, UJT.
3. Soldering Practice- Simple circuits using active and passive components.
4. Study and operation of Ammeters, Voltmeters, Transformers, Analog and Digital Multimeter, Function Generator, Regulated Power Supply and CRO..

List of Experiments: (Minimum of Ten Experiments has to be performed)

1. P-N Junction Diode Characteristics
Part A: Germanium Diode (Forward bias & Reverse bias)
Part B: Silicon Diode (Forward Bias only)
2. Zener Diode Characteristics
Part A: V-I Characteristics
Part B: Zener Diode as Voltage Regulator
3. Rectifiers (without and with c-filter)
Part A: Half-wave Rectifier
Part B: Full-wave Rectifier
4. BJT Characteristics (CE Configuration)
Part A: Input Characteristics
Part B: Output Characteristics
5. FET Characteristics (CS Configuration)
Part A: Drain Characteristics
Part B: Transfer Characteristics
6. SCR Characteristics
7. UJT Characteristics
8. Transistor Biasing
9. CRO Operation and its Measurements
10. BJT-CE Amplifier
11. Emitter Follower-CC Amplifier
12. FET-CS Amplifier

Equipment required:

1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. Analog/Digital Function Generators
4. Digital Multimeters
5. Decade Résistance Boxes/Rheostats
6. Decade Capacitance Boxes
7. Ammeters (Analog or Digital)
8. Voltmeters (Analog or Digital)
9. Active & Passive Electronic Components

II Year - I Semester

L	T	P	C
0	0	3	2

NETWORKS & ELECTRICAL TECHNOLOGY LAB

Learning Objectives:

- To determine resonance frequency, Q-factor of RLC network.
- To analysis time response of first orders RC/RL network for non-sinusoidal inputs.
- To estimate parameters of two port networks
- To understand the concept network theorems in network reduction of electrical networks.
- To determine efficiency of dc shunt machine with actual loading.
- To analyse performance of 3 phase induction motor
- To understand the significance of regulation of an alternators through synchronous impedance method.

PART – A

Any five experiments are to be conducted from each part

1. Series and Parallel Resonance – Timing, Resonant frequency, Bandwidth and Q-factor determination for RLC network.
2. Time response of first order RC/RL network for periodic non-sinusoidal inputs – time constant and steady state error determination.
3. Two port network parameters – Z-Y Parameters, chain matrix and analytical verification.
4. Verification of Superposition and Reciprocity theorems.
5. Verification of maximum power transfer theorem. Verification on DC, verification on AC with Resistive and Reactive loads.
6. Experimental determination of Thevenin's and Norton's equivalent circuits and verification by direct test.

PART – B

1. Magnetization characteristics of D.C. Shunt generator. Determination of critical field resistance.
2. Speed control of D.C. Shunt motor by Armature & flux control methods
3. Brake test on DC shunt motor. Determination of performance characteristics.
4. OC & SC tests on Single-phase transformer (Predetermination of efficiency and regulation at given power factors and determination of equivalent circuit).
5. Brake test on 3-phase Induction motor (performance characteristics).
6. Regulation of alternator by synchronous impedance method

Learning Outcomes:

- Able to analyse RLC circuits and understand resonant frequency and Q-factor.
- Able to determine first order RC/RL networks of periodic non- sinusoidal waveforms.
- Able to apply network theorems to analyze the electrical network.
- Able to describe the performance of dc shunt machine.
- Able to investigate the performance of 1-phase transformer.
- Able to perform tests on 3-phase induction motor and alternator to determine their performance characteristic

II Year - II Semester

L	T	P	C
4	0	0	3

ELECTRONIC CIRCUIT ANALYSIS

Objectives:

The main objectives of this course are:

- Small signal high frequency BJT transistor amplifier Hybrid- π equivalent circuit and the expressions for conductances and capacitances are derived.
- Cascading of single stage amplifiers is discussed. Expressions for overall voltage gain are derived.
- The concept of feedback is introduced. Effect of negative feedback on amplifier characteristics is explained and necessary equations are derived.
- Basic principle of oscillator circuits is explained and different oscillator circuits are given with their analysis.
- Power amplifiers Class A, Class B, Class C, Class AB and other types of amplifiers are analyzed.
- Different types of tuned amplifier circuits are analyzed.

Outcomes:

At the end of this course the student can able to:

- Design and analysis of small signal high frequency transistor amplifier using BJT and FET.
- Design and analysis of multi stage amplifiers using BJT and FET and Differential amplifier using BJT
- Derive the expressions for frequency of oscillation and condition for oscillation of RC and LC oscillators and their amplitude and frequency stability concept.
- Know the classification of the power and tuned amplifiers and their analysis with performance comparison.

Syllabus:

UNIT-I Small Signal High Frequency Transistor Amplifier models:

BJT: Transistor at high frequencies, Hybrid- π common emitter transistor model, Hybrid π conductances, Hybrid π capacitances, validity of hybrid π model, determination of high-frequency parameters in terms of low-frequency parameters, CE short circuit current gain, current gain with resistive load, cut-off frequencies, frequency response and gain bandwidth product.

FET: Analysis of common Source and common drain Amplifier circuits at high frequencies.

UNIT-II

Multistage Amplifiers : Classification of amplifiers, methods of coupling, cascaded transistor amplifier and its analysis, analysis of two stage RC coupled amplifier, high input resistance transistor amplifier circuits and their analysis-Darlington pair amplifier, Cascode amplifier, Boot-strap emitter follower, Analysis of multi stage amplifiers using FET, Differential amplifier using BJT.

UNIT -III

Feedback Amplifiers : Feedback principle and concept, types of feedback, classification of amplifiers, feedback topologies, Characteristics of negative feedback amplifiers, Generalized analysis of feedback amplifiers, Performance comparison of feedback amplifiers, Method of analysis of feedback amplifiers.

Unit-IV

Oscillators: Oscillator principle, condition for oscillations, types of oscillators, RC-phase shift and Wein bridge oscillators with BJT and FET and their analysis, Generalized analysis of LC Oscillators, Hartley and Colpitt's oscillators with BJT and FET and their analysis, Frequency and amplitude stability of oscillators.

UNIT-V

Power Amplifiers: Classification of amplifiers, Class A power Amplifiers and their analysis, Harmonic Distortions, Class B Push-pull amplifiers and their analysis, Complementary symmetry push pull amplifier, Class AB power amplifier, Class-C power amplifier, Thermal stability and Heat sinks, Distortion in amplifiers.

UNIT-VI

Tuned Amplifiers : Introduction, Q-Factor, small signal tuned amplifier, capacitance single tuned amplifier, double tuned amplifiers, effect of cascading single tuned amplifiers on band width, effect of cascading double tuned amplifiers on band width, staggered tuned amplifiers, stability of tuned amplifiers, wideband amplifiers.

Text Books:

1. Integrated Electronics- J. Millman and C.C. Halkias, Tata Mc Graw-Hill, 1972.
2. Electronic Devices and Circuits- Salivahanan, N.Suresh Kumar, A. Vallavaraj, TATA McGraw Hill, Second Edition

References:

1. Electronic Circuit Analysis and Design – Donald A. Neaman, Mc Graw Hill.
2. Electronic Devices and Circuits Theory – Robert L. Boylestad and Louis Nashelsky, Pearson/Prentice Hall, Tenth Edition.
3. Electronic Circuit Analysis-B.V.Rao,K.R.Rajeswari, P.C.R.Pantulu,K.B.R.Murthy, Pearson Publications.
4. Microelectronic Circuits-Sedra A.S. and K.C. Smith, Oxford University Press, Sixth Edition.

II Year - II Semester

L	T	P	C
4	0	0	3

CONTROL SYSTEMS

Course objectives

1. To introduce the concepts of open loop and closed loop systems, mathematical models of mechanical and electrical systems, and concepts of feedback
2. To study the characteristics of the given system in terms of the transfer function and introducing various approaches to reduce the overall system for necessary analysis
3. To develop the acquaintance in analyzing the system response in time-domain and frequency domain in terms of various performance indices
4. To analyze the system in terms of absolute stability and relative stability by different approaches
5. To design different control systems for different applications as per given specifications
6. To introduce the concepts of state variable analysis, design and also the concepts of controllability and observability

UNIT-1

Introduction

System Control System, Open Loop Control System, Closed loop Control System, Different Examples

Mathematical models of Physical Systems

Differential equations of physical systems, Transfer functions, Block diagram Algebra, Signal flow graphs with illustrative examples

Effects of Feedback

Feedback Characteristics and its advantages, Linearizing effect of feedback

UNIT-2

Controller Components

DC Servomotor (Armature Controlled and Field Controlled) with necessary derivation for transfer function, AC Servomotor and its transfer function, AC Tachometer, Potentiometer, Synchros, AC Position Control Systems

Time Response Analysis

Standard test Signals, Time response of first and second order systems, steady state errors and error constants, Effect of adding a zero to a system, Design specifications of second order systems, Performance indices

UNIT-3

Concepts of Stability and Algebraic Criteria

The concept of Stability, Necessary Conditions for Stability, Routh-Hurwitz Stability Criterion, Relative stability analysis,

The Root Locus Technique

Introduction, The Root Locus concepts, Construction of Root Loci

UNIT-4

Frequency response analysis

Introduction, Correlation between time and frequency response, Polar Plots, Bode Plots, Nyquist Stability Criterion

UNIT-5

Introduction to Design

The design problem, Preliminary consideration of classical design, Realization of basic Compensators, Cascade compensation in time domain and frequency domain, Tuning of PID Controllers

UNIT-6

State Variable Analysis and Design

Introduction, Concepts of State, State Variables and State models, State models for linear continuous-time systems, State variables and linear discrete-time systems, Solution of state equations and Concepts of Controllability and Observability.

Text Book

I.J.Nagarath and M.Gopal, “ **Control System Engineering,**” New Age International Publishers, Fifth Edition

Reference Books

1. Katsuhiko Ogata, “Modern Control Engineering,” Pearson, Fifth Edition
2. S. Salivahanan, R. Rengaraj, and G. R. Venkata Krishnan, “ Control Systems Engineering,” Pearson, First Impression
3. Benjamin C. Kuo, Farid Golnaraghi, “ Automatic Control Systems,” Wiley Student Edition, Eighth Edition
4. PadmaRaju and Reddy , “ Instrumentation and Control Systems “, McGrawHill Education ,2016

Course Outcomes

1. This course introduces the concepts of feedback and its advantages to various control systems
2. The performance metrics to design the control system in time-domain and frequency domain are introduced.
3. Control systems for various applications can be designed using time-domain and frequency domain analysis.
4. In addition to the conventional approach, the state space approach for the analysis of control systems is also introduced.

II Year - II Semester

L	T	P	C
4	0	0	3

EM WAVES AND TRANSMISSION LINES

OBJECTIVES:

The main objectives of this course are to understand:

1. Fundamentals of steady electric and magnetic fields using various laws
2. The concept of static and time varying Maxwell equations and power flow using pointing theorem
3. Wave characteristics in different media for normal and oblique incidence
4. Various concepts of transmission lines and impedance measurements

SYLLABUS:

UNIT I:

Review of Co-ordinate Systems, **Electrostatics**:, Coulomb's Law, Electric Field Intensity, Electric Flux Density, Gauss Law and Applications, Electric Potential, Maxwell's Two Equations for Electrostatic Fields, Energy Density, Illustrative Problems. Convection and Conduction Currents, Dielectric Constant, Continuity Equation, Relaxation Time, Poisson's and Laplace's Equations; Capacitance – Parallel Plate, Coaxial Capacitors, Illustrative Problems. [1,5]

UNIT II: Magneto Statics : Biot-Savart Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Maxwell's Two Equations for Magnetostatic Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Ampere's Force Law, Inductances and Magnetic Energy. Illustrative Problems. [1,5]

Maxwell's Equations (Time Varying Fields): Faraday's Law and Transformer emf, Inconsistency of Ampere's Law and Displacement Current Density, Maxwell's Equations in Different Final Forms and Word Statements. Conditions at a Boundary Surface : Dielectric-Dielectric and Dielectric-Conductor Interfaces. Illustrative Problems. [1,2]

UNIT III: EM Wave Characteristics - I: Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves – Definition, All Relations Between E & H, Sinusoidal Variations, Wave Propagation in Lossy dielectrics, lossless dielectrics, free space, wave propagation in good conductors, skin depth, Polarization & Types. Illustrative Problems. [1,2,3]

UNIT IV: EM Wave Characteristics – II: Reflection and Refraction of Plane Waves – Normal and Oblique Incidences, for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection, Surface Impedance. Poynting Vector and Poynting Theorem – Applications, Power Loss in a Plane Conductor. Illustrative Problems. [2,3,4]

UNIT V: Transmission Lines - I : Types, Parameters, T& π Equivalent Circuits, Transmission Line Equations, Primary & Secondary Constants, Expressions for Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Infinite Line, Lossless lines, distortion less lines, Loading - Types of Loading. Illustrative Problems. [1,7]

UNIT VI: Transmission Lines – II : Input Impedance Relations, SC and OC Lines, Reflection Coefficient, VSWR. Low loss radio frequency lines and UHF Transmission lines, UHF Lines as Circuit Elements; Impedance Transformations $\lambda/4$, $\lambda/2$, $\lambda/8$ Lines –. Smith Chart – Construction and Applications, Quarter wave transformer, Stub Matching-single & double, Illustrative Problems. [1,7]

TEXT BOOKS:

1. Elements of Electromagnetic – Matthew N.O. Sadiku, Oxford Univ. Press, 3rd ed., 2001.
2. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2nd Edition, 2000.

REFERENCE BOOKS:

1. Electromagnetic Fields and Wave Theory –GSN Raju, Pearson Education 2006
2. Engineering Electromagnetics:Nathan Ida, Springer(India)Pvt.Ltd., New Delhi, 2nd ed., 2005.
3. Engineering Electromagnetics – William H. Hayt Jr. and John A. Buck, TMH, 7th ed., 2006.
4. Electromagnetic Field Theory and Transmission Lines: G SasiBhushana Rao,Wiley India 2013
5. Transmission Lines and Networks–Umesh Sinha,Satya Prakashan (Tech. India Publications), New Delhi, 2001.
6. Electromagnetic waves and transmission lines – R S Rao, PHI, EEE edition

OUTCOMES:

At the end of this course the student can able to:

1. Determine E and H using various laws and applications of electric & magnetic fields
2. Apply the Maxwell equations to analyze the time varying behavior of EM waves
3. Gain the knowledge in uniform plane wave concept and characteristics of uniform plane wave in various media
4. Calculate Brewster angle, critical angle and total internal reflection
5. Derive the expressions for input impedance of transmission lines
6. Calculate reflection coefficient, VSWR etc. using smith chart

II Year - II Semester

L	T	P	C
4	0	0	3

ANALOG COMMUNICATIONS

UNIT I

AMPLITUDE MODULATION : Introduction to communication system, Need for modulation, Frequency Division Multiplexing , Amplitude Modulation, Definition, Time domain and frequency domain description, single tone modulation, power relations in AM waves, Generation of AM waves, square law Modulator, Switching modulator, Detection of AM Waves; Square law detector, Envelope detector.

UNIT II

DSB & SSB MODULATION : Double side band suppressed carrier modulators, time domain and frequency domain description, Generation of DSBSC Waves, Balanced Modulators, Ring Modulator, Coherent detection of DSB-SC Modulated waves, COSTAS Loop. Frequency domain description, Frequency discrimination method for generation of AM SSB Modulated Wave, Time domain description, Phase discrimination method for generating AM SSB Modulated waves. Demodulation of SSB Waves, Vestigial side band modulation: Frequency description, Generation of VSB Modulated wave, Time domain description, Envelope detection of a VSB Wave pulse Carrier, Comparison of AM Techniques, Applications of different AM Systems.

UNIT III

ANGLE MODULATION : Basic concepts, Frequency Modulation: Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave, Narrow band FM, Wide band FM, Constant Average Power, Transmission bandwidth of FM Wave - Generation of FM Waves, Direct FM, Detection of FM Waves: Balanced Frequency discriminator, Zero crossing detector, Phase locked loop, Comparison of FM & AM.

UNIT IV

TRANSMITTERS & RECEIVERS: Radio Transmitter - Classification of Transmitter, AM Transmitter, Effect of feedback on performance of AM Transmitter, FM Transmitter – Variable reactance type and phase modulated FM Transmitter, frequency stability in FM Transmitter. **Radio Receiver** - Receiver Types - Tuned radio frequency receiver, Superhetrodyne receiver, RF section and Characteristics - Frequency changing and tracking, Intermediate frequency, AGC, FM Receiver, Comparison with AM Receiver, Amplitude limiting. Communication Receivers, extensions of superhetrodyne principle and additional circuits.

UNIT V

NOISE : Review of noise and noise sources, noise figure, Noise in Analog communication Systems, Noise in DSB& SSB System, Noise in AM System, Noise in Angle Modulation Systems, Threshold effect in Angle Modulation System, Pre-emphasis & de-emphasis

UNIT VI

PULSE MODULATION : Time Division Multiplexing,, Types of Pulse modulation, PAM (Single polarity, double polarity) PWM: Generation & demodulation of PWM, PPM, Generation and demodulation of PPM, TDM Vs FDM

TEXT BOOKS:

1. Principles of Communication Systems – H Taub & D. Schilling, Gautam Sahe, TMH, 2007 3rd Edition.
2. Communication Systems – B.P. Lathi, BS Publication, 2006.

REFERENCES:

1. Principles of Communication Systems - Simon Haykin, John Wiley, 2nd Ed.,.
2. Electronics & Communication System – George Kennedy and Bernard Davis, TMH 2004.
3. Communication Systems– R.P. Singh, SP Sapre, Second Edition TMH, 2007.
4. Fundamentals of Communication Systems - John G. Proakis, Masond, Salehi PEA, 2006.
5. Electronic Communication systems – Tomasi, Pearson.

Course Objectives:

Students undergoing this course, are expected to

1. Familiarize with the fundamentals of analog communication systems
2. Familiarize with various techniques for analog modulation and demodulation of signals
3. Distinguish the figure of merits of various analog modulation methods
4. Develop the ability to classify and understand various functional blocks of radio transmitters and receivers
5. Familiarize with basic techniques for generating and demodulating various pulse modulated signals

Course Outcomes:

After undergoing the course, students will be able to

1. Differentiate various Analog modulation and demodulation schemes and their spectral characteristics
2. Analyze noise characteristics of various analog modulation methods
3. Analyze various functional blocks of radio transmitters and receivers
4. Design simple analog systems for various modulation techniques.

II Year - II Semester

L	T	P	C
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PULSE AND DIGITAL CIRCUITS

OBJECTIVES

The student will be made

- To understand the concept of wave shaping circuits, Switching Characteristics of diode and transistor.
- To study the design and analysis of various Multivibrators.
- To understand the functioning of different types of time-base Generators.
- To learn the working of logic families & Sampling Gates.

UNIT I

LINEAR WAVESHAPING: High pass, low pass RC circuits, their response for sinusoidal, step, pulse, square, ramp and exponential inputs. RC network as differentiator and integrator; Attenuators, its applications in CRO probe, RL and RLC circuits and their response for step input, Ringing circuit.

UNIT II

NON-LINEAR WAVE SHAPING : Diode clippers, Transistor clippers, clipping at two independent levels, Transfer characteristics of clippers, Emitter coupled clipper; Clamping operation, clamping circuits using diode with different inputs, Clamping circuit theorem, practical clamping circuits, effect of diode characteristics on clamping voltage, Transfer characteristics of clampers.

UNIT III

SWITCHING CHARACTERISTICS OF DEVICES : Diode as a switch, piecewise linear diode characteristics, Design and analysis of Transistor as a switch, Break down voltage consideration of transistor, saturation parameters of Transistor and their variation with temperature, Design of transistor switch, transistor-switching times.

Bistable Multivibrator: Analysis And Design of Fixed Bias, Self Bias Bistable Multi Vibrator, Collector Catching Diodes, Commutating Capacitors, Triggering of Binary Circuits, Emitter Coupled Bistable Multivibrator (Schmitt Trigger).

UNIT IV

Monostable Multivibrator: Analysis and Design of Collector Coupled Monostable Multi vibrator, Triggering of Monostable Multivibrator, Applications of Monostable Multivibrator.

Astable Multivibrator: Analysis and Design of Collector Coupled Astable Multivibrator, Application of Astable Multivibrator as a Voltage to Frequency Converter.

UNIT V

VOLTAGE TIME BASE GENERATORS:

General features of a time base signal, Methods of generating time base waveform Exponential Sweep Circuits, Negative Resistance Switches, basic principles in Miller and Bootstrap time base generators, Transistor Miller time base generator, Transistor Bootstrap time base generator.

UNIT VI

LOGIC FAMILIES & SAMPLING GATES:

LOGIC FAMILIES: Diode Logic, Transistor Logic, Diode-Transistor Logic, Transistor-Transistor Logic, Emitter Coupled Logic, AOI Logic, Comparison of Logic Families.

SAMPLING GATES: Basic Operating Principles of Sampling Gates, Diode Unidirectional Sampling Gate and Two-Diode Bi-Directional Sampling Gate, Four-Diode gates, Six-Diode Gates, Reduction of Pedestal in Sampling Gates, Applications of Sampling Gates.

TEXT BOOKS:

1. Pulse, Digital and Switching Waveforms - J. Millman and H. Taub, McGraw-Hill
2. Pulse and Digital Circuits – A. Anand Kumar, PHI, 2005

REFERENCES:

1. Pulse, Digital and Switching Waveforms - J. Millman and H. Taub, Mothiki S Prakash Rao McGraw-Hill, Second Edition, 2007.
2. Solid State Pulse circuits - David A. Bell, PHI, 4th Edn., 2002
3. Pulse & Digital Circuits by Venkata Rao,K,Ramasudha K, Manmadha Rao,G., Pearson,2010

OUTCOMES

After going through this course the student will be able to

- Design linear and non-linear wave shaping circuits.
- Apply the fundamental concepts of wave shaping for various switching and signal generating circuits.
- Design different multivibrators and time base generators.
- Utilize the non sinusoidal signals in many experimental research areas.

II Year - II Semester

L	T	P	C
4	0	0	3

MANAGEMENT SCIENCE

Course Objectives:

- *To familiarize with the process of management and to provide basic insight into select contemporary management practices
- *To provide conceptual knowledge on functional management and strategic management.

UNIT I

Introduction to Management: Concept –nature and importance of Management –Generic Functions of Management – Evaluation of Management thought- Theories of Motivation – Decision making process-Designing organization structure- Principles of organization – Organizational typology- International Management: Global Leadership and Organizational behavior Effectiveness(GLOBE) structure

UNIT II

Operations Management: Principles and Types of Management – Work study- Statistical Quality Control- Control charts (P-chart, R-chart, and C-chart) Simple problems- Material Management: Need for Inventory control- EOQ, ABC analysis (simple problems) and Types of ABC analysis (HML, SDE, VED, and FSN analysis).

UNIT III

Functional Management: Concept of HRM, HRD and PMIR- Functions of HR Manager- Wage payment plans(Simple Problems) – Job Evaluation and Merit Rating - Marketing Management- Functions of Marketing – Marketing strategies based on product Life Cycle, Channels of distributions. Operationlizing change through performance management.

UNIT IV

Project Management: (PERT/CPM): Development of Network – Difference between PERT and CPM Identifying Critical Path- Probability- Project Crashing (Simple Problems)

UNIT V

Strategic Management: Vision, Mission, Goals, Strategy – Elements of Corporate Planning Process – Environmental Scanning – SWOT analysis- Steps in Strategy Formulation and Implementation, Generic Strategy Alternatives. Global strategies, theories of Multinational Companies.

UNIT VI

Contemporary Management Practice: Basic concepts of MIS, MRP, Justin- Time(JIT) system, Total Quality Management(TQM), Six sigma and Capability Maturity Model(CMM) Levies, Supply Chain Management , Enterprise Resource Planning (ERP), Business Process outsourcing (BPO), Business process Re-engineering and Bench Marking, Balanced Score Card.

Course Outcome:

- *After completion of the Course the student will acquire the knowledge on management functions, global leadership and organizational behavior.
- *Will familiarize with the concepts of functional management project management and strategic management.

Text Books

1. Dr. P. Vijaya Kumar & Dr. N. Appa Rao, '*Management Science*' Cengage, Delhi, 2012.
2. Dr. A. R. Aryasri, '*Management Science*' TMH 2011.

References

1. Koontz & Weihrich: '*Essentials of management*' TMH 2011
2. Seth & Rastogi: *Global Management Systems*, Cengage learning , Delhi, 2011
3. Robbins: *Organizational Behaviour*, Pearson publications, 2011
4. Kanishka Bedi: *Production & Operations Management*, Oxford Publications, 2011
5. Philip Kotler & Armstrong: *Principles of Marketing*, Pearson publications
6. Biswajit Patnaik: *Human Resource Management*, PHI, 2011
7. Hitt and Vijaya Kumar: *Starategic Management*, Cengage learning
8. Prem Chadha: *Performance Management*, Trinity Press(An imprint of Laxmi Publications Pvt. Ltd.) Delhi 2015.
9. Anil Bhat& Arya Kumar : *Principles of Management*, Oxford University Press, New Delhi, 2015.

II Year - II Semester

L	T	P	C
0	0	3	2

ELECTRONIC CIRCUIT ANALYSIS LAB

Note: The students are required to design the circuit and perform the simulation using Multisim/ Equivalent Industrial Standard Licensed simulation software tool. Further they are required to verify the result using necessary hardware equipment.

List of Experiments :(Minimum of Ten Experiments has to be performed)

1. Determination of f_T of a given transistor.
2. Voltage-Series Feedback Amplifier
3. Current-Shunt Feedback Amplifier
4. RC Phase Shift/Wien Bridge Oscillator
5. Hartley/Colpitt's Oscillator
6. Two Stage RC Coupled Amplifier
7. Darlington Pair Amplifier
8. Bootstrapped Emitter Follower
9. Class A Series-fed Power Amplifier
10. Transformer-coupled Class A Power Amplifier
11. Class B Push-Pull Power Amplifier
12. Complementary Symmetry Class B Push-Pull Power Amplifier
13. Single Tuned Voltage Amplifier
14. Double Tuned Voltage Amplifier

Equipment required:

Software:

- i. Multisim/ Equivalent Industrial Standard Licensed simulation software tool.
- ii. Computer Systems with required specifications

Hardware:

10. Regulated Power supplies
11. Analog/Digital Storage Oscilloscopes
12. Analog/Digital Function Generators
13. Digital Multimeters
14. Decade Résistance Boxes/Rheostats
15. Decade Capacitance Boxes
16. Ammeters (Analog or Digital)
17. Voltmeters (Analog or Digital)
18. Active & Passive Electronic Components

II Year - II Semester

L	T	P	C
0	0	3	2

ANALOG COMMUNICATIONS LAB

List of Experiments (Twelve experiments to be done- **The students have to calculate the relevant parameters**) -

(a. Hardware, b. MATLAB Simulink, c. MATLAB Communication tool box)

- A. Amplitude Modulation - Mod. & Demod.
- B. AM - DSB SC - Mod. & Demod.
- C. Spectrum Analysis of Modulated signal using Spectrum Analyser
- D. Diode Detector
- E. Pre-emphasis & De-emphasis
- F. Frequency Modulation - Mod. & Demod.
- G. AGC Circuits
- H. Sampling Theorem
- I. Pulse Amplitude Modulation - Mod. & Demod.
- J. PWM , PPM - Mod. & Demod.
- K. PLL
- L. Radio receiver characteristics

Equipments & Software required:

Software :

- i.) Computer Systems with latest specifications
- ii) Connected in Lan (Optional)
- iii) Operating system (Windows XP)
- iv) Simulations software (Simulink & MATLAB)

Equipment:

- 1. RPS - 0 – 30 V
- 2. CRO - 0 – 20 M Hz.
- 3. Function Generators - 0 – 1 M Hz
- 4. Components
- 5. Multimeters
- 6. Spectrum Analyser

III Year - I Semester

L	T	P	C
4	0	0	3

COMPUTER ARCHITECTURE AND ORGANIZATION

OBJECTIVES:

- Understand the architecture of a modern computer with its various processing units. Also the Performance measurement of the computer system.
- In addition to this the memory management system of computer.

UNIT -I:

Basic Structure Of Computers: Functional unit, Basic Operational concepts, Bus structures, System Software, Performance, The history of computer development.

UNIT -II:

Machine Instruction and Programs:

Instruction and Instruction Sequencing: Register Transfer Notation, Assembly Language Notation, Basic Instruction Types,

Addressing Modes, Basic Input/output Operations, The role of Stacks and Queues in computer programming equation. Component of Instructions: Logic Instructions, shift and Rotate Instructions

UNIT -III:

Type of Instructions: Arithmetic and Logic Instructions, Branch Instructions, Addressing Modes, Input/output Operations

UNIT -IV:

INPUT/OUTPUT ORGANIZATION: Accessing I/O Devices, Interrupts: Interrupt Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices, Direct Memory Access,

Buses: Synchronous Bus, Asynchronous Bus, Interface Circuits, Standard I/O Interface: Peripheral Component Interconnect (PCI) Bus, Universal Serial Bus (USB)

UNIT -V:

The MEMORY SYSTEMS: Basic memory circuits, Memory System Consideration, Read-Only Memory: ROM, PROM, EPROM, EEPROM, Flash Memory,

Cache Memories: Mapping Functions, INTERLEAVING

Secondary Storage: Magnetic Hard Disks, Optical Disks,

UNIT -VI:

Processing Unit: Fundamental Concepts: Register Transfers, Performing An Arithmetic Or Logic Operation, Fetching A Word From Memory,

Execution of Complete Instruction, Hardwired Control,

Micro programmed Control: Microinstructions, Micro program Sequencing, Wide Branch Addressing Microinstructions with next –Address Field

OUTCOMES:

- Students can understand the architecture of modern computer.
- They can analyze the Performance of a computer using performance equation
- Understanding of different instruction types.
- 4. Students can calculate the effective address of an operand by addressing modes
- 5. They can understand how computer stores positive and negative numbers.
- 6. Understanding of how a computer performs arithmetic operation of positive and negative numbers.

TEXT BOOKS:

1. Computer Organization, Carl Hamacher, Zvonks Vranesic, Safea Zaky, 5th Edition, McGraw Hill.
2. Computer Architecture and Organization , John P. Hayes ,3rd Edition, McGraw Hill.

REFERENCE BOOKS:

1. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson/PHI
2. Structured Computer Organization – Andrew S. Tanenbaum, 4th Edition PHI/Pearson
3. Fundamentals of Computer Organization and Design, - Sivaraama Dandamudi Springer Int. Edition.
4. “Computer Organization and Design: The Hardware/Software Interface” by David A. Patterson and John L. Hennessy.
5. J .P. Hayes, "Computer Architecture and Organization", McGraw-Hill, 1998.

III Year - I Semester

L	T	P	C
4	0	0	3

LINEAR IC APPLICATIONS

OBJECTIVES

- To understand the basic operation & performance parameters of differential amplifiers.
- To understand & learn the measuring techniques of performance parameters of OP-AMP
- To learn the linear and non-linear applications of operational amplifiers.
- To understand the analysis & design of different types of active filters using opamps
- To learn the internal structure, operation and applications of different analog ICs
- To Acquire skills required for designing and testing integrated circuits

UNIT I

INTEGRATED CIRCUITS: Differential Amplifier- DC and AC analysis of Dual input Balanced output Configuration, Properties of other differential amplifier configuration (Dual Input Unbalanced Output, Single Ended Input – Balanced/ Unbalanced Output), DC Coupling and Cascade Differential Amplifier Stages, Level translator.

UNIT II

Characteristics of OP-Amps, Integrated circuits-Types, Classification, Package Types and Temperature ranges, Power supplies, Op-amp Block Diagram, ideal and practical Op-amp Specifications, DC and AC characteristics, 741 op-amp & its features, Op-Amp parameters & Measurement, Input & Out put Off set voltages & currents, slew rate, CMRR, PSRR, drift, Frequency Compensation techniques.

UNIT III

LINEAR and NON-LINEAR APPLICATIONS OF OP-AMPS: Inverting and Non-inverting amplifier, Integrator and differentiator, Difference amplifier, Instrumentation amplifier, AC amplifier, V to I, I to V converters, Buffers. Non- Linear function generation, Comparators, Multivibrators, Triangular and Square wave generators, Log and Anti log Amplifiers, Precision rectifiers.

UNIT IV

ACTIVE FILTERS, ANALOG MULTIPLIERS AND MODULATORS: Design & Analysis of Butterworth active filters – 1st order, 2nd order LPF, HPF filters. Band pass, Band reject and all pass filters. Four Quadrant Multiplier, IC 1496, Sample & Hold circuits.

UNIT V

TIMERS & PHASE LOCKED LOOPS: Introduction to 555 timer, functional diagram, Monostable and Astable operations and applications, Schmitt Trigger; PLL - introduction, block schematic, principles and description of individual blocks, 565 PLL, Applications of PLL – frequency multiplication, frequency translation, AM, FM & FSK demodulators. Applications of VCO (566).

UNIT VI

DIGITAL TO ANALOG AND ANALOG TO DIGITAL CONVERTERS: Introduction, basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, and IC 1408 DAC, Different types of ADCs – parallel Comparator type ADC, counter type ADC, successive approximation ADC and dual slope ADC. DAC and ADC Specifications, Specifications AD 574 (12 bit ADC).

TEXT BOOKS:

1. Linear Integrated Circuits – D. Roy Choudhury, New Age International (p) Ltd, 2nd Edition,2003.
2. Op-Amps & Linear ICs - Ramakanth A. Gayakwad, PHI,1987.
3. Operational Amplifiers–C.G. Clayton, Butterworth & Company Publ. Ltd./Elsevier, 1971

REFERENCES :

1. Operational Amplifiers & Linear Integrated Circuits –Sanjay Sharma ;SK Kataria &Sons;2nd Edition,2010
2. Design with Operational Amplifiers & Analog Integrated Circuits – Sergio Franco, McGraw Hill, 1988.
3. OP AMPS and Linear Integrated Circuits concepts and Applications, James M Fiore, Cenage Learning India Ltd.
4. Operational Amplifiers & Linear Integrated Circuits–R.F.Coughlin & Fredrick Driscoll, PHI, 6th Edition.
5. Operational Amplifiers & Linear ICs – David A Bell, Oxford Uni. Press, 3rd Edition

OUTCOMES

- Design circuits using operational amplifiers for various applications.
- Analyze and design amplifiers and active filters using Op-amp.
- Diagnose and trouble-shoot linear electronic circuits.
- Understand the gain-bandwidth concept and frequency response of the amplifier configurations.
- Understand thoroughly the operational amplifiers with linear integrated circuits.

III Year - I Semester

L	T	P	C
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DIGITAL IC APPLICATIONS

OBJECTIVES

The main objectives of this course are:

- Introduction of digital logic families and interfacing concepts for digital design is considered.
- VHDL fundamentals were discussed to modeling the digital system design blocks.
- VHDL compilers, simulators and synthesis tools are described, which are used to verify digital systems in a technology-independent fashion.
- Design and implementation of combinational and sequential digital logic circuits is explained.

Outcomes:

At the end of this course the student can able to:

- Understand the structure of commercially available digital integrated circuit families.
- Learn the IEEE Standard 1076 Hardware Description Language (VHDL).
- Model complex digital systems at several levels of abstractions, behavioral, structural, simulation, synthesis and rapid system prototyping.
- Analyze and design basic digital circuits with combinatorial and sequential logic circuits using VHDL.

Syllabus:

UNIT-I

Digital Logic Families and Interfacing: Introduction to logic families, CMOS logic, CMOS steady state and dynamic electrical behavior, CMOS logic families. Bipolar logic, transistor-transistor logic, TTL families, CMOS/TTL interfacing, low voltage CMOS logic and interfacing, Emitter coupled logic.

(Text book-1)

UNIT-II

Introduction to VHDL: Design flow, program structure, levels of abstraction, Elements of VHDL: Data types, data objects, operators and identifiers. Packages, Libraries and Bindings, Subprograms. VHDL Programming using structural and data flow modeling.

(Text book-2)

UNIT-III

Behavioral Modeling: Process statement, variable assignment statement, signal assignment statement, wait statement, if statement, case statement, null statement, loop statement, exit statement, next statement, assertion statement, more on signal assignment statement, Inertial Delay Model, Transport Delay Model, Creating Signal Waveforms, Signal Drivers, Other Sequential Statements, Multiple Processes. Logic Synthesis, Inside a logic Synthesizer.

(Text book-2)

UNIT-IV

Combinational Logic Design: Binary Adder-Subtractor, Ripple Adder, Look Ahead Carry Generator, ALU, Decoders, encoders, multiplexers and demultiplexers, parity circuits, comparators, Barrel Shifter, Simple Floating-Point Encoder, Dual Priority Encoder, Design considerations of the above combinational logic circuits with relevant Digital ICs, modeling of above ICs using VHDL.

(Text book-1)

UNIT-V

Sequential Logic Design: SSI Latches and flip flops, Ring Counter, Johnson Counter, Design of Modulus N Synchronous Counters, Shift Registers, Universal Shift Registers, Design considerations of the above sequential logic circuits with relevant Digital ICs, modeling of above ICs using VHDL.

(Text book-1)

UNIT-VI:

Synchronous and Asynchronous Sequential Circuits: Basic design steps: State diagram, state table, state assignment, choice of flip flops and derivation of next state and output expressions, timing diagram. State assignment problem: One hot encoding. Mealy and Moore type FSM for serial adder, VHDL code for the serial adder. Analysis of Asynchronous circuits, State Reduction, State Assignment. A complete design example: The vending machine controller.

(Reference text book- 1)

Text Books:

1. Digital Design Principles & Practices – John F. Wakerly, PHI/ Pearson Education Asia, 3rd Ed., 2005.
2. VHDL Primer – J. Bhasker, Pearson Education/ PHI, 3rd Edition.

References:

1. Fundamentals of Digital Logic with VHDL Design- Stephen Brown, Zvonko Vranesic, McGrawHill, 3rd Edition.

III Year - I Semester

L	T	P	C
4	0	0	3

DIGITAL COMMUNICATIONS

UNIT I

PULSE DIGITAL MODULATION: Elements of digital communication systems, advantages of digital communication systems, Elements of PCM: Sampling, Quantization & Coding, Quantization error, Companding in PCM systems. Differential PCM systems (DPCM). Delta modulation, its draw backs, adaptive delta modulation, comparison of PCM and DM systems, noise in PCM and DM systems.

UNIT II

DIGITAL MODULATION TECHNIQUES: Introduction, ASK, FSK, PSK, DPSK, DEPSK, QPSK, M-ary PSK, ASK, FSK, similarity of BFSK and BPSK.

UNIT III

DATA TRANSMISSION : Base band signal receiver, probability of error, the optimum filter, matched filter, probability of error using matched filter, coherent reception, non-coherent detection of FSK, calculation of error probability of ASK, BPSK, BFSK, QPSK.

UNIT IV

INFORMATION THEORY: Discrete messages, concept of amount of information and its properties. Average information, Entropy and its properties. Information rate, Mutual information and its properties.

UNIT V

SOURCE CODING: Introductions, Advantages, Shannon's theorem, Shannon-Fano coding, Huffman coding, efficiency calculations, channel capacity of discrete and analog Channels, capacity of a Gaussian channel, bandwidth –S/N trade off.

UNIT VI

LINEAR BLOCK CODES: Introduction, Matrix description of Linear Block codes, Error detection and error correction capabilities of Linear block codes, Hamming codes, Binary cyclic codes, Algebraic structure, encoding, syndrome calculation, BCH Codes.

CONVOLUTION CODES: Introduction, encoding of convolution codes, time domain approach, transform domain approach. Graphical approach: state, tree and trellis diagram decoding using Viterbi algorithm.

TEXT BOOKS:

1. Digital communications - Simon Haykin, John Wiley, 2005
2. Principles of Communication Systems – H. Taub and D. Schilling, TMH, 2003

REFERENCES:

1. Digital and Analog Communication Systems - Sam Shanmugam, John Wiley, 2005.
2. Digital Communications – John Proakis, TMH, 1983. Communication Systems Analog & Digital – Singh & Sapre, TMH, 2004.
3. Modern Analog and Digital Communication – B.P.Lathi, Oxford reprint, 3rd edition, 2004.

Students undergoing this course are expected to:

Course Objectives:

1. Understand different pulse digital modulation techniques and their comparison
2. Familiarize various digital modulation techniques and calculation of their error probabilities
3. Understand the concept of entropy and different source coding techniques
4. Familiarize with block codes, cyclic codes and convolutional codes

Course Outcomes:

After undergoing the course students will be able to:

1. Determine the performance of different waveform coding techniques for the generation and digital representation of the signals.
2. Determine the probability of error for various digital modulation schemes
3. Analyze different source coding techniques
4. Compute and analyze different error control coding schemes for the reliable transmission of digital information over the channel.

III Year - I Semester

L	T	P	C
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ANTENNA AND WAVE PROPAGATION

OBJECTIVES

The student will be able to

- understand the applications of the electromagnetic waves in free space.
- introduce the working principles of various types of antennas
- discuss the major applications of antennas with an emphasis on how antennas are employed to meet electronic system requirements.
- understand the concepts of radio wave propagation in the atmosphere.

UNIT I

ANTENNA FUNDAMENTALS: Introduction, Radiation Mechanism – single wire, 2 wire, dipoles, Current Distribution on a thin wire antenna. Antenna Parameters - Radiation Patterns, Patterns in Principal Planes, Main Lobe and Side Lobes, Beamwidths, Polarization, Beam Area, Radiation Intensity, Beam Efficiency, Directivity, Gain and Resolution, Antenna Apertures, Aperture Efficiency, Effective Height, illustrated Problems.

UNIT II

THIN LINEAR WIRE ANTENNAS: Retarded Potentials, Radiation from Small Electric Dipole, Quarter wave Monopole and Half wave Dipole – Current Distributions, Evaluation of Field Components, Power Radiated, Radiation Resistance, Beamwidths, Directivity, Effective Area and Effective Height. Natural current distributions, fields and patterns of Thin Linear Center-fed Antennas of different lengths, Radiation Resistance at a point which is not current maximum. Antenna Theorems – Applicability and Proofs for equivalence of directional characteristics, Loop Antennas: Small Loops - Field Components, Comparison of far fields of small loop and short dipole, Concept of short magnetic dipole, D and R_r relations for small loops.

UNIT III

ANTENNA ARRAYS : 2 element arrays – different cases, Principle of Pattern Multiplication, N element Uniform Linear Arrays – Broadside, End-fire Arrays, EFA with Increased Directivity, Derivation of their characteristics and comparison; Concept of Scanning Arrays. Directivity Relations (no derivations). Related Problems. Binomial Arrays, Effects of Uniform and Non-uniform Amplitude Distributions, Design Relations. Arrays with Parasitic Elements, Yagi-Uda Arrays, Folded Dipoles and their characteristics.

UNIT IV

NON-RESONANT RADIATORS : Introduction, Traveling wave radiators – basic concepts, Long wire antennas – field strength calculations and patterns, Microstrip Antennas-Introduction, Features, Advantages and Limitations, Rectangular Patch Antennas –Geometry and Parameters, Impact of different parameters on characteristics. Broadband Antennas: Helical Antennas – Significance, Geometry, basic properties; Design considerations for monofilar helical antennas in Axial Mode and Normal Modes (Qualitative Treatment).

UNIT V

VHF, UHF AND MICROWAVE ANTENNAS : Reflector Antennas : Flat Sheet and Corner Reflectors. Paraboloidal Reflectors – Geometry, characteristics, types of feeds, F/D Ratio, Spill Over, Back Lobes, Aperture Blocking, Off-set Feeds, Cassegrain Feeds.

Horn Antennas – Types, Optimum Horns, Design Characteristics of Pyramidal Horns; Lens Antennas – Geometry, Features, Dielectric Lenses and Zoning, Applications, Antenna Measurements – Patterns Required, Set Up, Distance Criterion, Directivity and Gain Measurements (Comparison, Absolute and 3-Antenna Methods).

UNIT VI

WAVE PROPAGATION : Concepts of Propagation – frequency ranges and types of propagations. Ground Wave Propagation–Characteristics, Parameters, Wave Tilt, Flat and Spherical Earth Considerations. Sky Wave Propagation – Formation of Ionospheric Layers and their Characteristics, Mechanism of Reflection and Refraction, Critical Frequency, MUF and Skip Distance – Calculations for flat and spherical earth cases, Optimum Frequency, LUHF, Virtual Height, Ionospheric Abnormalities, Ionospheric Absorption.

Fundamental Equation for Free-Space Propagation, Basic Transmission Loss Calculations. Space Wave Propagation – Mechanism, LOS and Radio Horizon. Tropospheric Wave Propagation – Radius of Curvature of path, Effective Earth's Radius, Effect of Earth's Curvature, Field Strength Calculations, M-curves and Duct Propagation, Tropospheric Scattering.

TEXT BOOKS

1. Antennas for All Applications – John D. Kraus and Ronald J. Marhefka, 3rd Edition, TMH, 2003.
2. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2nd Edition, 2000.

REFERENCES

1. Antenna Theory - C.A. Balanis, John Wiley and Sons, 2nd Edition, 2001.
2. Antennas and Wave Propagation – K.D. Prasad, Satya Prakashan, Tech India Publications, New Delhi, 2001.
3. Transmission and Propagation – E.V.D. Glazier and H.R.L. Lamont, The Services Text Book of Radio, vol. 5, Standard Publishers Distributors, Delhi.
4. Electronic and Radio Engineering – F.E. Terman, McGraw-Hill, 4th Edition, 1955.
5. Antennas – John D. Kraus, McGraw-Hill, 2nd Edition, 1988.

OUTCOMES

After going through this course the student will be able to

- Identify basic antenna parameters.
- Design and analyze wire antennas, loop antennas, reflector antennas, lens antennas, horn antennas and microstrip antennas
- Quantify the fields radiated by various types of antennas
- Design and analyze antenna arrays
- Analyze antenna measurements to assess antenna's performance
- Identify the characteristics of radio wave propagation

III Year - I Semester

L	T	P	C
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PULSE & DIGITAL CIRCUITS LAB

- 1. Linear wave shaping.**
- 2. Non Linear wave shaping – Clippers.**
- 3. Non Linear wave shaping – Clampers.**
- 4. Transistor as a switch.**
- 5. Study of Logic Gates & Some applications.**
- 6. Study of Flip-Flops & some applications.**
- 7. Sampling Gates.**
- 8. Astable Multivibrator.**
- 9. Monostable Multivibrator.**
- 10. Bistable Multivibrator.**
- 11. Schmitt Trigger.**
- 12. UJT Relaxation Oscillator.**
- 13. Bootstrap sweep circuit.**

Equipment required for Laboratory:

- 1. RPS - 0 – 30 V**
- 2. CRO - 0 – 20 M Hz.**
- 3. Function Generators - 0 – 1 M Hz**
- 4. Components**
- 5. Multi Meters**

III Year - I Semester

L	T	P	C
0	0	3	2

L IC APPLICATIONS LAB

Minimum Twelve Experiments to be conducted :

1. Study of OP AMPs – IC 741, IC 555, IC 565, IC 566, IC 1496 – functioning, parameters and Specifications.
2. OP AMP Applications – Adder, Subtractor, Comparator Circuits.
3. Integrator and Differentiator Circuits using IC 741.
4. Active Filter Applications – LPF, HPF (first order)
5. Active Filter Applications – BPF, Band Reject (Wideband) and Notch Filters.
6. IC 741 Oscillator Circuits – Phase Shift and Wien Bridge Oscillators.
7. Function Generator using OP AMPs.
8. IC 555 Timer – Monostable Operation Circuit.
9. IC 555 Timer – Astable Operation Circuit.
10. Schmitt Trigger Circuits – using IC 741 and IC 555.
11. IC 565 – PLL Applications.
12. IC 566 – VCO Applications.
13. Voltage Regulator using IC 723.
14. Three Terminal Voltage Regulators – 7805, 7809, 7912.

Equipment required for Laboratories:

1. RPS
2. CRO
3. Function Generator
4. Multi Meters
5. IC Trainer Kits (Optional)
6. Bread Boards
7. Components:- IC741, IC555, IC565, IC1496, IC723, 7805, 7809, 7912 and other essential components.
8. Analog IC Tester

III Year - I Semester

L	T	P	C
0	0	3	2

DICA LABORATORY

Note: The students are required to design and draw the internal logical structure of the following Digital Integrated Circuits and to develop VHDL/Verilog HDL Source code, perform simulation using relevant simulator and analyze the obtained simulation results using necessary synthesizer.

All the experiments are required to verify and implement the logical operations on the latest FPGA Hardware in the Laboratory.

List of Experiments :(Minimum of Ten Experiments has to be performed)

1. Realization of Logic Gates
2. Design of Full Adder using 3 modeling systems
3. 3 to 8 Decoder -74138
4. 8 to 3 Encoder (with and without parity)
5. 8 x 1 Multiplexer-74151 and 2x 4 De-multiplexer-74155
6. 4- Bit comparator-7485
7. D Flip-Flop-7474
8. Decade counter -7490
9. Shift registers-7495
10. 8-bit serial in-parallel out and parallel in-serial out
11. Fast In & Fast Out (FIFO)
12. MAC (Multiplier & Accumulator)
13. ALU Design.

Equipment/Software required:

1. Xilinx Vivado software / Equivalent Industry Standard Software
2. Xilinx Hardware / Equivalent hardware
3. Personal computer system with necessary software to run the programs and Implement.

III Year - I Semester

L	T	P	C
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PROFESSIONAL ETHICS AND HUMAN VALUES

Course Objectives:

***To give basic insights and inputs to the student to inculcate Human values to grow as a responsible human beings with proper personality.**

***Professional Ethics instills the student to maintain ethical conduct and discharge their professional duties.**

UNIT I: Human Values:

Morals, Values and Ethics – Integrity – Trustworthiness - Work Ethics – Service Learning – Civic Virtue – Respect for others – Living Peacefully – Caring – Sharing – Honesty – Courage – Value Time – Co-operation – Commitment – Empathy – Self-confidence – Spirituality- Character.

UNIT II: Principles for Harmony:

Truthfulness – Customs and Traditions - Value Education – Human Dignity – Human Rights – Fundamental Duties - Aspirations and Harmony (I, We & Nature) – Gender Bias - Emotional Intelligence – Salovey – Mayer Model – Emotional Competencies – Conscientiousness.

UNIT III: Engineering Ethics and Social Experimentation:

History of Ethics - Need of Engineering Ethics - Senses of Engineering Ethics- Profession and Professionalism — Self Interest - Moral Autonomy – Utilitarianism – Virtue Theory - Uses of Ethical Theories - Deontology- Types of Inquiry – Kohlberg’s Theory - Gilligan’s Argument – Heinz’s Dilemma - Comparison with Standard Experiments — Learning from the Past – Engineers as Managers – Consultants and Leaders – Balanced Outlook on Law - Role of Codes – Codes and Experimental Nature of Engineering.

UNIT IV: Engineers’ Responsibilities towards Safety and Risk:

Concept of Safety - Safety and Risk – Types of Risks – Voluntary v/s Involuntary Risk – Consequences - Risk Assessment – Accountability – Liability - Reversible Effects - Threshold Levels of Risk - Delayed v/s Immediate Risk - Safety and the Engineer – Designing for Safety – Risk-Benefit Analysis-Accidents.

UNIT V: Engineers’ Duties and Rights:

Concept of Duty - Professional Duties – Collegiality - Techniques for Achieving Collegiality – Senses of Loyalty - Consensus and Controversy - Professional and Individual Rights – Confidential and Proprietary Information - Conflict of Interest-Ethical egoism - Collective Bargaining – Confidentiality - Gifts and Bribes - Problem solving- Occupational Crimes- Industrial Espionage- Price Fixing-Whistle Blowing.

UNIT VI: Global Issues:

Globalization and MNCs – Cross Culture Issues - Business Ethics – Media Ethics - Environmental Ethics – Endangering Lives - Bio Ethics - Computer Ethics - War Ethics – Research Ethics - Intellectual Property Rights.

- Related Cases Shall be dealt where ever necessary.

Outcome:

***It gives a comprehensive understanding of a variety issues that are encountered by every professional in discharging professional duties.**

***It provides the student the sensitivity and global outlook in the contemporary world to fulfill the professional obligations effectively.**

References:

1. Professional Ethics by R. Subramaniam – Oxford Publications, New Delhi.
2. Ethics in Engineering by Mike W. Martin and Roland Schinzinger - Tata McGraw-Hill – 2003.
3. Professional Ethics and Morals by Prof.A.R.Aryasri, DharanikotaSuyodhana - Maruthi Publications.
4. Engineering Ethics by Harris, Pritchard and Rabins, Cengage Learning, New Delhi.
5. Human Values & Professional Ethics by S. B. Gogate, Vikas Publishing House Pvt. Ltd., Noida.
6. Engineering Ethics & Human Values by M.Govindarajan, S.Natarajan and V.S.SenthilKumar-PHI Learning Pvt. Ltd – 2009.
7. Professional Ethics and Human Values by A. Alavudeen, R.Kalil Rahman and M. Jayakumaran – University Science Press.
8. Professional Ethics and Human Values by Prof.D.R.Kiran-Tata McGraw-Hill - 2013
9. Human Values And Professional Ethics by Jayshree Suresh and B. S. Raghavan, S.Chand Publications

III Year - II Semester

L	T	P	C
4	0	0	3

MICROPROCESSORS AND MICROCONTROLLERS

UNIT-I:

8086 ARCHITECTURE: Main features, pin diagram/description, 8086 microprocessor family, 8086 internal architecture, bus interfacing unit, execution unit, interrupts and interrupt responses, 8086 system timing, minimum mode and maximum mode configuration.

UNIT-II:

8086 PROGRAMMING: Program development steps, instructions, addressing modes, assembler directives, writing simple programs with an assembler, assembly language program development tools.

UNIT-III:

8086 INTERFACING : Semiconductor memories interfacing (RAM,ROM), 8254 software programmable timer/counter, Intel 8259 programmable interrupt controller, software and hardware interrupt applications, Intel 8237a DMA controller, Intel 8255 programmable peripheral interface, keyboard interfacing, alphanumeric displays (LED,7-segment display, multiplexed 7-segment display, LCD), Intel 8279 programmable keyboard/display controller, stepper motor, A/D and D/A converters.

UNIT-IV:

80386 AND 80486 MICROPROCESSORS: Introduction, programming concepts, special purpose registers, memory organization, moving to protected mode, virtual mode, memory paging mechanism, architectural differences between 80386 and 80486 microprocessors.

UNIT-V:

Intel 8051 MICROCONTROLLER: Architecture, hardware concepts, input/output ports and circuits, external memory, counters/timers, serial data input/output, interrupts.

Assembly language programming: Instructions, addressing modes, simple programs.

Interfacing: keyboard, displays (LED, 7-segment display unit), A/D and D/A converters.

UNIT-VI:

PIC MICROCONTROLLER: Introduction, characteristics of PIC microcontroller, PIC microcontroller families, memory organization, parallel and serial input and output, timers, Interrupts, PIC 16F877 architecture, instruction set of the PIC 16F877.

Text Books:

1. Microprocessors and Interfacing – Programming and Hardware by Douglas V Hall, SSSP Rao, Tata McGraw Hill Education Private Limited, 3rd Edition.
2. The 8051 Microcontroller & Embedded Systems Using Assembly and C by Kenneth J.Ayala, Dhananjay V.Gadre,Cengage Learning , India Edition.

References:

1. The Intel Microprocessors-Architecture, Programming, and Interfacing by Barry B.Brey, Pearson, Eighth Edition-2012.
2. Microprocessors and Microcontrollers-Architecture, Programming and System Design by Krishna Kant, PHI Learning Private Limited, Second Edition, 2014.
3. Microprocessors and Microcontrollers by N.Senthil Kumar, M.Saravanan and S.Jeevananthan, Oxford University Press, Seventh Impression 2013

III Year - II Semester

L	T	P	C
4	0	0	3

MICROWAVE ENGINEERING

OBJECTIVES

The student will

- Understand fundamental characteristics of waveguides and Microstrip lines through electromagnetic field analysis.
- Understand the basic properties of waveguide components and Ferrite materials composition
- Understand the function, design, and integration of the major microwave components oscillators, power amplifier.
- Understand a Microwave test bench setup for measurements.

UNIT I

MICROWAVE TRANSMISSION LINES: Introduction, Microwave Spectrum and Bands, Applications of Microwaves. Rectangular Waveguides – TE/TM mode analysis, Expressions for Fields, Characteristic Equation and Cut-off Frequencies, Filter Characteristics, Dominant and Degenerate Modes, Sketches of TE and TM mode fields in the cross-section, Mode Characteristics – Phase and Group Velocities, Wavelengths and Impedance Relations; Power Transmission and Power Losses in Rectangular Guide, Impossibility of TEM mode. Related Problems.

UNIT II

CIRCULAR WAVEGUIDES: Introduction, Nature of Fields, Characteristic Equation, Dominant and Degenerate Modes.

Cavity Resonators– Introduction, Rectangular and Cylindrical Cavities, Dominant Modes and Resonant Frequencies, Q factor and Coupling Coefficients, Excitation techniques- waveguides and cavities, Related Problems.

MICROSTRIP LINES– Introduction, Zo Relations, Effective Dielectric Constant, Losses, Q factor.

UNIT III

MICROWAVE TUBES :Limitations and Losses of conventional tubes at microwave frequencies. Re-entrant Cavities, Microwave tubes – O type and M type classifications. O-type tubes :2 Cavity Klystrons – Structure, Velocity Modulation Process and Applegate Diagram, Bunching Process and Small Signal Theory –Expressions for o/p Power and Efficiency, Applications, Reflex Klystrons – Structure, Applegate Diagram and Principle of working, Mathematical Theory of Bunching, Power Output, Efficiency, Electronic Admittance; Oscillating Modes and o/p Characteristics, Electronic and Mechanical Tuning, Applications, Related Problems.

UNIT - IV

HELIX TWTS: Significance, Types and Characteristics of Slow Wave Structures; Structure of TWT and Suppression of Oscillations, Nature of the four Propagation Constants(Qualitative treatment).

M-type Tubes

Introduction, Cross-field effects, Magnetrons – Different Types, 8-Cavity Cylindrical Travelling Wave Magnetron – Hull Cut-off Condition, Modes of Resonance and PI-Mode Operation, Separation of PI-Mode, o/p characteristics.

UNIT V

WAVEGUIDE COMPONENTS AND APPLICATIONS - I :Coupling Mechanisms – Probe, Loop, Aperture types. Waveguide Discontinuities – Waveguide irises, Tuning Screws and Posts, Matched Loads. Waveguide Attenuators – Resistive Card, Rotary Vane types; Waveguide Phase Shifters – Dielectric, Rotary Vane types. Scattering Matrix– Significance, Formulation and Properties. S-Matrix Calculations for – 2 port Junction, E-plane and H-plane Tees, Magic Tee, Hybrid Ring; Directional Couplers – 2Hole, Bethe Hole types, Ferrite Components– Faraday Rotation, S-Matrix Calculations for Gyrator, Isolator, Circulator, Related Problems.

UNIT VI

MICROWAVE SOLID STATE DEVICES: Introduction, Classification, Applications. TEDs – Introduction, Gunn Diode – Principle, RWH Theory, Characteristics, Basic Modes of Operation, Oscillation Modes. Avalanche Transit Time Devices – Introduction, IMPATT and TRAPATT Diodes – Principle of Operation and Characteristics. **MICROWAVE MEASUREMENTS:** Description of Microwave Bench – Different Blocks and their Features, Precautions; Microwave Power Measurement – Bolometer Method. Measurement of Attenuation, Frequency, Q-factor, Phase shift, VSWR, Impedance Measurement.

TEXT BOOKS:

1. Microwave Devices and Circuits – Samuel Y. Liao, PHI, 3rd Edition, 1994.
2. Foundations for Microwave Engineering – R.E. Collin, IEEE Press, John Wiley, 2nd Edition, 2002.

REFERENCES:

1. Microwave Principles – Herbert J. Reich, J.G. Skalnik, P.F. Ordung and H.L. Krauss, CBS Publishers and Distributors, New Delhi, 2004
2. Microwave Engineering- Annapurna Das and Sisir K.Das, Mc Graw Hill Education, 3rd Edition.
3. Microwave and Radar Engineering-M.Kulkarni, Umesh Publications, 3rd Edition.
4. Microwave Engineering – G S N Raju , I K International
5. Microwave and Radar Engineering – G Sasibhushana Rao Pearson

OUTCOMES : After going through this course the student will be able to

- Design different modes in waveguide structures
- Calculate S-matrix for various waveguide components and splitting the microwave energy in a desired direction
- Distinguish between Microwave tubes and Solid State Devices, calculation of efficiency of devices.
- Measure various microwave parameters using a Microwave test bench

III Year - II Semester

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VLSI DESIGN

Objectives:

The main objectives of this course are:

- Basic characteristics of MOS transistor and examines various possibilities for configuring inverter circuits and aspects of latch-up are considered.
- Design processes are aided by simple concepts such as stick and symbolic diagrams but the key element is a set of design rules, which are explained clearly.
- Basic circuit concepts are introduced for MOS processes we can set out approximate circuit parameters which greatly ease the design process.

Outcomes:

At the end of this course the student can able to:

- Understand the properties of MOS active devices and simple circuits configured when using them and the reason for such encumbrances as ratio rules by which circuits can be interconnected in silicon.
- Know three sets of design rules with which nMOS and CMOS designs may be fabricated.
- Understand the scaling factors determining the characteristics and performance of MOS circuits in silicon.

Syllabus:

UNIT-I:

Introduction and Basic Electrical Properties of MOS Circuits: Introduction to IC technology, Fabrication process: nMOS, pMOS and CMOS. I_{ds} versus V_{ds} Relationships, Aspects of MOS transistor Threshold Voltage, MOS transistor Trans, Output Conductance and Figure of Merit. nMOS Inverter, Pull-up to Pull-down Ratio for nMOS inverter driven by another nMOS inverter, and through one or more pass transistors. Alternative forms of pull-up, The CMOS Inverter, Latch-up in CMOS circuits, Bi-CMOS Inverter, Comparison between CMOS and BiCMOS technology.

(Text Book-1)

UNIT-II:

MOS and Bi-CMOS Circuit Design Processes: MOS Layers, Stick Diagrams, Design Rules and Layout, General observations on the Design rules, $2\mu\text{m}$ Double Metal, Double Poly, CMOS/BiCMOS rules, $1.2\mu\text{m}$ Double Metal, Double Poly CMOS rules, Layout Diagrams of NAND and NOR gates and CMOS inverter, Symbolic Diagrams-Translation to Mask Form.

(Text Book-1)

UNIT-III:

Basic Circuit Concepts: Sheet Resistance, Sheet Resistance concept applied to MOS transistors and Inverters, Area Capacitance of Layers, Standard unit of capacitance, Some area Capacitance Calculations, The Delay Unit, Inverter Delays, Driving large capacitive loads, Propagation Delays, Wiring Capacitances, Choice of layers.

Scaling of MOS Circuits: Scaling models and scaling factors, Scaling factors for device parameters, Limitations of scaling, Limits due to sub threshold currents, Limits on logic levels and supply voltage due to noise and current density. Switch logic, Gate logic.

(Text Book-1)

UNIT-IV:

Chip Input and Output circuits: ESD Protection, Input Circuits, Output Circuits and L(di/dt) Noise, On-Chip clock Generation and Distribution.

Design for Testability: Fault types and Models, Controllability and Observability, Ad Hoc Testable Design Techniques, Scan Based Techniques and Built-In Self Test techniques.

(Text Book-2)

UNIT-V:

FPGA Design: FPGA design flow, Basic FPGA architecture, FPGA Technologies, FPGA families- Altera Flex 8000FPGA, Altera Flex 10FPGA, Xilinx XC4000 series FPGA, Xilinx Spartan XL FPGA, Xilinx Spartan II FPGAs, Xilinx Vertex FPGA. Case studies: FPGA Implementation of Half adder and full adder.

Introduction to synthesis: Logic synthesis, RTL synthesis, High level Synthesis.

(Reference Text Book-1)

UNIT-VI:

Introduction to Low Power VLSI Design: Introduction to Deep submicron digital IC design, Low Power CMOS Logic Circuits: Over view of power consumption, Low –power design through voltage scaling, Estimation and optimisation of switching activity, Reduction of switching capacitance. Interconnect Design, Power Grid and Clock Design.

(Text Book-2)

Text Books:

1. Essentials of VLSI Circuits and Systems - Kamran Eshraghian, Douglas and A. Pucknell and Sholeh Eshraghian, Prentice-Hall of India Private Limited, 2005 Edition.
2. CMOS Digital Integrated Circuits Analysis and Design- Sung-Mo Kang, Yusuf Leblebici, Tata McGraw-Hill Education, 2003.

References:

1. Advanced Digital Design with the Verilog HDL, Michael D.Ciletti, Xilinx Design Series, Pearson Education
2. Analysis and Design of Digital Integrated Circuits in Deep submicron Technology, 3rd edition, David Hodges.

III Year - II Semester

L	T	P	C
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DIGITAL SIGNAL PROCESSING

OBJECTIVES

The student will be able to

- Analyze the Discrete Time Signals and Systems
- Know the importance of FFT algorithm for computation of Discrete Fourier Transform
- Understand the various implementations of digital filter structures
- Learn the FIR and IIR Filter design procedures
- Know the need of Multirate Processing
- Learn the concepts of DSP Processors

UNIT I INTRODUCTION: Introduction to Digital Signal Processing: Discrete time signals & sequences, Classification of Discrete time systems, stability of LTI systems, Invertability, Response of LTI systems to arbitrary inputs. Solution of Linear constant coefficient difference equations. Frequency domain representation of discrete time signals and systems. Review of Z-transforms, solution of difference equations using Z-transforms, System function.

UNIT II DISCRETE FOURIER SERIES & FOURIER TRANSFORMS: Properties of discrete Fourier series, DFS representation of periodic sequences, Discrete Fourier transforms: Properties of DFT, linear filtering methods based on DFT, Fast Fourier transforms (FFT) - Radix-2 decimation in time and decimation in frequency FFT Algorithms, Inverse FFT.

UNIT III. DESIGN OF IIR DIGITAL FILTERS& REALIZATIONS: Analog filter approximations – Butter worth and Chebyshev, Design of IIR Digital filters from analog filters, Design Examples, Analog and Digital frequency transformations. Basic structures of IIR systems, Transposed forms.

UNIT IV DESIGN OF FIR DIGITAL FILTERS & REALIZATIONS:

Characteristics of FIR Digital Filters, frequency response. Design of FIR Digital Filters using Window Techniques and Frequency Sampling technique, Comparison of IIR & FIR filters.

Basic structures of FIR systems, *Lattice structures, Lattice-ladder structures*

UNIT V MULTIRATE DIGITAL SIGNAL PROCESSING: Introduction, Decimation, Interpolation Sampling rate conversion, Implementation of sampling rate converters, *Applications – Sub-band Coding of Speech Signals, Implementation of Digital Filter Banks, Trans-multiplexers.*

UNIT VI INTRODUCTION TO DSP PROCESSORS: Introduction to programmable DSPs: Multiplier and Multiplier Accumulator, Modified bus structures and memory access schemes in P-DSPs, Multiple Access Memory, Multiported memory, VLIW architecture, Pipelining, Special addressing modes, On-Chip Peripherals. Architecture of TMS320C5X: Introduction, Bus Structure, Central Arithmetic Logic Unit, Auxiliary Register ALU, Index Register, Block Move Address Register, Parallel Logic Unit, Memory mapped registers, program controller, some flags in the status registers, On-chip memory, On-chip peripherals.

TEXT BOOKS:

1. Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis, Dimitris G.Manolakis,Pearson Education / PHI, 2007.
2. Discrete Time Signal Processing – A.V.Oppenheim and R.W. Schaffer, PHI
3. Digital Signal Processors – Architecture, Programming and Applications,, B.Venkataramani, M.Bhaskar, TATA McGraw Hill, 2002
4. Digital Signal Processing – K Raja Rajeswari, I.K. International Publishing House

Reference Books:

1. Digital Signal Processing: Andreas Antoniou, TATA McGraw Hill , 2006
2. Digital Signal Processing: MH Hayes, Schaum's Outlines, TATA Mc-Graw Hill, 2007.
3. DSP Primer - C. Britton Rorabaugh, Tata McGraw Hill, 2005.
4. Fundamentals of Digital Signal Processing using Matlab – Robert J. Schilling, Sandra L. Harris,Thomson, 2007.
5. Digital Signal Processing – Alan V. Oppenheim, Ronald W. Schafer, PHI Ed., 2006
6. Digital Signal Processing – Ramesh babu, Sci Tech publications

OUTCOMES

After going through this course the student will be able to

- Apply the difference equations concept in the anayziation of Discrete time systems
- Use the FFT algorithm for solving the DFT of a given signal
- Design a Digital filter (FIR&IIR) from the given specifications
- Realize the FIR and IIR structures from the designed digital filter.
- Use the Multirate Processing concepts in various applications(eg: Design of phase shifters, Interfacing of digital systems...)
- Apply the signal processing concepts on DSP Processor.

III Year - II Semester

L	T	P	C
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**OOPS THROUGH JAVA
OPEN ELECTIVE**

OBJECTIVES:

- Understanding the OOP's concepts, classes and objects, threads, files, applets, swings and act.
- This course introduces computer programming using the JAVA programming language with object-oriented programming principles.
- Emphasis is placed on event-driven programming methods, including creating and manipulating objects, classes, and using Java for network level programming and middleware development

UNIT-I:

Introduction to OOP, procedural programming language and object oriented language, principles of OOP, applications of OOP, history of java, java features, JVM, program structure.

Variables, primitive data types, identifiers, literals, operators, expressions, precedence rules and associativity, primitive type conversion and casting, flow of control.

UNIT-II:

Classes and objects, class declaration, creating objects, methods, constructors and constructor overloading, garbage collector, importance of static keyword and examples, this keyword, arrays, command line arguments, nested classes.

UNIT-III:

Inheritance, types of inheritance, super keyword, final keyword, overriding and abstract class.

Interfaces, creating the packages, using packages, importance of CLASSPATH and java.lang package. Exception handling, importance of try, catch, throw, throws and finally block, user-defined exceptions, Assertions.

UNIT-IV:

Multithreading: introduction, thread life cycle, creation of threads, thread priorities, thread synchronization, communication between threads. Reading data from files and writing data to files, random access file,

UNIT-V:

Applet class, Applet structure, Applet life cycle, sample Applet programs. Event handling: event delegation model, sources of event, Event Listeners, adapter classes, inner classes.

UNIT-VI:

AWT: introduction, components and containers, Button, Label, Checkbox, Radio Buttons, List Boxes, Choice Boxes, Container class, Layouts, Menu and Scrollbar.

OUTCOMES:

- Understand Java programming concepts and utilize Java Graphical User Interface in Program writing.
- Write, compile, execute and troubleshoot Java programming for networking concepts.
- Build Java Application for distributed environment.
- Design and Develop multi-tier applications.

- Identify and Analyze Enterprise applications.

TEXT BOOKS:

1. The complete Reference Java, 8th edition, Herbert Schildt, TMH.
2. Programming in JAVA, Sachin Malhotra, Saurabh Choudary, Oxford.
3. Introduction to java programming, 7th edition by Y Daniel Liang, Pearson.

REFERENCE BOOKS:

1. Swing: Introduction, JFrame, JApplet, JPanel, Componets in Swings, Layout Managers in
2. Swings, JList and JScrollPane, Split Pane, JTabbedPane, JTree, JTable, Dialog Box.

DATA MINING OPEN ELECTIVE

OBJECTIVES:

- Students will be enabled to understand and implement classical models and algorithms in data warehousing and data mining.
- They will learn how to analyze the data, identify the problems, and choose the relevant models and algorithms to apply.
- They will further be able to assess the strengths and weaknesses of various methods and algorithms and to analyze their behavior.

UNIT –I

Introduction: Why Data Mining? What Is Data Mining? 1.3 What Kinds of Data Can Be Mined? 1.4 What Kinds of Patterns Can Be Mined? Which Technologies Are Used? Which Kinds of Applications Are Targeted? Major Issues in Data Mining. Data Objects and Attribute Types, Basic Statistical Descriptions of Data, Data Visualization, Measuring Data Similarity and Dissimilarity

UNIT –II

Data Pre-processing: Data Preprocessing: An Overview, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization

UNIT –III

Classification: Basic Concepts, General Approach to solving a classification problem, Decision Tree Induction: Working of Decision Tree, building a decision tree, methods for expressing an attribute test conditions, measures for selecting the best split, Algorithm for decision tree induction.

UNIT –IV

Classification: Alternative Techniques, Bayes' Theorem, Naïve Bayesian Classification, Bayesian Belief Networks

UNIT –V

Association Analysis: Basic Concepts and Algorithms: Problem Defecation, Frequent Item Set generation, Rule generation, compact representation of frequent item sets, FP-Growth Algorithm. **(Tan & Vipin)**

UNIT –VI

Cluster Analysis: Basic Concepts and Algorithms: Overview: What Is Cluster Analysis? Different Types of Clustering, Different Types of Clusters; K-means: The Basic K-means Algorithm, K-means Additional Issues, Bisecting K-means, Strengths and Weaknesses; Agglomerative Hierarchical Clustering: Basic Agglomerative Hierarchical Clustering Algorithm DBSCAN: Traditional Density Center-Based Approach, DBSCAN Algorithm, Strengths and Weaknesses. **(Tan & Vipin)**

OUTCOMES:

- Understand stages in building a Data Warehouse
- Understand the need and importance of preprocessing techniques
- Understand the need and importance of Similarity and dissimilarity techniques
- Analyze and evaluate performance of algorithms for Association Rules.
- Analyze Classification and Clustering algorithms

TEXT BOOKS:

1. Introduction to Data Mining: Pang-Ning Tan & Michael Steinbach, Vipin Kumar, Pearson.
2. Data Mining concepts and Techniques, 3/e, Jiawei Han, Michel Kamber, Elsevier.

REFERENCE BOOKS:

1. Data Mining Techniques and Applications: An Introduction, Hongbo Du, Cengage Learning.
2. Data Mining : Vikram Pudi and P. Radha Krishna, Oxford.
3. Data Mining and Analysis - Fundamental Concepts and Algorithms; Mohammed J. Zaki, Wagner Meira, Jr, Oxford
4. Data Warehousing Data Mining & OLAP, Alex Berson, Stephen Smith, TMH.

INDUSTRIAL ROBOTICS

OPEN ELECTIVE

Course Objectives:

1. To give students practice in applying their knowledge of mathematics, science, and Engineering and to expand this knowledge into the vast area of robotics.
2. The students will be exposed to the concepts of robot kinematics, Dynamics, Trajectory planning.
3. Mathematical approach to explain how the robotic arm motion can be described.
4. The students will understand the functioning of sensors and actuators.

UNIT-I

INTRODUCTION: Automation and Robotics, CAD/CAM and Robotics – An over view of Robotics – present and future applications – classification by coordinate system and control system.

UNIT – II

COMPONENTS OF THE INDUSTRIAL ROBOTICS: Function line diagram representation of robot arms, common types of arms. Components, Architecture, number of degrees of freedom – Requirements and challenges of end effectors, determination of the end effectors, comparison of Electric, Hydraulic and Pneumatic types of locomotion devices.

UNIT – III

MOTION ANALYSIS: Homogeneous transformations as applicable to rotation and translation – problems.

MANIPULATOR KINEMATICS: Specifications of matrices, D-H notation joint coordinates and world coordinates Forward and inverse kinematics – problems.

UNIT – IV

Differential transformation and manipulators, Jacobians – problems

Dynamics: Lagrange – Euler and Newton – Euler formulations – Problems.

UNIT V

General considerations in path description and generation. Trajectory planning and avoidance of obstacles, path planning, Skew motion, joint integrated motion –straight line motion – Robot programming, languages and software packages-description of paths with a robot programming language..

UNIT VI

ROBOT ACTUATORS AND FEED BACK COMPONENTS:

Actuators: Pneumatic, Hydraulic actuators, electric & stepper motors.

Feedback components: position sensors – potentiometers, resolvers, encoders – Velocity sensors.

ROBOT APPLICATIONS IN MANUFACTURING: Material Transfer - Material handling, loading and unloading- Processing - spot and continuous arc welding & spray painting - Assembly and Inspection.

TEXT BOOKS:

1. Industrial Robotics / Groover M P / Pearson Edu.
2. Robotics and Control / Mittal R K & Nagrath I J / TMH.

REFERENCES:

1. Robotics / Fu K S/ McGraw Hill.
2. Robotic Engineering / Richard D. Klafter, Prentice Hall
3. Robot Analysis and Control / H. Asada and J.J.E. Slotine / BSP Books Pvt.Ltd.
4. Introduction to Robotics / John J Craig / Pearson Edu.

Course outcomes:

Upon successful completion of this course you should be able to:

1. Identify various robot configuration and components,
2. Select appropriate actuators and sensors for a robot based on specific application
3. Carry out kinematic and dynamic analysis for simple serial kinematic chains
4. Perform trajectory planning for a manipulator by avoiding obstacles.

POWER ELECTRONICS

(Open Elective)

Preamble:

The usage of power electronics in day to day life has increased in recent years. It is important for student to understand the fundamental principles behind all these converters. This course covers characteristics of semiconductor devices, ac/dc, dc/dc, ac/ac and dc/ac converters. The importance of using pulse width modulated techniques to obtain high quality power supply (dc/ac converter) is also discussed in detail in this course.

Learning Objectives:

- To study the characteristics of various power semiconductor devices and to design firing circuits for SCR.
- To understand the operation of single phase half wave and full-wave converters
- To understand the operation of different types of DC-DC converters.
- To understand the operation of inverters and application of PWM techniques for voltage control and harmonic mitigation.
- To understand the operation of AC-AC converters and switch mode power supplies operation.

UNIT-I

Power Semi-Conductor Devices

Thyristors–Silicon controlled rectifiers (SCR's) – Characteristics of power MOSFET and power IGBT – Basic theory of operation of SCR–Static characteristics – Turn on and turn off methods–Dynamic characteristics of SCR – Snubber circuit design – Firing circuits for SCR

UNIT-II

AC-DC Single-Phase Converters

Single phase half wave controlled rectifiers – R load and RL load with and without freewheeling diode – Single Phase full wave controlled rectifiers – center tapped configuration and bridge configuration – R load and RL load with and without freewheeling diode – Effect of source inductance in 1-phase fully controlled bridge rectifier.

UNIT-III

DC-DC Converters

Buck Converter operation – Time ratio control and current limit control strategies–Voltage and current waveforms– Derivation of output voltage –Boost converter operation –Voltage and current waveforms–Derivation of output voltage – Buck-Boost converter operation –Voltage and current waveforms – Principle operation of forward and fly back converters

UNIT – IV

DC-AC Converters

Single phase inverters–Unipolar and bipolar switching – Single phase half bridge and full bridge inverters with R and RL loads – PWM techniques– Sine triangular PWM technique– amplitude and frequency modulation Indices – Harmonic analysis.

UNIT – V

AC – AC Single-Phase Converters

Static V-I characteristics of TRIAC and modes of operation – Single phase AC-AC regulator phase angle control and integrated cycle control with R and RL load – For continuous and discontinuous conduction – Principle of operation of Cyclo-Converters

UNIT – VI

Switch Mode Power Supplies

Overview of Switching Power Supplies – Linear Power Supplies – DC to DC converters with electrical isolation – Control of Switch Mode DC Supplies – PWM duty ratio control – Current mode control – Power Supply Protection

Learning Outcomes:

Student should be able to

- Explain the characteristics of various power semiconductor devices and analyse the static and dynamic characteristics of SCR's.
- Design firing circuits for SCR.
- Able to explain the operation of single phase half wave and full-wave converters
- Analyse the operation of different types of DC-DC converters.
- Explain the operation of inverters and application of PWM techniques for voltage control and harmonic mitigation.
- Analyse the operation of AC-AC converters.
- Able to explain switch mode power supplies operation and control

Text Books:

1. Power Electronics: Circuits, Devices and Applications – by M. H. Rashid, Prentice Hall of India, 2nd edition, 1998
2. Power Electronics: Essentials & Applications by L.Umanand, Wiley, Pvt. Limited, India, 2009

Reference Books:

1. Power Electronics: converters, applications & design -by Nedmohan, Tore M. Undeland, Robbins by Wiley India Pvt. Ltd.
2. Elements of Power Electronics–Philip T.Krein.oxford.
3. Power Electronics – by P.S.Bhimbra, Khanna Publishers.
4. Power Electronics handbook by Muhammad H.Rashid, Elsevier.
5. Power Converter Circuits -by William Shepherd, Li zhang, CRC Taylor & Francis Group.

**BIO-MEDICAL ENGINEERING
(OPEN ELECTIVE)**

UNIT-I:

INTRODUCTION TO BIOMEDICAL INSTRUMENTATION: Age of Biomedical Engineering, Development of Biomedical Instrumentation, Man Instrumentation System, Components of the Man-Instrument System, Physiological System of the Body, Problems Encountered in Measuring a Living System, Sources of Bioelectric Potentials, Muscle, Bioelectric Potentials, Sources of Bioelectric Potentials, Resting and Action Potentials, Propagation of Action Potential, Bioelectric Potentials-ECG, EEG and EMG, Evoked Responses.

UNIT-II:

ELECTRODES AND TRANSDUCERS: Introduction, Electrode Theory, Biopotential Electrodes, Examples of Electrodes, Basic Transducer Principles, Biochemical Transducers, The Transducer and Transduction Principles, Active Transducers, Passive Transducers, Transducers for Biomedical Applications, Pulse Sensors, Respiration Sensor, Transducers with Digital Output.

UNIT-III:

CARDIOVASCULAR SYSTEM AND MEASUREMENTS: The Heart and Cardiovascular System, Electro Cardiography, Blood Pressure Measurement, Measurement of Blood Flow and Cardiac Output, Measurement of Heart Sound, Plethysmography.

MEASUREMENTS IN THE RESPIRATORY SYSTEM: The Physiology of The Respiratory System, Tests and Instrumentation for The Mechanics of Breathing, Respiratory Therapy Equipment.

UNIT-IV:

PATIENT CARE AND MONITORING: Elements of Intensive-Care Monitoring, Patient Monitoring Displays, Diagnosis, Calibration and Repair ability of Patient-Monitoring Equipment, Other Instrumentation for Monitoring Patients, Organization of the Hospital for Patient-Care Monitoring, Pacemakers, Defibrillators, Radio Frequency Applications of Therapeutic use.

THERAPEUTIC AND PROSTHETIC DEVICES: Audiometers and Hearing Aids, Myoelectric Arm, Laparoscope, Ophthalmology Instruments, Anatomy of Vision, Electrophysiological Tests, Ophthalmoscope, Tonometer for Eye Pressure Measurement, Diathermy, Clinical Laboratory Instruments, Biomaterials, Stimulators.

UNIT-V:

DIAGNOSTIC TECHNIQUES AND BIO-TELEMETRY: Principles of Ultrasonic Measurement, Ultrasonic Imaging, Ultrasonic Applications of Therapeutic Uses, Ultrasonic Diagnosis, X-Ray and Radio-Isotope Instrumentations, CAT Scan, Emission Computerized Tomography, MRI, Introduction to Biotelemetry, Physiological Parameters Adaptable to Biotelemetry, The Components of Biotelemetry System, Implantable Units, Telemetry for ECG Measurements during Exercise, Telemetry for Emergency Patient Monitoring

UNIT-VI:

MONITORS, RECORDERS AND SHOCK HAZARDS: Biopotential Amplifiers, Monitors, Recorders, Shock Hazards and Prevention, Physiological Effects and Electrical Current, Shock Hazards from Electrical Equipment, Methods of Accident Prevention, Isolated Power Distribution System.

Text Books:

1. "Bio-Medical Electronics and Instrumentation", Onkar N. Pandey, Rakesh Kumar, Katson Books.
2. "Bio-Medical Instrumentation", Cromewell , Wiebell, Pfeiffer

References:

1. "Introduction to Bio-Medical Equipment Technology", 4th Edition, Joseph J. Carr, John M. Brown, Pearson Publications.
2. "Hand Book of Bio-Medical Instrumentation", Khandapur. McGrawHill

ARTIFICIAL NEURAL NETWORKS

OPEN ELECTIVE

Course Objectives:

1. To Introduce the concept of Artificial Neural Networks , Characteristics, Models of Neuron, Learning Rules, Learning Methods, Stability and Convergence
2. To study the basics of Pattern Recognition and Feed forward Neural Networks
3. To study the basics of Feedback neural networks and Boltzmann machine
4. To introduce the Analysis of Feedback layer for different output functions, Pattern Clustering and Mapping networks
5. To study the Stability, Plasticity, Neocognitron and Different applications of Neural Networks

UNIT-I : Basics of Artificial Neural Networks

Introduction: Biological Neural Networks, Characteristics of Neural Networks, Models of Neuron, Topology, Basic Learning Rules

Activation and Synaptic Dynamics: Activation Dynamic Models, Synaptic Dynamic Models, Learning Methods, Stability & Convergence, Recall in Neural Networks

UNIT-II: Functional Units of ANN for Pattern Recognition Tasks: Pattern Recognition problem Basic Fundamental Units, Pattern Recognition Tasks by the Functional Units

Feed forward Neural Networks: Analysis of Pattern Association Networks, Analysis of Pattern Classification Networks, Analysis of Pattern Mapping Networks

UNIT-III:

Feedback Neural Networks: Analysis of linear auto adaptive feed forward networks, Analysis of pattern storage Networks, Stochastic Networks & Stimulated Annealing, Boltzmann machine

UNIT-IV:

Competitive Learning Neural Networks: Components of a Competitive Learning Network, Analysis of Feedback layer for Different Output Functions, Analysis of Pattern Clustering Networks and Analysis of Feature Mapping Network

UNIT-V:

Architectures for Complex Pattern Recognition Tasks: Associative memory, Pattern mapping Stability – Plasticity dilemma: ART, temporal patterns, Pattern visibility: Neocognitron

UNIT-VI:

Applications of Neural Networks: Pattern classification, Associative memories, Optimization, Applications in Image Processing, Applications in decision making

Text Book

1. B.Yagnanarayana“Artificial Neural Networks”, PHI

Reference Book

1. Laurene Fausett ,“Fundamentals of Neural Networks”, Pearson Education
2. Simon Haykin , “Neural Networks”, Second Edition

Course Outcomes

1. This Course introduces Artificial Neural Networks and Learning Rules and Learning methods
2. Feed forward and Feedback Neural Networks are introduced
3. Applications of Neural Networks in different areas are introduced

III Year - II Semester

L	T	P	C
0	0	3	2

MICROPROCESSORS AND MICROCONTROLLERS LAB

LIST OF EXPERIMENTS

PART- A: (Minimum of 5 Experiments has to be performed)

8086 Assembly Language Programming using Assembler Directives

15. Sorting.
16. Multibyte addition/subtraction
17. Sum of squares/cubes of a given n-numbers
18. Addition of n-BCD numbers
19. Factorial of given n-numbers
20. Multiplication and Division operations
21. Stack operations
22. BCD to Seven segment display codes

PART- B: (Minimum of 3 Experiments has to be performed)

8086 Interfacing

1. Hardware/Software Interrupt Application
2. A/D Interface through Intel 8255
3. D/A Interface through Intel 8255
4. Keyboard and Display Interface through Intel 8279
5. Generation of waveforms using Intel 8253/8254

PART- C: (Minimum of 3 Experiments has to be performed)

8051 Assembly Language Programs

1. Finding number of 1's and number of 0's in a given 8-bit number
2. Addition of even numbers from a given array
3. Ascending / Descending order
4. Average of n-numbers

PART-D: (Minimum of 3 Experiments has to be performed)

8051 Interfacing

1. Switches and LEDs
2. 7-Segment display (multiplexed)
3. Stepper Motor Interface
4. Traffic Light Controller

Equipment Required:

1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. 8086 Microprocessor kits
4. 8051 microcontroller kits
5. ADC module
6. DAC module
7. Stepper motor module
8. Keyboard module
9. LED, 7-Segment Units
10. Digital Multimeters
11. ROM/RAM Interface module
12. Bread Board etc.

III Year - II Semester

L	T	P	C
0	0	3	2

VLSI LABORATORY

Note: The students are required to design the schematic diagrams using CMOS logic and to draw the layout diagrams to perform the following experiments using 130nm technology with the Industry standard EDA Tools.

List of Experiments:

- i. Design and Implementation of an Universal Gates
- ii. Design and Implementation of an Inverter
- iii. Design and Implementation of Full Adder
- iv. Design and Implementation of Full Subtractor
- v. Design and Implementation of Decoder
- vi. Design and Implementation of RS-Latch
- vii. Design and Implementation of D-Latch
- viii. Design and Implementation asynchronous counter
- ix. Design and Implementation of static RAM cell
- x. Design and Implementation of 8 bit DAC using R-2R ladder network

Software Required:

- i. Mentor Graphics Software / Equivalent Industry Standard Software.
- ii. Personal computer system with necessary software to run the programs and to implement.

III Year - II Semester

L	T	P	C
0	0	3	2

DIGITAL COMMUNICATIONS LAB

1. Time division multiplexing.
2. Pulse code modulation.
3. Differential pulse code modulation.
4. Delta modulation.
5. Frequency shift keying.
6. Phase shift keying .
7. Differential phase shift keying.
8. Companding
9. Source Encoder and Decoder
10. Linear Block Code-Encoder and Decoder
11. Binary Cyclic Code – Encoder and Decoder
12. Convolution Code – Encoder and Decoder

Equipment required for Laboratories:

1. RPS – 0 – 30 V
2. CRO – 0 – 20 M Hz.
3. Function Generators – 0 – 1 M Hz
4. RF Generators – 0 – 1000 M Hz./0 – 100 M Hz.
5. Multimeters
6. Lab Experimental kits for Digital Communication
7. Components

III Year - II Semester

L	T	P	C
0	2	0	0

INTELLECTUAL PROPERTY RIGHTS AND PATENTS

UNIT I: Introduction to Intellectual Property Rights (IPR)

Concept of Property - Introduction to IPR – International Instruments and IPR - WIPO - TRIPS – WTO -Laws Relating to IPR - IPR Tool Kit - Protection and Regulation - Copyrights and Neighboring Rights – Industrial Property – Patents - Agencies for IPR Registration – Traditional Knowledge –Emerging Areas of IPR - Layout Designs and Integrated Circuits – Use and Misuse of Intellectual Property Rights.

UNIT II: Copyrights and Neighboring Rights

Introduction to Copyrights – Principles of Copyright Protection – Law Relating to Copyrights - Subject Matters of Copyright – Copyright Ownership – Transfer and Duration – Right to Prepare Derivative Works –Rights of Distribution – Rights of Performers – Copyright Registration – Limitations – Infringement of Copyright – Relief and Remedy – Case Law - Semiconductor Chip Protection Act.

UNIT III: Patents

Introduction to Patents - Laws Relating to Patents in India – Patent Requirements – Product Patent and Process Patent - Patent Search - Patent Registration and Granting of Patent - Exclusive Rights – Limitations - Ownership and Transfer — Revocation of Patent – Patent Appellate Board - Infringement of Patent – Double Patenting — Patent Cooperation Treaty – New developments in Patents – Software Protection and Computer related Innovations.

UNIT IV: Trademarks

Introduction to Trademarks – Laws Relating to Trademarks – Functions of Trademark – Distinction between Trademark and Property Mark – Marks Covered under Trademark Law - Trade Mark Registration – Trade Mark Maintenance – Transfer of rights - Deceptive Similarities - Likelihood of Confusion - Dilution of Ownership – Trademarks Claims and Infringement – Remedies – Passing Off Action.

UNIT V: Trade Secrets

Introduction to Trade Secrets – General Principles - Laws Relating to Trade Secrets - Maintaining Trade Secret – Physical Security – Employee Access Limitation – Employee Confidentiality Agreements – Breach of Contract – Law of Unfair Competition – Trade Secret Litigation – Applying State Law.

UNIT VI: Cyber Law and Cyber Crime

Introduction to Cyber Law – Information Technology Act 2000 - Protection of Online and Computer Transactions - E-commerce - Data Security – Authentication and Confidentiality - Privacy - Digital Signatures – Certifying Authorities - Cyber Crimes - Prevention and Punishment – Liability of Network Providers.

- Relevant Cases Shall be dealt where ever necessary.

References:

1. Intellectual Property Rights (Patents & Cyber Law), Dr. A. Srinivas. Oxford University Press, New Delhi.
2. Deborah E. Bouchoux: Intellectual Property, Cengage Learning, New Delhi.
3. PrabhuddhaGanguli: Intellectual Property Rights, Tata Mc-Graw –Hill, New Delhi
4. Richard Stim: Intellectual Property, Cengage Learning, New Delhi.
5. Kompal Bansal & Parishit Bansal Fundamentals of IPR for Engineers, B. S. Publications (Press).
6. Cyber Law - Texts & Cases, South-Western's Special Topics Collections.
7. R.Radha Krishnan, S.Balasubramanian: Intellectual Property Rights, Excel Books. New Delhi.
8. M.Ashok Kumar and MohdIqbal Ali: Intellectual Property Rights, Serials Pub.

RADAR SYSTEMS

OBJECTIVES

The student will be introduced to:

1. The Basic Principle of radar and radar range equation.
2. Different types of radars; CW, FM-CW, MTI and pulse Doppler radars.
3. Understand the different tracking techniques for radar.
4. Understand the characteristics of a matched filter receiver and its performance.
5. Understand the different types of displays, duplexers and antennas used in radar systems.

UNIT-I:

Basics of Radar : Introduction, Maximum Unambiguous Range, simple Radar range Equation, Radar Block Diagram and Operation, Radar Frequencies and Applications. Prediction of Range Performance, Minimum Detectable Signal, Receiver Noise, Illustrative Problems.

Radar Equation : Modified Radar Range Equation, SNR, probability of detection, probability of False Alarm, Integration of Radar Pulses, Radar Cross Section of Targets (simple targets - sphere, cone-sphere), Creeping Wave, Transmitter Power, PRF and Range Ambiguities, System Losses (qualitative treatment), Illustrative Problems.

UNIT-II:

CW and Frequency Modulated Radar : Doppler Effect, CW Radar – Block Diagram, Isolation between Transmitter and Receiver, Non-zero IF Receiver, Receiver Bandwidth Requirements, Applications of CW radar. Illustrative Problems

FM-CW Radar: Range and Doppler Measurement, Block Diagram and Characteristics, FM-CW altimeter, Multiple Frequency CW Radar.

UNIT-III:

MTI and Pulse Doppler Radar: Introduction, Principle, MTI Radar with - Power Amplifier Transmitter and Power Oscillator Transmitter, Delay Line Cancellers – Filter Characteristics, Blind Speeds, Double Cancellation, N^{th} Cancellation Staggered PRFs. Range Gated Doppler Filters. MTI Radar Parameters, Limitations to MTI Performance, MTI versus Pulse Doppler Radar.

UNIT -IV:

Tracking Radar: Tracking with Radar, Sequential Lobing, Conical Scan, Mono pulse Tracking Radar – Amplitude Comparison Mono pulse (one- and two- coordinates), Phase Comparison Mono pulse, Tracking in Range, Acquisition and Scanning Patterns, Comparison of Trackers.

UNIT -V:

Detection of Radar Signals in Noise : Introduction, Matched Filter Receiver – Response Characteristics and Derivation, Correlation detection and Cross-correlation Receiver, Efficiency of Non-matched Filters, Matched Filter with Non-white Noise, Noise Figure and Noise Temperature.

UNIT -VI:

Radar Receivers –Displays – types. Duplexers – Branch type and Balanced type, Circulators as Duplexers. Introduction to Phased Array Antennas – Basic Concepts, Radiation Pattern, Beam Steering and Beam Width changes, Series versus parallel feeds, Applications, Advantages and Limitations. Radomes.

TEXT BOOKS:

1. Introduction to Radar Systems – Merrill I. Skolnik, TMH Special Indian Edition, 2nd Ed., 2007.

REFERENCE BOOKS:

1. Introduction to Radar Systems, 3rd edition – M.I. Skolnik, TMH Ed., 2005
2. Radar: Principles, Technology, Applications – Byron Edde, Pearson Education, 2004.
3. Radar Principles – Peebles, Jr., P.Z., Wiley, New York, 1998.
4. Principles of Modern Radar: Basic Principles – Mark A. Richards, James A. Scheer, William A. Holm, Yesdee,
5. Radar Engineering – GSN Raju, IK International.

OUTCOMES**After going through this course the student will be able to:**

1. Derive the radar range equation and to solve some analytical problems.
2. Understand the different types of radars and its applications.
3. Understand the concept of tracking and different tracking techniques.
4. Understand the various components of radar receiver and its performanc.

IV Year - I Semester

L	T	P	C
4	0	0	3

DIGITAL IMAGE PROCESSING

UNIT-1

Introduction: Introduction to Image Processing, Fundamental steps in digital image processing, components of an image processing system, image sensing and acquisition, image sampling and quantization, some basic relationships between pixels, an introduction to the mathematical tools used in digital image processing.

Image Transforms: Need for image transforms, Discrete Fourier transform (DFT) of one variable, Extension to functions of two variables, some properties of the 2-D Discrete Fourier transform, Importance of Phase, Walsh Transform. Hadamard transform, Haar Transform, Slant transform, Discrete Cosine transform, KL Transform, SVD and Radon Transform, Comparison of different image transforms

UNIT-2

Intensity Transformations and Spatial Filtering: Background, Some basic intensity transformation functions, histogram processing, fundamentals of spatial filtering, smoothing spatial filters , sharpening spatial filters, Combining spatial enhancement methods

Filtering in the Frequency Domain: Preliminary concepts, The Basics of filtering in the frequency domain, image smoothing using frequency domain filters, Image Sharpening using frequency domain filters, Selective filtering.

UNIT-3

Image Restoration and Reconstruction: A model of the image degradation / Restoration process, Noise models, restoration in the presence of noise only-Spatial Filtering, Periodic Noise Reduction by frequency domain filtering, Linear, Position –Invariant Degradations, Estimating the degradation function, Inverse filtering, Minimum mean square error (Wiener) filtering, constrained least squares filtering ,geometric mean filter ,image reconstruction from projections.

UNIT-4

Image compression: Fundamentals, Basic compression methods: Huffman coding, Golomb coding, Arithmetic coding, LZW coding, Run-Length coding, Symbol-Based coding, Bit-Plane coding, Block Transform coding, Predictive coding

Wavelets and Multiresolution Processing: Image pyramids, subband coding, Multiresolution expansions, wavelet transforms in one dimensions & two dimensions, Wavelet coding.

UNIT-5

Image segmentation: Fundamentals, point, line, edge detection, thresholding, region –based segmentation.

Morphological Image Processing: Preliminaries, Erosion and dilation, opening and closing, basic morphological algorithms for boundary extraction, thinning, gray-scale morphology, Segmentation using morphological watersheds.

UNIT-6

Color image processing: color fundamentals, color models, pseudo color image processing, basics of full color image processing, color transformations, smoothing and sharpening. Image segmentation based on color, noise in color images, color image compression.

Text Books

1. R. C. Gonzalez and R. E. Woods, Digital Image Processing, 3rd edition, Prentice Hall, 2008.
2. Jayaraman, S. Esakkirajan, and T. Veerakumar, "Digital Image Processing", Tata McGraw-Hill Education, 2011.

Reference Books

1. Anil K.Jain, "Fundamentals of Digital Image Processing", Prentice Hall of India, 9th Edition, Indian Reprint, 2002.
2. B.Chanda, D.Dutta Majumder, "Digital Image Processing and Analysis", PHI, 2009.

Course Objectives:

Students undergoing this course are expected to:

1. Familiarize with basic concepts of digital image processing and different image transforms
2. Learn various image processing techniques like image enhancement, restoration, segmentation and compression
3. Understand color fundamentals and different color models
4. Understand wavelets and morphological image processing

Course Outcomes:

After undergoing the course students will be able to

1. Perform image manipulations and different digital image processing techniques
2. Perform basic operations like – Enhancement, segmentation, compression, Image transforms and restoration techniques on image.
3. Analyze pseudo and fullcolor image processing techniques.
4. Apply various morphological operators on images

IV Year - I Semester

L	T	P	C
4	0	0	3

COMPUTER NETWORKS

OBJECTIVES:

- Understand state-of-the-art in network protocols, architectures, and applications.
- Process of networking research
- Constraints and thought processes for networking research
- Problem Formulation—Approach—Analysis—

UNIT – I

Introduction: Network Topologies WAN, LAN, MAN. Reference models- The OSI Reference Model- the TCP/IP Reference Model - A Comparison of the OSI and TCP/IP Reference Models

UNIT – II

Physical Layer – Fourier Analysis – Bandwidth Limited Signals – The Maximum Data Rate of a Channel - Guided Transmission Media, Digital Modulation and Multiplexing: Frequency Division Multiplexing, Time Division Multiplexing, Code Division Multiplexing

Data Link Layer Design Issues, Error Detection and Correction, Elementary Data Link Protocols, Sliding Window Protocols

UNIT – III

The Data Link Layer - Services Provided to the Network Layer – Framing – Error Control – Flow Control, Error Detection and Correction – Error-Correcting Codes – Error Detecting Codes, Elementary Data Link Protocols- A Utopian Simplex Protocol-A Simplex Stop and Wait Protocol for an Error free channel-A Simplex Stop and Wait Protocol for a Noisy Channel, Sliding Window Protocols-A One Bit Sliding Window Protocol-A Protocol Using Go-Back-N- A Protocol Using Selective Repeat

UNIT – IV

The Medium Access Control Sublayer-The Channel Allocation Problem-Static Channel Allocation-Assumptions for Dynamic Channel Allocation, Multiple Access Protocols-Aloha-Carrier Sense Multiple Multiple Access Protocols-Collision-Free Protocols-Limited Contention Protocols-Wireless LAN Protocols, Ethernet-Classic Ethernet Physical Layer-Classic Ethernet MAC Sublayer Protocol-Ethernet Performance-Fast Ethernet Gigabit Ethernet-10-Gigabit Ethernet-Retrospective on Ethernet, Wireless Lans-The 802.11 Architecture and Protocol Stack-The 802.11 Physical Layer-The802.11 MAC Sublayer Protocol-The 805.11 Frame Structure-Services

UNIT – V

Design Issues-The Network Layer Design Issues – Store and Forward Packet Switching-Services Provided to the Transport layer- Implementation of Connectionless Service-Implementation of Connection Oriented Service-Comparison of Virtual Circuit and Datagram Networks, Routing Algorithms-The Optimality principle-Shortest path Algorithm, Congestion Control Algorithms-Approaches to Congestion Control-Traffic Aware Routing-Admission Control-Traffic Throttling-Load Shedding.

UNIT – VI

Transport Layer – The Internet Transport Protocols: Udp, the Internet Transport Protocols: Tcp
Application Layer –The Domain Name System: The DNS Name Space, Resource Records, Name Servers, Electronic Mail: Architecture and Services, The User Agent, Message Formats, Message Transfer, Final Delivery

OUTCOMES:

- Understand OSI and TCP/IP models
- Analyze MAC layer protocols and LAN technologies
- 3 .Design applications using internet protocols
- 4 .Understand routing and congestion control algorithms
- 5 .Understand how internet works

TEXT BOOKS:

1. Computer Networks, Tanenbaum and David J Wetherall, 5th Edition, Pearson Edu, 2010
2. Computer Networks: A Top Down Approach, Behrouz A. Forouzan, Firouz Mosharraf, McGraw Hill Education

REFERENCE BOOKS:

1. Larry L. Peterson and Bruce S. Davie, “Computer Networks - A Systems Approach” (5th ed), Morgan Kaufmann/ Elsevier, 2011

IV Year - I Semester

L	T	P	C
4	0	0	3

OPTICAL COMMUNICATIONS

OBJECTIVES

The student will be introduced to the functionality of each of the components that comprise a fiber-optic communication system

- the properties of optical fiber that affect the performance of a communication link and types of fiber materials with their properties and the losses occur in fibers.
- the principles of single and multi-mode optical fibers and their characteristics
- working of semiconductor lasers, and differentiate between direct modulation and external electro-optic modulation.
- Analyze the operation of LEDs, laser diodes, and PIN photo detectors (spectral properties, bandwidth, and circuits) and apply in optical systems.
- Analyze and design optical communication and fiber optic sensor systems.
- the models of analog and digital receivers.

UNIT I

Overview of optical fiber communication - Historical development, The general system, advantages of optical fiber communications. Optical fiber wave guides- Introduction, Ray theory transmission, Total Internal Reflection, Acceptance angle, Numerical Aperture, Skew rays, Cylindrical fibers- Modes, V-number, Mode coupling, Step Index fibers, Graded Index fibers, Single mode fibers- Cut off wavelength, Mode Field Diameter, Effective Refractive Index, Related problems.

UNIT II

Fiber materials:- Glass, Halide, Active glass, Chalgenide glass, Plastic optical fibers. Signal distortion in optical fibers-Attenuation, Absorption, Scattering and Bending losses, Core and Cladding losses, Information capacity determination, Group delay, Types of Dispersion:- Material dispersion, Wave-guide dispersion, Polarization-Mode dispersion, Intermodal dispersion, Pulse broadening in Graded index fiber, Related problems.

UNIT III

. Optical fiber Connectors-Connector types, Single mode fiber connectors, Connector return loss, Fiber Splicing- Splicing techniques, Splicing single mode fibers, Fiber alignment and joint loss- Multimode fiber joints, single mode fiber joints.

UNIT IV

Optical sources- LEDs, Structures, Materials, Quantum efficiency, Power, Modulation, Power bandwidth product. Injection Laser Diodes- Modes, Threshold conditions, External quantum efficiency, Laser diode rate equations, Resonant frequencies, Reliability of LED&ILD, Optical detectors- Physical principles of PIN and APD, Detector response time, Temperature effect on Avalanche gain, Comparison of Photo detectors, Related problems.

UNIT V

Source to fiber power launching - Output patterns, Power coupling, Power launching, Equilibrium Numerical Aperture, Laser diode to fiber coupling, Optical receiver operation- Fundamental receiver operation, Digital signal transmission, error sources, Receiver configuration, Digital receiver performance, Probability of Error, Quantum limit, Analog receivers.

UNIT VI

Optical system design - Point-to- point links- Component choice and considerations, Link power budget, Rise time budget with examples, Line coding in Optical links, WDM, Necessity, Principles, Measurement of Attenuation and Dispersion, Eye pattern.

TEXT BOOKS :

1. Optical Fiber Communications – Gerd Keiser, Mc Graw-Hill International edition, 3rd Edition, 2000.
2. Optical Fiber Communications – John M. Senior, PHI, 2nd Edition, 2002.

REFERENCES :

1. Fiber Optic Communications – D.K. Mynbaev , S.C. Gupta and Lowell L. Scheiner, Pearson Education,2005.
2. Text Book on Optical Fiber Communication and its Applications – S.C.Gupta, PHI, 2005.
3. Fiber Optic Communication Systems – Govind P. Agarwal , John Wiley, 3rd Edition, 2004.
4. Fiber Optic Communications – Joseph C. Palais, 4th Edition, Pearson Education, 2004.

OUTCOMES

After going through this course the student will be able to

- Choose necessary components required in modern optical communications systems .
- Design and build optical fiber experiments in the laboratory, and learn how to calculate electromagnetic modes in waveguides, the amount of light lost going through an optical system, dispersion of optical fibers.
- Use different types of photo detectors and optical test equipment to analyze optical fiber and light wave systems.
- Choose the optical cables for better communication with minimum losses
Design, build, and demonstrate optical fiber experiments in the laboratory.

IV Year - I Semester

L	T	P	C
4	0	0	3

TELEVISION ENGINEERING
(Elective- I)

UNIT I

INTRODUCTION: TV transmitter and receivers, synchronization. Television Pictures: Geometric form and aspect ratio, image continuity, interlaced scanning, picture resolution, Composite video signal: Horizontal and vertical sync, scanning sequence, Colour signal generation and Encoding: Perception of brightness and colours, additive colour mixing, video signals for colours, luminance signal, colour difference signals, encoding of colour difference signals, formation of chrominance signals, PAL encoder.

UNIT II

TV SIGNAL TRANSMISSION AND PROPAGATION: Picture signal transmission, positive and negative modulation, VSB transmission, sound signal transmission, standard channel BW, TV transmitter, TV signal propagation, interference, TV broadcast channels.

MONOCHROME TV RECEIVER: RF tuner, IF subsystem, video amplifier, sound section, sync separation and processing, deflection circuits, scanning circuits.

PAL-D colour receiver: Electron tuners, IF subsystem, Y-signal channel, chroma decoder, separation of U & V Colour phasors, synchronous demodulators, subcarrier generation, raster circuits.

UNIT III

VISION IF SUBSYSTEM: AGC, noise cancellation, video and intercarrier sound signal detection, Colour receiver IF subsystem, Receiver sound system: FM detection, FM Sound detectors, typical applications. TV Receiver Tuners: Tuner operation, VHF and UHF tuners.

COLOUR SIGNAL DECODING: PAL-D decoder, chroma signal amplifiers, separation of U and V signals, Color burst separation, Burst phase discriminator, Reference oscillator, Indent and color killer circuits, RO phase shift and 180 degrees PAL-SWITCH circuitry, U & V demodulators, Colour signal mixing.

UNIT-IV

HISTORY OF HDTV: Analog and Digital TV Compared, Going HD, Broadcast Engineering and Information Technology, The Road to HDTV, The Grand Alliance, A DTV Standard at Last, Producing HDTV, HD Goes Coast-to-Coast, DTV Conversion.

COMPRESSION TECHNIQUES: Compression, MPEG-2 Video Compression, MPEG-4, H.264, Motion – JPEG (M-JPEG) compression, Audio Compression, Compressed Data Streams, Packetized Transport.

UNIT V

DTV TRANSMITTER AND RECIEVER: Engineering Basics, Presentation, Transmission, Reception and Demodulation, Transport Stream Demultiplexing, Decoding and Decompression, Program Assembly and Presentation, Receiver Issues, Presentation Concerns.

HDTV AND DTV STANDARDS: Standards Bodies, The ATSC Standards, SMPTE Standards, The Audio Engineering Society, Cable DTV Standards, Institute of Electronic and Electrical Engineers, The Consumer Electronics Association, Other Societies and Organizations.

UNIT VI

EMERGING TECHNOLOGIES AND STANDARDS: Technology and Standards Development, Presentation, Delivery and Distribution, MPEG and Metadata, Enhanced, Interactive and Personalized, Virtual Product Placement, Multiplatform Emergency Alert System.

TEXT BOOKS

1. Modern Television Practice – Principles, Technology and Service – R.R.Gulati, New Age International Publication, 2002
2. Television and Video Engineering – A.M.Dhake, 2nd Edition,
3. “HDTV and the Transition to Digital Broadcasting: Understanding New Television Technologies” by Philip J. Cianci, Focal Press, 2007.
4. “Digital Video and HDTV Algorithms and Interfaces” by Charles Poynton, Morgan Kaufman publishers, 2007.

REFERENCES

1. Basic Television and Video Systems – B.Grob and C.E.Herndon, McGrawHill,1999
2. “Newnes Guide to Television and Video Technology” by Ibrahim.K.F, Newnes Publishers, 4th edition, 2007.
3. “H.264 and MPEG-4 and Video compression video coding for Next-generation Multimedia” by Iain E. G. Richardson,John Wiley & Sons Ltd., 2003.

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ELECTRONIC SWITCHING SYSTEMS

(Elective- I)

OBJECTIVES :

The student will

- Understand the means of measuring traffic.
- Understand the implication of the traffic level on system design.

UNIT -I:

Introduction: Evolution of Telecommunications, Simple Telephone Communication, Basics of Switching System, Manual Switching System, Major Telecommunication Networks.

Crossbar Switching: Principles of Common Control, Touch Tone Dial Telephone, Principles of Crossbar Switching, Crossbar Switch Configurations, Cross point Technology, Crossbar Exchange Organization.

UNIT -II:

Electronic Space Division Switching: Stored Program Control, Centralized SPC: Stand by mode, Synchronous duplex mode, Distributed SPC, Software Architecture, Application Software, Enhanced Services, Two-Stage Networks, Three-Stage Networks, n- Stage Networks.

UNIT -III

Time Division Switching: Basic Time Division Space Switching, Basic Time Division Time Switching, Generalised time division Space switch, Basic Time division time switching: modes of operation, simple problems, Time Multiplexed Space Switching, Time Multiplexed Time division space Switch, Time Multiplexed Time Switching, Combination Switching: Time Space (TS) Switching, Space-time (ST) Switching, Three-Stage Combination Switching, n- Stage Combination Switching.

UNIT IV

Telephone Networks: Subscriber Loop System, Switching Hierarchy and Routing, Transmission Plan, Transmission Systems, Numbering Plan, Charging Plan, Signaling Techniques, In-channel Signaling, Common Channel Signaling, CCITT Signaling System no.6, CCITT Signaling System no.7, **Packet Switching:** Statistical Multiplexing, Local- Area and Wide- Area Networks, Large-scale Networks, Broadband Networks.

UNIT -V:

Switching Networks: Single- Stage Networks, Grading, Link Systems, Grades of service of link systems, Application of Graph Theory to link Systems, Use of Expansion, Call Packing, Rearrange-able Networks, Strict- Sense non-blocking Networks, Sectionalized Switching Networks

Telecommunications Traffic: The Unit of Traffic, Congestion, Traffic Measurement, A Mathematical Model, Lost-call Systems, Queuing Systems. Problems

UNIT -VI:

Integrated Services Digital Network: Motivation for ISDN, New Services, Network and Protocol Architecture, Transmission Channels, User- Network Interfaces, Signaling, Numbering and Addressing, Service Characterization, Interworking, ISDN Standards, Expert Systems in ISDN, Broadband ISDN, Voice Data Integration.

TEXT BOOKS:

1. Telecommunication Switching Systems and Networks- Thiagarajan Viswanathan, 2000, PHI.
2. Telecommunications Switching, Traffic and Networks- J. E. Flood, 2006, Pearson Education.

REFERENCES:

1. Digital Telephony- J. Bellamy, 2nd Edition, 2001, John Wiley.
2. Data Communications and Networks- Achyut S. Godbole, 2004, TMH.
3. Principles of Communication Systems- H. Taub & D. Schilling, 2nd Edition, 2003, TMH.
4. Data Communication & Networking- B. A. Forouzan, 3rd Edition, 2004, TMH.
5. Telecommunication System Engineering – Roger L. Freeman, 4th Ed., Wiley-Inter Science, John Wiley & Sons, 2004.

Outcomes

The student will be able to

- Evaluate the time and space parameters of a switched signal
- Establish the digital signal path in time and space, between two terminals
- Evaluate the inherent facilities within the system to test some of the SLIC, CODEC and digital switch functions.
- Investigate the traffic capacity of the system.
- Evaluate methods of collecting traffic data.
- Evaluate the method of interconnecting two separate digital switches.

SYSTEM DESIGN THROUGH VERILOG

(Elective- I)

UNIT-I

INTRODUCTION TO VERILOG:

Verilog as HDL, Levels of design description, concurrency, simulation and synthesis, functional verification, system tasks, programming language interface(PLI), module, simulation and synthesis tools, test benches.

LANGUAGE CONSTRUCTS AND CONVENTIONS:

Introduction, keywords, identifiers, whitespace characters, comments, numbers, strings, logic values, data types, scalars and vectors, parameters, memory, operators, system tasks.

UNIT-II

GATE LEVEL MODELLING:

Introduction, AND gate primitive, module structure, other gate primitives, illustrative examples, tristate gates, array of instances of primitives, design of Flip flops with gate primitives, delays, strengths and contention resolution, net types, design of basic circuits.

UNIT-III

BEHAVIORAL MODELLING:

Introduction, operations and assignments, functional Bifurcation, initial construct, always construct, examples, assignments with delays, wait construct, multiple always blocks, designs at behavioral level, blocking and non-blocking assignments, the case statement, simulation flow, if and if else constructs, assign-De assign construct, repeat construct, FOR loop, the disable construct, While loop, Forever loop, parallel blocks, force-release construct, event.

UNIT-IV

DATAFLOW LEVEL AND SWITCH LEVEL MODELLING:

Introduction, continuous assignment structures, delays and continuous assignments, assignment to vectors, basic transistor switches, CMOS switch, Bidirectional gates and time delays with switch primitives, instantiations with strengths and delays, strength contention with trireg nets.

UNIT-V

SYNTHESIS OF COMBINATIONAL AND SEQUENTIAL LOGIC USING VERILOG: Synthesis of combinational logic: Net list of structured primitives, a set of continuous assignment statements and level sensitive cyclic behavior with examples, Synthesis of priority structures, Exploiting logic don't care conditions. Synthesis of sequential logic with latches: Accidental synthesis of latches and Intentional synthesis of latches, Synthesis of sequential logic with flip-flops, Synthesis of explicit state machines.

UNIT-VI

VERILOG MODELS:

Static RAM Memory, A simplified 486 Bus Model, Interfacing Memory to a Microprocessor Bus, UART Design and Design of Microcontroller CPU.

TEXT BOOKS:

1. Design through Verilog HDL – T.R. Padmanabhan and B. Bala Tripura Sundari, WSE, IEEE Press, 2004.
2. Advanced Digital Design with Verilog HDL – Michael D. Ciletti, PHI, 2005.

REFERENCES:

1. Fundamentals of Logic Design with Verilog – Stephen. Brown and Zvonko Vranesic, TMH, 2005.
2. A Verilog Primer – J. Bhasker, BSP, 2003.

IV Year - I Semester

L	T	P	C
4	0	0	3

**EMBEDDED SYSTEMS
ELECTIVE - II**

OBJECTIVES:

The main objectives of this course are given below:

- The basic concepts of an embedded system are introduced.
- The various elements of embedded hardware and their design principles are explained.
- Different steps involved in the design and development of firmware for embedded systems is elaborated.
- Internals of Real-Time operating system and the fundamentals of RTOS based embedded firmware design is discussed.
- Fundamental issues in hardware software co-design were presented and explained.
- Familiarise with the different IDEs for firmware development for different family of processors/controllers and embedded operating systems.
- Embedded system implementation and testing tools are introduced and discussed.

Outcomes:

At the end of this course the student can able to:

- Understand the basic concepts of an embedded system and able to know an embedded system design approach to perform a specific function.
- The hardware components required for an embedded system and the design approach of an embedded hardware.
- The various embedded firmware design approaches on embedded environment.
- Understand how to integrate hardware and firmware of an embedded system using real time operating system.

Syllabus

UNIT-I

INTRODUCTION: Embedded system-Definition, history of embedded systems, classification of embedded systems, major application areas of embedded systems, purpose of embedded systems, the typical embedded system-core of the embedded system, Memory, Sensors and Actuators, Communication Interface, Embedded firmware, Characteristics of an embedded system, Quality attributes of embedded systems, Application-specific and Domain-Specific examples of an embedded system.

UNIT-II

EMBEDDED HARDWARE DESIGN: Analog and digital electronic components, I/O types and examples, Serial communication devices, Parallel device ports, Wireless devices, Timer and counting devices, Watchdog timer, Real time clock.

UNIT-III

EMBEDDED FIRMWARE DESIGN: Embedded Firmware design approaches, Embedded Firmware development languages, ISR concept, Interrupt sources, Interrupt servicing mechanism, Multiple interrupts, DMA, Device driver programming, Concepts of C versus Embedded C and Compiler versus Cross-compiler.

UNIT-IV

REAL TIME OPERATING SYSTEM: Operating system basics, Types of operating systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling, Threads, Processes and Scheduling, Task communication, Task synchronisation, Device Drivers.

HARDWARE SOFTWARE CO-DESIGN: Fundamental Issues in Hardware Software Co-Design, Computational models in embedded design, Hardware software Trade-offs, Integration of Hardware and Firmware, ICE.

UNIT-V

EMBEDDED SYSTEM DEVELOPMENT: The integrated development environment, Types of files generated on cross-compilation, Deassembler/Decompiler, Simulators, Emulators and Debugging, Target hardware debugging, Boundary Scan, Embedded Software development process and tools.

UNIT-VI

EMBEDDED SYSTEM IMPLEMENTATION AND TESTING: The main software utility tool, CAD and the hardware, Translation tools-Pre-processors, Interpreters, Compilers and Linkers, Debugging tools, Quality assurance and testing of the design, Testing on host machine, Simulators, Laboratory Tools.

Text Books:

1. Embedded Systems Architecture- By Tammy Noergaard, Elsevier Publications, 2013.
2. Embedded Systems-By Shibu.K.V-Tata McGraw Hill Education Private Limited, 2013.

References:

1. Embedded System Design, Frank Vahid, Tony Givargis, John Wiley Publications, 2013.
2. Embedded Systems-Lyla B.Das-Pearson Publications, 2013.

ANALOG IC DESIGN

ELECTIVE - II

OBJECTIVES

The student will be introduced to

- The student will be able to understand the behavior of MOS Devices and Small-Signal & Large-Signal Modeling of MOS Transistor and Analog Sub-Circuits.
- In this course, students can study CMOS Amplifiers like Differential Amplifiers, Cascode Amplifiers, Output Amplifiers, and Operational Amplifiers.
- Another main object of this course is to motivate the graduate students to design and to develop the Analog CMOS Circuits for different Analog operations.
- The concepts of Open-Loop Comparators and Different Types of Oscillators like Ring Oscillator, LC Oscillator etc.

UNIT -I:

MOS Devices and Modeling: The MOS Transistor, Passive Components- Capacitor & Resistor, Integrated circuit Layout, CMOS Device Modeling - Simple MOS Large-Signal Model, Other Model Parameters, Small-Signal Model for the MOS Transistor, Computer Simulation Models, Sub-threshold MOS Model.

UNIT -II:

Analog CMOS Sub-Circuits: MOS Switch, MOS Diode, MOS Active Resistor, Current Sinks and Sources, Current Mirrors-Current mirror with Beta Helper, Degeneration, Cascode current Mirror and Wilson Current Mirror, Current and Voltage References, Band gap Reference.

UNIT -III:

CMOS Amplifiers: Inverters, Differential Amplifiers, Cascode Amplifiers, Current Amplifiers, Output Amplifiers, High Gain Amplifiers Architectures.

UNIT -IV:

CMOS Operational Amplifiers: Design of CMOS Op Amps, Compensation of Op Amps, Design of Two-Stage Op Amps, Power- Supply Rejection Ratio of Two-Stage Op Amps, Cascode Op Amps, Measurement Techniques of OP Amp.

UNIT -V:

Comparators: Characterization of Comparator, Two-Stage, Open-Loop Comparators, Other Open-Loop Comparators, Improving the Performance of Open-Loop Comparators, Discrete-Time Comparators.

UNIT -VI:

Oscillators & Phase-Locked Loops: General Considerations, Ring Oscillators, LC Oscillators, Voltage Controlled Oscillators.

Simple PLL, Charge Pump PLLs, Non-Ideal Effects in PLLs, Delay Locked Loops, Applications.

Text Books:

1. Design of Analog CMOS Integrated Circuits- Behzad Razavi, TMH Edition.
2. CMOS Analog Circuit Design - Philip E. Allen and Douglas R. Holberg, Oxford University Press, International Second Edition/Indian Edition, 2010.

References:

1. Analysis and Design of Analog Integrated Circuits- Paul R. Gray, Paul J. Hurst, S. Lewis and R. G. Meyer, Wiley India, Fifth Edition, 2010.
2. Analog Integrated Circuit Design- David A. Johns, Ken Martin, Wiley Student Edn, 2013.

OUTCOMES

After going through this course the student will be able to

- Understand the concepts of MOS Devices and Modeling.
- Design and analyze any Analog Circuits in real time applications.
- Extend the Analog Circuit Design to Different Applications in Real Time.
- Understand of Open-Loop Comparators and Different Types of Oscillators.

NETWORK SECURITY AND CRYPTOGRAPHY ELECTIVE - II

OBJECTIVES:

- In this course the following principles and practice of cryptography and network security are covered:
- Classical systems, symmetric block ciphers (DES, AES, other contemporary symmetric ciphers)
- Public-key cryptography (RSA, discrete logarithms),
- Algorithms for factoring and discrete logarithms, cryptographic protocols, hash functions, authentication, key management, key exchange, signature schemes,
- Email and web security, viruses, firewalls, digital right management, and other topics.

UNIT- I:

Basic Principles

Security Goals, Cryptographic Attacks, Services and Mechanisms, Mathematics of Cryptography.

UNIT- II:

Symmetric Encryption

Mathematics of Symmetric Key Cryptography, Introduction to Modern Symmetric Key Ciphers, Data Encryption Standard, Advanced Encryption Standard.

UNIT- III:

Asymmetric Encryption

Mathematics of Asymmetric Key Cryptography, Asymmetric Key Cryptography

UNIT- IV:

Data Integrity, Digital Signature Schemes & Key Management

Message Integrity and Message Authentication, Cryptographic Hash Functions, Digital Signature, Key Management.

UNIT -V:

Network Security-I

Security at application layer: PGP and S/MIME, Security at the Transport Layer: SSL and TLS

UNIT -VI:

Network Security-II

Security at the Network Layer: IPSec, System Security

OUTCOMES:

- To be familiarity with information security awareness and a clear understanding of its importance.
- To master fundamentals of secret and public cryptography
- To master protocols for security services
- To be familiar with network security threats and countermeasures
- To be familiar with network security designs using available secure solutions (such as PGP, SSL, IPSec, etc)

TEXT BOOKS:

1. Cryptography and Network Security, Behrouz A Forouzan, Debdeep Mukhopadhyay, (3e) Mc Graw Hill.
2. Cryptography and Network Security, William Stallings, (6e) Pearson.
3. Everyday Cryptography, Keith M. Martin, Oxford.

REFERENCE BOOKS:

1. Network Security and Cryptography, Bernard Meneges, Cengage Learning.

IV Year - I Semester

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MICROWAVE ENGINEERING & OPTICAL LAB

Minimum Twelve Experiments to be conducted:

Part – A (Any 7 Experiments (8 & 9 compulsory)) :

1. Reflex Klystron Characteristics.
2. Gunn Diode Characteristics.
3. Attenuation Measurement.
4. Directional Coupler Characteristics.
5. Impedance and Frequency Measurement.
6. Scattering parameters of Circulator.
7. Scattering parameters of Magic Tee.
8. Radiation Pattern of Horn and Parabolic Antennas.
9. Synthesis of Microstrip antennas (Rectangular Structure) Using HFSS.

Part – B (Any 5 Experiments) :

10. Characterization of LED.
11. Characterization of Laser Diode.
12. Intensity modulation of Laser output through an optical fiber.
13. Measurement of Data rate for Digital Optical link.
14. Measurement of NA.
15. Measurement of losses for Analog Optical link.

Equipment required for Laboratories:

1. Regulated Klystron Power Supply, Klystron mount
2. VSWR Meter
3. Micro Ammeter
4. Multi meter
5. CRO
6. GUNN Power Supply, Pin Modulator
7. Crystal Diode detector
8. Micro wave components (Attenuation)
9. Frequency Meter
10. Slotted line carriage
11. Probe detector
12. Wave guide shorts
13. SS Tuner
14. Directional Coupler
15. E, H, Magic Tees
16. Circulators, Isolator
17. Matched Loads
18. Pyramidal Horn and Parabolic Antennas
19. Turntable for Antenna Measurements
20. HFSS Software
21. Fiber Optic Analog Trainer based LED
22. Fiber Optic Analog Trainer based laser
23. Fiber Optic Digital Trainer
24. Fiber cables - (Plastic, Glass)

IV Year - I Semester

L	T	P	C
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DIGITAL SIGNAL PROCESSING LABORATORY

List of the Experiments / programs

To Student has to perform at least FOUR Experiments in each part

PART-1(SIGNALS)

- 1) Generation of discrete time signals for discrete signals
- 2) To verify the Linear Convolution
 - a) Using MATLAB
 - b) Using Code Composer Studio(CCS)
- 3) To verify the Circular Convolution for discrete signals
 - a) Using MATLAB
 - b) Using Code Composer Studio(CCS)
- 4) To Find the addition of Sinusoidal Signals
- 5) To verify Discrete Fourier Transform(DFT) and Inverse Discrete Fourier Transform(IDFT)
 - a) Using MATLAB
 - b) Using Code Composer Studio(CCS)
- 6) Transfer Function Stability Analysis: using pole-zero plot, bode plot, Nyquist plot, z-plane plot.

PART-2 (FILTERS)

- 7) Frequency Response of IIR low pass Butterworth Filter
- 8) Frequency Response of IIR high pass Butterworth Filter
- 9) Frequency Response of IIR low pass Chebyshev Filter
- 10) Frequency Response of IIR high pass Chebyshev Filter
- 11) Frequency Response of FIR low pass Filter using Rectangle Window
- 12) Frequency Response of FIR low pass Filter using Triangle Window

PART – 3(IMAGE PROCESSING)

- 13) An image processing in a false contouring system
- 14) To generate the histogram equalization to the image
- 15) To verify the Normalized Cross Correlation to the addition of noise and removal of noise using filters to an image.
- 16) Compute the edge of an image using spatial filters.
- 17) Perform the image motion blur and calculate PSNR to the noise image and also noise free image.
- 18) To verify the PSNR to the Second order Decomposition of Discrete Wavelet transforms and to the reconstructed image using inverse Discrete Wavelet transform

IV Year - II Semester

L	T	P	C
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CELLULAR AND MOBILE COMMUNICATIONS

OBJECTIVES

The student will be introduced to:

1. Understand the basic cellular concepts like frequency reuse, cell splitting, cell sectoring etc., and various cellular systems.
2. Understand the different types of interference s influencing cellular and mobile communications.
3. Understand the frequency management, channel assignment and various propagation effects in cellular environment.
4. Understand the different types antennas used at cell site and mobile.
5. Understand the concepts of handoff and types of handoffs.
6. Understand the architectures of GSM and 3G cellular systems.

UNIT I

CELLULAR MOBILE RADIO SYSTEMS: Introduction to Cellular Mobile System, uniqueness of mobile radio environment, operation of cellular systems, consideration of the components of Cellular system, Hexagonal shaped cells, Analog and Digital Cellular systems.

CELLULAR CONCEPTS: Evolution of Cellular systems, Concept of frequency reuse, frequency reuse ratio, Number of channels in a cellular system, Cellular traffic: trunking and blocking, Grade of Service; Cellular structures: macro, micro, pico and femto cells; Cell splitting, Cell sectoring.

UNIT II

INTERFERENCE: Types of interferences, Introduction to Co-Channel Interference, real time Co-Channel interference, Co-Channel measurement, Co-channel Interference Reduction Factor, desired C/I from a normal case in a omni directional Antenna system, design of Antenna system, antenna parameters and their effects, diversity receiver, non-cochannel interference-different types.

UNIT III

FREQUENCY MANAGEMENT AND CHANNEL ASSIGNMENT: Numbering and grouping, setup access and paging channels, channel assignments to cell sites and mobile units: fixed channel and non-fixed channel assignment, channel sharing and borrowing, overlaid cells.

CELL COVERAGE FOR SIGNAL AND TRAFFIC: Signal reflections in flat and hilly terrain, effect of human made structures, phase difference between direct and reflected paths, straight line path loss slope, general formula for mobile propagation over water and flat open area, near and long distance propagation, antenna height gain, form of a point to point model.

UNIT IV

CELL SITE AND MOBILE ANTENNAS : Sum and difference patterns and their synthesis, omni directional antennas, directional antennas for interference reduction, space diversity antennas, umbrella pattern antennas, minimum separation of cell site antennas, high gain antennas.

UNIT V

HANDOFF STRATEGIES

Concept of Handoff, types of handoff, handoff initiation, delaying handoff, forced handoff, mobile assigned handoff, intersystem handoff, vehicle locating methods, dropped call rates and their evaluation.

UNIT VI

DIGITAL CELLULAR NETWORKS: GSM architecture, GSM channels, multiple access schemes; TDMA, CDMA, OFDMA; architecture of 3G cellular systems.

TEXTBOOKS :

1. Mobile Cellular Telecommunications – W.C.Y. Lee, Tata McGraw Hill, 2nd Edn., 2006.
2. Principles of Mobile Communications – Gordon L. Stuber, Springer International 2nd Edition, 2007.

REFERENCES :

1. Wireless Communications – Theodore. S. Rappoport, Pearson education, 2nd Edn., 2002.
2. Wireless and Mobile Communications – Lee McGraw Hills, 3rd Edition, 2006.
3. Mobile Cellular Communication – G Sasibhushana Rao Pearson
3. Wireless Communication and Networking – Jon W. Mark and Weihua Zhqung, PHI, 2005.
4. Wireless Communication Technology – R. Blake, Thompson Asia Pvt. Ltd., 2004.

Outcomes:

At the end of this course the student can able to:

1. Identify the limitations of conventional mobile telephone systems; understand the concepts of cellular systems.
2. Understand the frequency management, channel assignment strategies and antennas in cellular systems.
3. Understand the concepts of handoff and architectures of various cellular systems.

IV Year - II Semester

L	T	P	C
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ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

UNIT I

Performance characteristics of instruments, Static characteristics, Accuracy, Resolution, Precision, Expected value, Error, Sensitivity. Errors in Measurement, Dynamic Characteristics-speed of response, Fidelity, Lag and Dynamic error. DC Voltmeters- Multi-range, Range extension/Solid state and differential voltmeters, AC voltmeters- multi range, range extension, shunt. Thermocouple type RF ammeter, Ohmmeters series type, shunt type, Multi-meter for Voltage, Current and resistance measurements.

UNIT II

Signal Generator- fixed and variable, AF oscillators, Standard and AF sine and square wave signal generators, Function Generators, Square pulse, Random noise, sweep, Arbitrary waveform. Wave Analyzers, Harmonic Distortion Analyzers, Spectrum Analyzers, Digital Fourier Analyzers.

UNIT III

Oscilloscopes CRT features, vertical amplifiers, horizontal deflection system, sweep, trigger pulse, delay line, sync selector circuits, simple CRO, triggered sweep CRO, Dual beam CRO, . Dual trace oscilloscope, sampling oscilloscope, storage oscilloscope, digital readout oscilloscope, digital storage oscilloscope, Lissajous method of frequency measurement, standard specifications of CRO, probes for CRO- Active & Passive, attenuator type.

UNIT IV

AC Bridges Measurement of inductance- Maxwell's bridge, Anderson bridge. Measurement of capacitance - Schering Bridge. Wheat stone bridge. Wien Bridge, Errors and precautions in using bridges. Q-meter.

UNIT V

Transducers- active & passive transducers : Resistance, Capacitance, inductance; Strain gauges, LVDT, Piezo Electric transducers, Resistance Thermometers, Thermocouples, Thermistors, Sensistors.

UNIT VI

Measurement of physical parameters force, pressure, velocity, humidity, moisture, speed, proximity and displacement. Data acquisition systems.

TEXTBOOKS :

1. Electronic instrumentation, second edition - H.S.Kalsi, Tata McGraw Hill, 2004.
2. Modern Electronic Instrumentation and Measurement Techniques – A.D. Helfrick and W.D. Cooper, PHI, 5th Edition, 2002.

REFERENCES :

1. Electronic Instrumentation & Measurements - David A. Bell, PHI, 2nd Edition, 2003.
2. Electronic Test Instruments, Analog and Digital Measurements - Robert A.Witte, Pearson Education, 2nd Ed., 2004.
3. Electronic Measurements & Instrumentations by K. Lal Kishore, Pearson Education - 2005.

OUTCOMES

The student will be able to

- Select the instrument to be used based on the requirements.
- Understand and analyze different signal generators and analyzers.
- Understand the design of oscilloscopes for different applications.
- Design different transducers for measurement of different parameters.

IV Year - II Semester

L	T	P	C
4	0	0	3

SATELLITE COMMUNICATIONS

OBJECTIVES

The student will be introduced to:

1. Understand the basic concepts, applications, frequencies used and types of satellite communications.
2. Understand the concept of look angles, launches and launch vehicles and orbital effects in satellite communications.
3. Understand the various satellite subsystems and its functionality.
4. Understand the concepts of satellite link design and calculation of C/N ratio.
5. Understand the concepts of multiple access and various types of multiple access techniques in satellite systems.
6. Understand the concepts of satellite navigation, architecture and applications of GPS.

UNIT I

INTRODUCTION [2] : Origin of Satellite Communications, Historical Back-ground, Basic Concepts of Satellite Communications, Frequency allocations for Satellite Services, Applications, Future Trends of Satellite Communications.

ORBITAL MECHANICS AND LAUNCHERS[1] : Orbital Mechanics, Look Angle determination, Orbital perturbations, Orbit determination, launches and launch vehicles, Orbital effects in communication systems performance.

UNIT II

SATELLITE SUBSYSTEMS[1] : Attitude and orbit control system, telemetry, tracking, Command and monitoring, power systems, communication subsystems, Satellite antenna Equipment reliability and Space qualification.

UNIT III

SATELLITE LINK DESIGN[1] : Basic transmission theory, system noise temperature and G/T ratio, Design of down links, up link design, Design of satellite links for specified C/N, System design example.

UNIT IV

MULTIPLE ACCESS[1][2] : Frequency division multiple access (FDMA) Intermodulation, Calculation of C/N. Time division Multiple Access (TDMA) Frame structure, Examples. Satellite Switched TDMA Onboard processing, DAMA, Code Division Multiple access (CDMA), Spread spectrum transmission and reception.

UNIT V

EARTH STATION TECHNOLOGY[3] : Introduction, Transmitters, Receivers, Antennas, Tracking systems, Terrestrial interface, Primary power test methods.

LOW EARTH ORBIT AND GEO-STATIONARY SATELLITE SYSTEMS[1] : Orbit consideration, coverage and frequency considerations, Delay & Throughput considerations, System considerations, Operational NGSO constellation Designs

UNIT VI

SATELLITE NAVIGATION & THE GLOBAL POSITIONING SYSTEM [1] : Radio and Satellite Navigation, GPS Position Location principles, GPS Receivers and codes, Satellite signal acquisition, GPS Navigation Message, GPS signal levels, GPS receiver operation, GPS C/A code accuracy, Differential GPS.

TEXT BOOKS:

1. Satellite Communications – Timothy Pratt, Charles Bostian and Jeremy Allnut, WSE, Wiley Publications, 2nd Edition, 2003.
2. Satellite Communications Engineering – Wilbur L. Pritchard, Robert A Nelson and Henri G.Suyderhoud, 2nd Edition, Pearson Publications, 2003.

REFERENCES :

1. Satellite Communications : Design Principles – M. Richharia, BS Publications, 2nd Edition, 2003.
2. Satellite Communication - D.C Agarwal, Khanna Publications, 5th Ed.
3. Fundamentals of Satellite Communications – K.N. Raja Rao, PHI, 2004
4. Satellite Communications – Dennis Roddy, McGraw Hill, 2nd Edition, 1996.

Outcomes:

At the end of this course the student can able to:

1. Understand the concepts, applications and subsystems of Satellite communications.
2. Derive the expression for G/T ratio and to solve some analytical problems on satellite link design.
3. Understand the various types of multiple access techniques and architecture of earth station design.
4. Understand the concepts of GPS and its architecture.

IV Year - II Semester

L	T	P	C
4	0	0	3

**WIRELESS SENSORS AND NETWORKS
ELECTIVE-III**

UNIT I

OVERVIEW OF WIRELESS SENSOR NETWORKS:

Key definitions of sensor networks, Advantages of sensor Networks, Unique constraints and challenges, Driving Applications, Enabling Technologies for Wireless Sensor Networks.

ARCHITECTURES:

Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes, Operating Systems and Execution Environments, Network Architecture -Sensor Network Scenarios, Optimization Goals and Figures of Merit, Gateway Concepts.

UNIT II

NETWORKING Technologies:

Physical Layer and Transceiver Design Considerations, Personal area networks (PANs), hidden node and exposed node problem, Topologies of PANs, MANETs, WANETs.

UNIT-III

MAC Protocols for Wireless Sensor Networks:

Issues in Designing a MAC protocol for Ad Hoc Wireless Networks, Design goals of a MAC Protocol for Ad Hoc Wireless Networks, Classifications of MAC Protocols, Contention - Based Protocols, Contention - Based Protocols with reservation Mechanisms, Contention – Based MAC Protocols with Scheduling Mechanisms, MAC Protocols that use Directional Antennas, Other MAC Protocols.

UNIT-IV

ROUTING PROTOCOLS:

Introduction, Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classification of Routing Protocols, Table –Driven Routing Protocols, On – Demand Routing Protocols, Hybrid Routing Protocols, Routing Protocols with Efficient Flooding Mechanisms, Hierarchical Routing Protocols, Power – Aware Routing Protocols, Proactive Routing

UNIT-V

TRANSPORT LAYER AND SECURITY PROTOCOLS:

Introduction, Issues in Designing a Transport Layer Protocol for Ad Hoc Wireless Networks, Design Goals of a Transport Layer Protocol for Ad Hoc Wireless Networks, Classification of Transport Layer Solutions, TCP Over Ad Hoc Wireless Networks, Other Transport Layer Protocol for Ad Hoc Wireless Networks,

UNIT- VI

SECURITY IN WSNs:

Security in Ad Hoc Wireless Networks, Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management, Secure Routing in Ad Hoc Wireless Networks.

SENSOR NETWORK PLATFORMS AND TOOLS:

Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms, Node-level Simulators, State-centric programming.

APPLICATIONS of WSN:

S Ultra wide band radio communication, Wireless fidelity systems. Future directions, Home automation, smart metering Applications

TEXT BOOKS:

1. Ad Hoc Wireless Networks: Architectures and Protocols - C. Siva Ram Murthy and B.S.Manoj, 2004, PHI
2. Wireless Ad- hoc and Sensor Networks: Protocols, Performance and Control – Jagannathan Sarangapani, CRC Press
3. Holger Karl & Andreas Willig, “Protocols And Architectures for Wireless Sensor Networks”, John Wiley, 2005.

REFERENCES:

1. Kazem Sohraby, Daniel Minoli, & Taieb Znati, “Wireless Sensor Networks- Technology, Protocols, and Applications”, John Wiley, 2007.
2. Feng Zhao & Leonidas J. Guibas, “Wireless Sensor Networks- An Information Processing Approach”, Elsevier, 2007.
3. Ad- Hoc Mobile Wireless Networks: Protocols & Systems, C.K. Toh ,1 ed. Pearson Education.
4. Wireless Sensor Networks - C. S. Raghavendra, Krishna M. Sivalingam, 2004, Springer
5. Wireless Sensor Networks – S Anandamurugan , Lakshmi Publications

DIGITAL IC DESIGN ELECTIVE-III

OBJECTIVES

- The student will be able to understand the MOS Design.
- In this course, students can study Combinational MOS Logic Circuits and Sequential MOS Logic Circuits.
- Another main object of this course is to motivate the graduate students to design and to develop the Digital Integrated Circuits for different Applications.
- The concepts of Semiconductor Memories, Flash Memory, RAM array organization.

UNIT-I:

MOS Design: Pseudo NMOS Logic – Inverter, Inverter threshold voltage, Output high voltage, Output Low voltage, Gain at gate threshold voltage, Transient response, Rise time, Fall time, Pseudo NMOS logic gates, Transistor equivalency, CMOS Inverter logic.

UNIT-II:

Combinational MOS Logic Circuits: MOS logic circuits with NMOS loads, Primitive CMOS logic gates – NOR & NAND gate, Complex Logic circuits design – Realizing Boolean expressions using NMOS gates and CMOS gates, AOI and OIA gates, CMOS full adder, CMOS transmission gates, Designing with Transmission gates.

UNIT-III:

Sequential MOS Logic Circuits: Behaviour of bistable elements, SR Latch, Clocked latch and flip flop circuits, CMOS D latch and edge triggered flip-flop.

UNIT-IV:

Dynamic Logic Circuits: Basic principle, Voltage Bootstrapping, Synchronous dynamic pass transistor circuits, Dynamic CMOS transmission gate logic, High performance Dynamic CMOS circuits.

UNIT-V:

Interconnect: Capacitive Parasitics, Resistive Parasitics, Inductive Parasitics, Advanced Interconnect Techniques.

UNIT-VI:

Semiconductor Memories: Memory Types, RAM array organization, DRAM – Types, Operation, Leakage currents in DRAM cell and refresh operation, SRAM operation Leakage currents in SRAM cells, Flash Memory- NOR flash and NAND flash.

Text Books:

1. Digital Integrated Circuits – A Design Perspective, Jan M. Rabaey, Anantha Chandrakasan, Borivoje Nikolic, 2nd Ed., PHI.
2. Digital Integrated Circuit Design – Ken Martin, Oxford University Press, 2011.

References:

1. CMOS Digital Integrated Circuits Analysis and Design – Sung-Mo Kang, Yusuf Leblebici, TMH, 3rd Ed., 2011.
2. CMOS VLSI Design – Neil H.E Weste, David harris, Ayan Banerjee 3rd Edition, Pearson

OUTCOMES

After going through this course the student will be able to

- Understand the concepts of MOS Design.
- Design and analysis of Combinational and Sequential MOS Circuits.
- Extend the Digital IC Design to Different Applications.
- Understand the Concepts of Semiconductor Memories, Flash Memory, RAM array organization.

OPERATING SYSTEMS ELECTIVE-III

OBJECTIVES:

- Study the basic concepts and functions of operating systems.
- Understand the structure and functions of OS.
- Learn about Processes, Threads and Scheduling algorithms.
- Understand the principles of concurrency and Deadlocks.
- Learn various memory management schemes.
- Study I/O management and File systems.
- Learn the basics of Linux system and perform administrative tasks on Linux Servers.

UNIT I

Introduction to Operating System Concept: Types of operating systems, operating systems concepts, operating systems services, Introduction to System call, System call types.

UNIT-II:

Process Management – Process concept, The process, Process State Diagram , Process control block, Process Scheduling- Scheduling Queues, Schedulers, Operations on Processes, Interprocess Communication, Threading Issues, Scheduling-Basic Concepts, Scheduling Criteria, Scheduling Algorithms.

UNIT-III:

Memory Management: Swapping, Contiguous Memory Allocation, Paging, structure of the Page Table, Segmentation

Virtual Memory Management:

Virtual Memory, Demand Paging, Page-Replacement Algorithms, Thrashing

UNIT-IV:

Concurrency: Process Synchronization, The Critical- Section Problem, Synchronization Hardware, Semaphores, Classic Problems of Synchronization, Monitors, Synchronization examples

Principles of deadlock – System Model, Deadlock Characterization, Deadlock Prevention, Detection and Avoidance, Recovery from Deadlock

UNIT-V:

File system Interface- the concept of a file, Access Methods, Directory structure, File system mounting, file sharing, protection.

File System implementation- File system structure, allocation methods, free-space management

Mass-storage structure overview of Mass-storage structure, Disk scheduling, Device drivers,

UNIT VI:

Linux System: Components of LINUX, Interprocess Communication, Synchronisation, Interrupt, Exception and System Call.

Android Software Platform: Android Architecture, Operating System Services, Android Runtime Application Development, Application Structure, Application Process management

OUTCOMES:

- Design various Scheduling algorithms.
- Apply the principles of concurrency.
- Design deadlock, prevention and avoidance algorithms.
- Compare and contrast various memory management schemes.
- Design and Implement a prototype file systems.
- Perform administrative tasks on Linux Servers
- Introduction to Android Operating System Internals

TEXT BOOK:

1. Operating System Concepts, Abraham Silberschatz, Peter Baer Galvin and Greg Gagne 9th Edition, John Wiley and Sons Inc., 2012.
2. Operating Systems – Internals and Design Principles, William Stallings, 7th Edition, Prentice Hall, 2011.
3. Operating Systems-S Halder, Alex A Aravind Pearson Education Second Edition 2016 .

REFERENCES:

1. Modern Operating Systems, Andrew S. Tanenbaum, Second Edition, Addison Wesley, 2001.
2. Operating Systems: A Design-Oriented Approach, Charles Crowley, Tata Mc Graw Hill Education”, 1996.
3. Operating Systems: A Concept-Based Approach, D M Dhamdhare, Second Edition, Tata Mc Graw-Hill Education, 2007.

COURSE STRUCTURE AND SYLLABUS

For

COMPUTER SCIENCE AND ENGINEERING

(Applicable for batches admitted from 2016-2017)



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India

I Year - I Semester

S. No.	Subjects	L	T	P	Credits
1-HS	English – I	4	--	--	3
2-BS	Mathematics - I	4	--	--	3
3-BS	Mathematics – II (Mathematical Methods)	4	--	--	3
4-BS	Applied Physics	4	--	--	3
5	Computer Programming	4	--	--	3
6-ES	Engineering Drawing	4	--	--	3
7-HS	English - Communication Skills Lab - 1	--	--	3	2
8-BS	Applied / Engineering Physics Lab	--	--	3	2
9-ES	Applied / Engineering Physics – Virtual Labs – Assignments	--	--	2	--
10	Computer Programming Lab	--	--	3	2
Total Credits					24

I Year - II SEMESTER

S. No.	Subjects	L	T	P	Credits
1-HS	English – II	4	--	--	3
2-BS	Mathematics - III	4	--	--	3
3-BS	Applied Chemistry	4	--	--	3
4	Object Oriented Programming through C++	4	--	--	3
5-HS	Environmental Studies	4	--	--	3
6-ES	Engineering Mechanics	4	--	--	3
7-BS	Applied / Engineering Chemistry Laboratory	--	--	3	2
8-HS	English - Communication Skills Lab – 2	--	--	3	2
9	Object Oriented Programming Lab	--	--	3	2
Total Credits					24

II Year - I Semester

S. No.	Subjects	L	T	P	Credits
1-HS	Statistics with R Programming	4	--	--	3
2	Mathematical Foundations of Computer Science	4	--	--	3
3	Digital Logic Design	4	--	--	3
4	Python Programming	4	--	--	3
5	Data Structures through C++	4	--	--	3
6	Computer Graphics	4	--	--	3
7	Data Structures through C++Lab	--	--	3	2
8	Python Programming Lab	--	--	3	2
Total Credits					22

II Year - II Semester

S. No.	Subjects	L	T	P	Credits
1	Software Engineering	4	--	--	3
2	Java Programming	4	--	--	3
3	Advanced Data Structures	4	--	--	3
4	Computer Organization	4	--	--	3
5	Formal Languages and Automata Theory	4	--	--	3
6	Principles of Programming Languages	4	--	--	3
7	Advanced Data Structures Lab	--	--	3	2
8	Java Programming Lab	--	--	3	2
Total Credits					22

III Year - I Semester

S. No.	Subjects	L	T	P	Credits
1	Compiler Design	4	--	--	3
2	Unix Programming	4	--	--	3
3	Object Oriented Analysis and Design using UML	4	--	--	3
4	Database Management Systems	4	--	--	3
5	Operating Systems	4	--	--	3
6	Unified Modeling Lab	--	--	3	2
7	Operating System & Linux Programming Lab	--	--	3	2
8	Database Management System Lab	--	--	3	2
MC	Professional Ethics & Human Values	--	3	--	--
Total Credits					21

III Year - II Semester

S. No.	Subjects	L	T	P	Credits
1	Computer Networks	4	2	--	3
2	Data Warehousing and Mining	4	--	--	3
3	Design and Analysis of Algorithms	4	--	--	3
4	Software Testing Methodologies	4	--	--	3
5	Open Elective: i. Artificial Intelligence ii. Internet of Things iii. Cyber Security iv. Digital Signal Processing v. Embedded Systems vi. Robotics	4	--	--	3
6	Network Programming Lab	--	--	3	2
7	Software Testing Lab	--	--	3	2
8	Data Warehousing and Mining Lab	--	--	3	2
9	IPR & Patents	--	2	--	--
Total Credits					21

IV Year - I Semester

S. No.	Subjects	L	T	P	Credits
1	Cryptography and Network Security	4	--	--	3
2	Software Architecture & Design Patterns	4	--	--	3
3	Web Technologies	4	--	--	3
4- HS	Managerial Economics and Financial Analysis	4	--	--	3
5	Elective-I i. Big Data Analytics ii. Information Retrieval Systems iii. Mobile Computing	4	--	--	3
6	Elective-II i. Cloud Computing ii. Software Project Management iii. Scripting Languages	4	--	--	3
7	Software Architecture & Design Patterns Lab	--	--	3	2
8	Web Technologies Lab	--	--	3	2
Total Credits					22

IV Year - II Semester

S. No.	Subjects	L	T	P	Credits
1	Distributed Systems	4	--	--	3
2- HS	Management Science	4	--	--	3
3	Machine Learning	4	--	--	3
4	Elective-III i. Concurrent and Parallel Programming ii. Artificial Neural Networks iii. Operations Research	4	--	--	3
5	Seminar	--	3	--	2
6	Project	--	--	--	10
Total Credits					24

Total Course Credits = 48+44 + 42 + 46 = 180

SYLLABUS

I Year - I Semester

L	T	P	C
4	0	0	3

ENGLISH - I

Introduction:

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training the students to acquire communicative competence, the syllabus has been designed to develop linguistic and communicative competence of the students of Engineering.

As far as the detailed Textbooks are concerned, the focus should be on the skills of listening, speaking, reading and writing. The nondetailed Textbooks are meant for extensive reading for pleasure and profit.

Thus the stress in the syllabus is primarily on the development of communicative skills and fostering of ideas.

Objectives:

1. To improve the language proficiency of the students in English with emphasis on LSRW skills.
2. To enable the students to study and comprehend the prescribed lessons and subjects more effectively relating to their theoretical and practical components.
3. To develop the communication skills of the students in both formal and informal situations.

LISTENING SKILLS:

Objectives:

1. To enable the students to appreciate the role of listening skill and improve their pronunciation.
2. To enable the students to comprehend the speech of people belonging to different backgrounds and regions.
3. To enable the students to listen for general content, to fill up information and for specific information.

SPEAKING SKILLS:

Objectives:

1. To make the students aware of the importance of speaking for their personal and professional communication.
2. To enable the students to express themselves fluently and accurately in social and professional success.
3. To help the students describe objects, situations and people.
4. To make the students participate in group activities like roleplays, discussions and debates.
5. To make the students participate in Just a Minute talks.

READING SKILLS:

Objectives:

1. To enable the students to comprehend a text through silent reading.
2. To enable the students to guess the meanings of words, messages and inferences of texts in given contexts.
3. To enable the students to skim and scan a text.
4. To enable the students to identify the topic sentence.
5. To enable the students to identify discourse features.
6. To enable the students to make intensive and extensive reading.

WRITING SKILLS:

Objectives:

1. To make the students understand that writing is an exact formal skills.
2. To enable the students to write sentences and paragraphs.
3. To make the students identify and use appropriate vocabulary.
4. To enable the students to narrate and describe.
5. To enable the students capable of note-making.
6. To enable the students to write coherently and cohesively.
7. To make the students to write formal and informal letters.
8. To enable the students to describe graphs using expressions of comparison.
9. To enable the students to write technical reports.

Methodology:

1. The class are to be learner-centered where the learners are to read the texts to get a comprehensive idea of those texts on their own with the help of the peer group and the teacher.
2. Integrated skill development methodology has to be adopted with focus on individual language skills as per the tasks/exercise.
3. The tasks/exercises at the end of each unit should be completed by the learners only and the teacher intervention is permitted as per the complexity of the task/exercise.
4. The teacher is expected to use supplementary material wherever necessary and also generate activities/tasks as per the requirement.

5. The teacher is permitted to use lecture method when a completely new concept is introduced in the class.

Assessment Procedure: Theory

1. The formative and summative assessment procedures are to be adopted (mid exams and end semester examination).
2. Neither the formative nor summative assessment procedures should test the memory of the content of the texts given in the textbook. The themes and global comprehension of the units in the present day context with application of the language skills learnt in the unit are to be tested.
3. Only new unseen passages are to be given to test reading skills of the learners. Written skills are to be tested from sentence level to essay level. The communication formats— emails, letters and reports-- are to be tested along with appropriate language and expressions.

4. Examinations:

I mid exam + II mid exam (15% for descriptive tests+10% for online tests)= 25%

(80% for the best of two and 20% for the other)

Assignments= 5%

End semester exams=70%

5. Three take home assignments are to be given to the learners where they will have to read texts from the reference books list or other sources and write their gist in their own words.

The following text books are recommended for study in I B.Tech I Semester (Common for all branches)and I B.Pharma I Sem of JNTU Kakinada from the academic year 2016-17

(R-16 Regulations)

DETAILED TEXTBOOK:

ENGLISH FOR ENGINEERS AND TECHNOLOGISTS, Published by **Orient Blackswan Pvt Ltd**

NON-DETAILED TEXTBOOK:

PANORAMA: A COURSE ON READING, Published by **Oxford University Press India**

The course content along with the study material is divided into six units.

UNIT I:

1. 'Human Resources' from English for Engineers and Technologists.

OBJECTIVE:

To develop human resources to serve the society in different ways.

OUTCOME:

The lesson motivates the readers to develop their knowledge different fields and serve the society accordingly.

2. 'An Ideal Family' from Panorama: A Course on Reading

OBJECTIVE:

To develop extensive reading skill and comprehension for pleasure and profit.

OUTCOME:

Acquisition of writing skills

UNIT 2:

1. ' Transport: Problems and Solutions' from English for Engineers and Technologists.

OBJECTIVE:

To highlight road safety measures whatever be the mode of transport.

OUTCOME:

The lesson motivates the public to adopt road safety measures.

2. 'War' from 'Panorama : A Course on Reading'

OBJECTIVE:

To develop extensive reading skill and comprehension for pleasure and profit.

OUTCOME:

Acquisition of writing skills

UNIT 3:

1. 'Evaluating Technology' from English for Engineers and Technologists.

OBJECTIVE:

To highlight the advantages and disadvantages of technology.

OUTCOME:

The lesson creates an awareness in the readers that mass production is ultimately detrimental to biological survival.

2. 'The Verger' from 'Panorama : A Course on Reading'

OBJECTIVE:

To develop extensive reading skill and comprehension for pleasure and profit.

OUTCOME:

Acquisition of writing skills

UNIT 4:

1. 'Alternative Sources of Energy' from English for Engineers and Technologists.

OBJECTIVE:

To bring into focus different sources of energy as alternatives to the depleting sources.

OUTCOME:

The lesson helps to choose a source of energy suitable for rural India.

2. 'The Scarecrow' from Panorama : A Course on Reading

OBJECTIVE:

To develop extensive reading skill and comprehension for pleasure and profit.

OUTCOME:

Acquisition of writing skills

UNIT 5:

1. 'Our Living Environment' from English for Engineers and Technologists.

OBJECTIVE:

To highlight the fact that animals must be preserved because animal life is precious.

OUTCOME:

The lesson creates an awareness in the reader as to the usefulness of animals for the human society.

2. 'A Village Host to Nation' from Panorama : A Course on Reading

OBJECTIVE:

To develop extensive reading skill and comprehension for pleasure and profit.

OUTCOME:

Acquisition of writing skills

UNIT 6:

1. ' Safety and Training' from English for Engineers and Technologists.

OBJECTIVE:

To highlight the possibility of accidents in laboratories, industries and other places and to follow safety measures.

OUTCOME:

The lesson helps in identifying safety measures against different varieties of accidents at home and in the workplace.

2. 'Martin Luther King and Africa' from Panorama : A Course on Reading

OBJECTIVE:

To develop extensive reading skill and comprehension for pleasure and profit.

OUTCOME:

Acquisition of writing skills

NOTE:

All the exercises given in the prescribed lessons in both detailed and non-detailed textbooks relating to the theme and language skills must be covered.

OVERALL COURSE OUTCOME:

1. Using English languages, both written and spoken, competently and correctly.
2. Improving comprehension and fluency of speech.
3. Gaining confidence in using English in verbal situations.

MODEL QUESTION PAPER FOR THEORY

PART- I

Six short answer questions on 6 unit themes

One question on eliciting student's response to any of the themes

PART-II

Each question should be from one unit and the last question can be a combination of two or more units.

Each question should have 3 sub questions: A,B & C

A will be from the main text: 5 marks

B from non-detailed text: 3 marks

C on grammar and Vocabulary: 6 marks

I Year - I Semester

L	T	P	C
4	0	0	3

MATHEMATICS-I
(Common to ALL branches of First Year B.Tech.)

Course Objectives:

1. The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course.
2. The skills derived from the course will help the student from a necessary base to develop analytic and design concepts.

Course Outcomes: At the end of the Course, Student will be able to:

1. Solve linear differential equations of first, second and higher order.
2. Determine Laplace transform and inverse Laplace transform of various functions and use Laplace transforms to determine general solution to linear ODE.
3. Calculate total derivative, Jacobian and minima of functions of two variables.

UNIT I: Differential equations of first order and first degree:

Linear-Bernoulli-Exact-Reducible to exact.

Applications: Newton's Law of cooling-Law of natural growth and decay-Orthogonal trajectories- Electrical circuits- Chemical reactions.

UNIT II: Linear differential equations of higher order:

Non-homogeneous equations of higher order with constant coefficients with RHS term of the type e^{ax} , $\sin ax$, $\cos ax$, polynomials in x , $e^{ax} V(x)$, $xV(x)$ - Method of Variation of parameters.

Applications: LCR circuit, Simple Harmonic motion.

UNIT III: Laplace transforms:

Laplace transforms of standard functions-Shifting theorems - Transforms of derivatives and integrals – Unit step function –Dirac's delta function- Inverse Laplace transforms– Convolution theorem (with out proof).

Applications: Solving ordinary differential equations (initial value problems) using Laplace transforms.

UNIT IV: Partial differentiation:

Introduction- Homogeneous function-Euler's theorem-Total derivative-Chain rule-Generalized Mean value theorem for single variable (without proof)-Taylor's and Mc Laurent's series expansion of functions of two variables– Functional dependence- Jacobian.

Applications: Maxima and Minima of functions of two variables without constraints and Lagrange's method (with constraints).

UNIT V: First order Partial differential equations:

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions –solutions of first order linear (Lagrange) equation and nonlinear (standard types) equations.

UNIT VI: Higher order Partial differential equations:

Solutions of Linear Partial differential equations with constant coefficients. RHS term of the type e^{ax+by} , $\sin(ax+by)$, $\cos(ax+by)$, $x^m y^n$. Classification of second order partial differential equations.

Text Books:

1. **B.S.Grewal**, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. **N.P.Bali**, Engineering Mathematics, Lakshmi Publications.

Reference Books:

1. **Erwin Kreyszig**, Advanced Engineering Mathematics, 10th Edition, Wiley-India
2. **Micheael Greenberg**, Advanced Engineering Mathematics, 9th edition, Pearson edn
3. **Dean G. Duffy**, Advanced engineering mathematics with MATLAB, CRC Press
4. **Peter O'neil**, Advanced Engineering Mathematics, Cengage Learning.
5. **Srimanta Pal, Subodh C.Bhunia**, Engineering Mathematics, Oxford University Press.
6. **Dass H.K., Rajnish Verma. Er.**, Higher Engineering Mathematics, S. Chand Co. Pvt. Ltd, Delhi.

I Year - I Semester

L	T	P	C
4	0	0	3

MATHEMATICS-II (Mathematical Methods)
(Common to ALL branches of First Year B.Tech.)

Course Objectives:

1. The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course.
2. The skills derived from the course will help the student from a necessary base to develop analytic and design concepts.
3. Understand the most basic numerical methods to solve simultaneous linear equations.

Course Outcomes: At the end of the Course, Student will be able to:

1. Calculate a root of algebraic and transcendental equations. Explain relation between the finite difference operators.
2. Compute interpolating polynomial for the given data.
3. Solve ordinary differential equations numerically using Euler's and RK method.
4. Find Fourier series and Fourier transforms for certain functions.
5. Identify/classify and solve the different types of partial differential equations.

UNIT I: Solution of Algebraic and Transcendental Equations:

Introduction- Bisection method – Method of false position – Iteration method – Newton-Raphson method (One variable and simultaneous Equations).

UNIT II: Interpolation:

Introduction- Errors in polynomial interpolation – Finite differences- Forward differences- Backward differences – Central differences – Symbolic relations and separation of symbols - Differences of a polynomial-Newton's formulae for interpolation – Interpolation with unequal intervals - Lagrange's interpolation formula.

UNIT III: Numerical Integration and solution of Ordinary Differential equations:

Trapezoidal rule- Simpson's $1/3^{\text{rd}}$ and $3/8^{\text{th}}$ rule-Solution of ordinary differential equations by Taylor's series-Picard's method of successive approximations-Euler's method - Runge-Kutta method (second and fourth order).

UNIT IV: Fourier Series:

Introduction- Periodic functions – Fourier series of -periodic function - Dirichlet's conditions – Even and odd functions – Change of interval– Half-range sine and cosine series.

UNIT V: Applications of PDE:

Method of separation of Variables- Solution of One dimensional Wave, Heat and two-dimensional Laplace equation.

UNIT VI: Fourier Transforms:

Fourier integral theorem (without proof) – Fourier sine and cosine integrals - sine and cosine transforms – properties – inverse transforms – Finite Fourier transforms.

Text Books:

1. **B.S.Grewal**, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. **N.P.Bali**, Engineering Mathematics, Lakshmi Publications.

Reference Books:

1. **Dean G. Duffy**, Advanced engineering mathematics with MATLAB, CRC Press
2. **V.Ravindranath and P.Vijayalakshmi**, Mathematical Methods, Himalaya Publishing House.
3. **Erwin Kreyszig**, Advanced Engineering Mathematics, 10th Edition, Wiley-India
4. **David Kincaid, Ward Cheney**, Numerical Analysis-Mathematics of Scientific Computing, 3rd Edition, Universities Press.
5. **Srimanta Pal, Subodh C.Bhunja**, Engineering Mathematics, Oxford University Press.
6. **Dass H.K., Rajnish Verma. Er.**, Higher Engineering Mathematics, S. Chand Co. Pvt. Ltd, Delhi.

I Year - I Semester

L	T	P	C
4	0	0	3

APPLIED PHYSICS
(CSE, ECE, EEE, IT, EIE, E.Com.E)

OBJECTIVES: *Physics curriculum which is re-oriented to the needs of Circuital branches of graduate engineering courses offered by JNTUniv.Kkd. that serves as a transit to understand the branch specific advanced topics. The courses are designed to:*

- *Impart Knowledge of Physical Optics phenomena like Interference, Diffraction and Polarization involving required to design instruments with higher resolution.*
- *Teach Concepts of coherent sources, its realization and utility optical instrumentation.*
- *Study the concepts regarding the bulk response of materials to the EM fields and their analytically study in the back-drop of basic quantum mechanics.*
- *Understand the physics of Semiconductors and their working mechanism for their utility in sensors.*

UNIT-I

INTERFERENCE: Principle of Superposition – Coherent Sources – Interference in thin films (reflection geometry) – Newton’s rings – construction and basic principle of Interferometers.

UNIT-II

DIFFRACTION: Fraunhofer diffraction at single slit - Cases of double slit, N-slits & Circular Aperture (Qualitative treatment only)-Grating equation - Resolving power of a grating, Telescope and Microscopes.

UNIT-III

POLARIZATION: Types of Polarization – Methods of production - Nicol Prism - Quarter wave plate and Half Wave plate – Working principle of Polarimeter (Sacharimeter).

LASERS: Characteristics– Stimulated emission – Einstein’s Transition Probabilities- Pumping schemes - Ruby laser – Helium Neon laser.

UNIT-IV

ELECTROMAGNETIC FIELDS: Scalar and Vector Fields – Electric Potential- Gradient, Divergence of fields – Gauss and Stokes theorems-Propagation of EM waves through dielectric medium.

UNIT-V

QUANTUM MECHANICS: Introduction - Matter waves – Schrödinger Time Independent and Time Dependent wave equations – Particle in a box.
FREE ELECTRON THEORY: Defects of Classical free electron theory –Quantum Free electron theory - concept of Fermi Energy.

UNIT-VI

BAND THEORY OF SOLIDS: Bloch's theorem (qualitative) – Kronig – Penney model – energy bands in crystalline solids – classification of crystalline solids– effective mass of electron & concept of hole.

SEMICONDUCTOR PHYSICS: Conduction – Density of carriers in Intrinsic and Extrinsic semiconductors – Drift & Diffusion – relevance of Einstein's equation- Hall effect in semiconductors

***Outcome:** Construction and working details of instruments, ie., Interferometer, Diffractometer and Polarimeter are learnt. Study EM-fields and semiconductors under the concepts of Quantum mechanics paves way for their optimal utility.*

Text Books:

1. A Text book of Engineering Physics – by Dr. M.N.Avadhanulu and Dr.P.G.Kshira sagar, S.Chand & Company Ltd., (2014)
2. 'Solid State Physics' by A.J.Dekker, Mc Millan Publishers (2011)
3. Engineering Physics by D.K.Bhattacharya and Poonam Tandon, Oxford press (2015)

Reference Books:

1. Applied Physics by P.K.Palanisamy, Scitech publications (2014)
2. Lasers and Non-Linear optics by B.B.Laud, New Age International Publishers (2008).
3. Engineering Physics by M. Arumugam, Anuradha Publication (2014)

I Year - I Semester

L	T	P	C
4	0	0	3

COMPUTER PROGRAMMING

Learning objectives:

Formulating algorithmic solutions to problems and implementing algorithms in C.

- Notion of Operation of a CPU, Notion of an algorithm and computational procedure, editing and executing programs in Linux.
- Understanding branching, iteration and data representation using arrays.
- Modular programming and recursive solution formulation.
- Understanding pointers and dynamic memory allocation.
- Understanding miscellaneous aspects of C.
- Comprehension of file operations.

UNIT-I:

History and Hardware - Computer Hardware, Bits and Bytes, Components, Programming Languages - Machine Language, Assembly Language, Low- and High-Level Languages, Procedural and Object-Oriented Languages, Application and System Software, The Development of C Algorithms The Software Development Process.

UNIT-II:

Introduction to C Programming- Identifiers, The main () Function, The printf () Function
Programming Style - Indentation, Comments, Data Types, Arithmetic Operations, Expression Types, Variables and Declarations, Negation, Operator Precedence and Associativity, Declaration Statements, Initialization.

Assignment - Implicit Type Conversions, Explicit Type Conversions (Casts), Assignment Variations, Mathematical Library Functions, Interactive Input, Formatted Output, Format Modifiers.

UNIT -III:

Control Flow-Relational Expressions - Logical Operators:

Selection: if-else Statement, nested if, examples, Multi-way selection: switch, else-if, examples.

Repetition: Basic Loop Structures, Pretest and Posttest Loops, Counter-Controlled and Condition-Controlled Loops, The while Statement, The for Statement, Nested Loops, The do-while Statement.

UNIT-IV

Modular Programming: Function and Parameter Declarations, Returning a Value, Functions with Empty Parameter Lists, Variable Scope, Variable Storage Class, Local Variable Storage Classes, Global Variable Storage Classes, Pass by Reference, Passing Addresses to a Function, Storing Addresses, Using Addresses, Declaring and Using Pointers, Passing Addresses to a Function.

Case Study: Swapping Values, Recursion - Mathematical Recursion, Recursion versus Iteration.

UNIT-V:

Arrays & Strings

Arrays: One-Dimensional Arrays, Input and Output of Array Values, Array Initialization, Arrays as Function Arguments, Two-Dimensional Arrays, Larger Dimensional Arrays- Matrices

Strings: String Fundamentals, String Input and Output, String Processing, Library Functions

UNIT-VI:

Pointers, Structures, Files

Pointers: Concept of a Pointer, Initialisation of pointer variables, pointers as function arguments, passing by address, Dangling memory, address arithmetic, character pointers and functions, pointers to pointers, Dynamic memory management functions, command line arguments.

Structures: Derived types, Structures declaration, Initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self referential structures, unions, typedef, bit-fields.

Data Files: Declaring, Opening, and Closing File Streams, Reading from and Writing to Text Files, Random File Access

Outcomes:

- Understand the basic terminology used in computer programming
- Write, compile and debug programs in C language.
- Use different data types in a computer program.
- Design programs involving decision structures, loops and functions.
- Explain the difference between call by value and call by reference
- Understand the dynamics of memory by the use of pointers
- Use different data structures and create/update basic data files.

Text Books:

1. ANSI C Programming, Gary J. Bronson, Cengage Learning.
2. Programming in C, BI Juneja Anita Seth, Cengage Learning.
3. The C programming Language, Dennis Richie and Brian Kernighan, Pearson Education.

Reference Books:

1. C Programming-A Problem Solving Approach, Forouzan, Gilberg, Cengage.
2. Programming with C, Bichkar, Universities Press.
3. Programming in C, Reema Thareja, OXFORD.
4. C by Example, Noel Kalicharan, Cambridge.

ENGINEERING DRAWING

Objective: Engineering drawing being the principle method of communication for engineers, the objective to introduce the students, the techniques of constructing the various types of polygons, curves and scales. The objective is also to visualize and represent the 3D objects in 2D planes with proper dimensioning, scaling etc.

- To introduce the use and the application of drawing instruments and to make the students construct the polygons, curves and various types of scales. The student will be able to understand the need to enlarge or reduce the size of objects in representing them.
- To introduce orthographic projections and to project the points and lines parallel to one plane and inclined to other.
- To make the students draw the projections of the lines inclined to both the planes.
- To make the students draw the projections of the plane inclined to both the planes.
- To make the students draw the projections of the various types of solids in different positions inclined to one of the planes.
- To represent the object in 3D view through isometric views. The student will be able to represent and convert the isometric view to orthographic view and vice versa.

UNIT I Polygons, Construction of regular polygons using given length of a side; Ellipse, arcs of circles and Oblong methods; Scales – Vernier and Diagonal scales.

UNIT II Introduction to orthographic projections; projections of points; projections of straight lines parallel to both the planes; projections of straight lines – parallel to one plane and inclined to the other plane.

UNIT III Projections of straight lines inclined to both the planes, determination of true lengths, angle of inclinations and traces.

UNIT IV Projections of planes: regular planes perpendicular/parallel to one plane and inclined to the other reference plane; inclined to both the reference planes.

UNIT V Projections of Solids – Prisms, Pyramids, Cones and Cylinders with the axis inclined to one of the planes.

UNIT VI Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

Text Books:

1. Engineering Drawing, N. D. Butt, Chariot Publications
2. Engineering Drawing, K. L. Narayana & P. Kannaiah, Scitech Publishers.
3. Engineering Graphics, P.I. Varghese, McGraw Hill Publishers

Reference Books:

1. Engineering Graphics for Degree, K. C. John, PHI Publishers
2. Engineering Drawing, Agarwal & Agarwal, Tata McGraw Hill Publishers
3. Engineering Drawing + AutoCad – K Venugopal, V. Prabhu Raja, New Age

I Year - I Semester

L	T	P	C
0	0	3	2

ENGLISH - COMMUNICATION SKILLS LAB - I

PRESCRIBED LAB MANUAL FOR SEMESTER I:

'INTERACT: English Lab Manual for Undergraduate Students' Published by **Orient Blackswan Pvt Ltd.**

OBJECTIVES:

To enable the students to learn through practice the communication skills of listening, speaking, reading and writing.

OUTCOME:

A study of the communicative items in the laboratory will help the students become successful in the competitive world.

The course content along with the study material is divided into six units.

UNIT 1:

1. WHY study Spoken English?
2. Making Inquiries on the phone, thanking and responding to Thanks
Practice work.

UNIT 2:

1. Responding to Requests and asking for Directions
Practice work.

UNIT 3:

1. Asking for Clarifications, Inviting, Expressing Sympathy, Congratulating
2. Apologising, Advising, Suggesting, Agreeing and Disagreeing
Practice work.

UNIT 4:

1. Letters and Sounds
Practice work.

UNIT 5:

1. The Sounds of English
Practice work.

UNIT 6:

1. Pronunciation
2. Stress and Intonation
Practice work.

Assessment Procedure: Laboratory

1. Every lab session (150 minutes) should be handled by not less than two teachers (three would be ideal) where each faculty has to conduct a speaking activity for 20/30 students.
2. The teachers are to assess each learner in the class for not less than 10 speaking activities, each one to be assessed for 10 marks or 10%. The average of 10 day-to-day activity assessments is to be calculated for 10 marks for internal assessment.

The rubric given below has to be filled in for all the students for all activities.

The rubric to assess the learners:

	Body language		Fluency & Audibility	Clarity in Speech	Neutralization of accent	Appropriate Language		Total 10 marks	Remarks
	Gestures & Postures	Eye Contact				Grammar	Vocabulary & expressions		

- **Lab Assessment: Internal (25 marks)**
 1. Day-to-Day activities: 10 marks
 2. Completing the exercises in the lab manual: 5 marks
 3. Internal test (5 marks written and 5 marks oral)
- **Lab Assessment: External (50 marks)**
 1. Written test: 20 marks (writing a dialogue, note-taking and answering questions on listening to an audio recording.
 2. Oral: Reading aloud a text or a dialogue- 10 marks
 3. Viva-Voce by the external examiner: 20 marks

Reference Books:

1. Strengthen your communication skills by Dr M Hari Prasad, Dr Salivendra Raju and Dr G Suvarna Lakshmi, Maruti Publications.
2. English for Professionals by Prof Eliah, B.S Publications, Hyderabad.
3. Unlock, Listening and speaking skills 2, Cambridge University Press
4. Spring Board to Success, Orient BlackSwan
5. A Practical Course in effective english speaking skills, PHI
6. Word power made handy, Dr shalini verma, Schand Company
7. Let us hear them speak, Jayashree Mohanraj, Sage texts
8. Professional Communication, Aruna Koneru, Mc Grawhill Education
9. Cornerstone, Developing soft skills, Pearson Education

I Year - I Semester

L	T	P	C
0	0	3	2

APPLIED/ENGINEERING PHYSICS LAB

(Any 10 of the following listed experiments)

Objective: *Training field oriented Engineering graduates to handle instruments and their design methods to improve the accuracy of measurements.*

LIST OF EXPERIMENTS:

1. Determination of wavelength of a source-Diffraction Grating-Normal incidence.
2. Newton's rings – Radius of Curvature of Plano - Convex Lens.
3. Determination of thickness of a spacer using wedge film and parallel interference fringes.
4. Determination of Rigidity modulus of a material- Torsional Pendulum.
5. Determination of Acceleration due to Gravity and Radius of Gyration- Compound Pendulum.
6. Melde's experiment – Transverse and Longitudinal modes.
7. Verification of laws of vibrations in stretched strings – Sonometer.
8. Determination of velocity of sound – Volume Resonator.
9. L- C- R Series Resonance Circuit.
10. Study of I/V Characteristics of Semiconductor diode.
11. I/V characteristics of Zener diode.
12. Characteristics of Thermistor – Temperature Coefficients.
13. Magnetic field along the axis of a current carrying coil – Stewart and Gee's apparatus.
14. Energy Band gap of a Semiconductor p - n junction.
15. Hall Effect in semiconductors.
16. Time constant of CR circuit.
17. Determination of wavelength of laser source using diffraction grating.
18. Determination of Young's modulus by method of single cantilever oscillations.
19. Determination of lattice constant – lattice dimensions kit.
20. Determination of Planck's constant using photocell.
21. Determination of surface tension of liquid by capillary rise method.

Outcome: *Physics lab curriculum gives fundamental understanding of design of an instrument with targeted accuracy for physical measurements*

I Year - I Semester	L	T	P	C
	0	0	2	0

APPLIED/ENGINEERING PHYSICS - VIRTUAL LABS – ASSIGNMENTS
(Constitutes 5% marks of 30marks of Internal-component)

Objective: *Training Engineering students to prepare a technical document and improving their writing skills.*

LIST OF EXPERIMENTS

1. Hall Effect
2. Crystal Structure
3. Hysteresis
4. Brewster's angle
5. Magnetic Levitation / SQUID
6. Numerical Aperture of Optical fiber
7. Photoelectric Effect
8. Simple Harmonic Motion
9. Damped Harmonic Motion
10. LASER – Beam Divergence and Spot size
11. B-H curve
12. Michelson's interferometer
13. Black body radiation

URL: www.vlab.co.in

Outcome: *Physics Virtual laboratory curriculum in the form of assignment ensures an engineering graduate to prepare a /technical/mini-project/ experimental report with scientific temper.*

I Year - I Semester

L	T	P	C
0	0	3	2

COMPUTER PROGRAMMING LAB

OBJECTIVES:

- Understand the basic concept of C Programming, and its different modules that includes conditional and looping expressions, Arrays, Strings, Functions, Pointers, Structures and File programming.
- Acquire knowledge about the basic concept of writing a program.
- Role of constants, variables, identifiers, operators, type conversion and other building blocks of C Language.
- Use of conditional expressions and looping statements to solve problems associated with conditions and repetitions.
- Role of Functions involving the idea of modularity.

Programming

Exercise - 1 Basics

- a) What is an OS Command, Familiarization of Editors - vi, Emacs
- b) Using commands like mkdir, ls, cp, mv, cat, pwd, and man
- c) C Program to Perform Adding, Subtraction, Multiplication and Division of two numbers From Command line

Exercise - 2 Basic Math

- a) Write a C Program to Simulate 3 Laws at Motion
- b) Write a C Program to convert Celsius to Fahrenheit and vice versa

Exercise - 3 Control Flow - I

- a) Write a C Program to Find Whether the Given Year is a Leap Year or not.
- b) Write a C Program to Add Digits & Multiplication of a number

Exercise – 4 Control Flow - II

- a) Write a C Program to Find Whether the Given Number is
 - i) Prime Number
 - ii) Armstrong Number
- b) Write a C program to print Floyd Triangle
- c) Write a C Program to print Pascal Triangle

Exercise – 5 Functions

- a) Write a C Program demonstrating of parameter passing in Functions and returning values.
- b) Write a C Program illustrating Fibonacci, Factorial with Recursion without Recursion

Exercise – 6 Control Flow - III

- a) Write a C Program to make a simple Calculator to Add, Subtract, Multiply or Divide Using switch...case

b) Write a C Program to convert decimal to binary and hex (using switch call function the function)

Exercise – 7 Functions - Continued

Write a C Program to compute the values of $\sin x$ and $\cos x$ and e^x values using Series expansion. (use factorial function)

Exercise – 8 Arrays

Demonstration of arrays

- a) Search-Linear.
- b) Sorting-Bubble, Selection.
- c) Operations on Matrix.

Exercises - 9 Structures

- a) Write a C Program to Store Information of a Movie Using Structure
- b) Write a C Program to Store Information Using Structures with Dynamically Memory Allocation
- c) Write a C Program to Add Two Complex Numbers by Passing Structure to a Function

Exercise - 10 Arrays and Pointers

- a) Write a C Program to Access Elements of an Array Using Pointer
- b) Write a C Program to find the sum of numbers with arrays and pointers.

Exercise – 11 Dynamic Memory Allocations

- a) Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc () function.
- b) Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc () function. Understand the difference between the above two programs

Exercise – 12 Strings

- a) Implementation of string manipulation operations **with** library function.
 - i) copy
 - ii) concatenate
 - iii) length
 - iv) compare
- b) Implementation of string manipulation operations **without** library function.
 - i) copy
 - ii) concatenate
 - iii) length
 - iv) compare

Exercise -13 Files

- a) Write a C programming code to open a file and to print its contents on screen.
- b) Write a C program to copy files

Exercise - 14 Files Continued

- a) Write a C program merges two files and stores their contents in another file.
- b) Write a C program to delete a file.

Exercise - 15

- a) System Assembling, Disassembling and identification of Parts / Peripherals. b) Operating System Installation-Install Operating Systems like Windows, Linux along with necessary Device Drivers.

Exercise - 16

- a) MS-Office / Open Office
- i) Word - Formatting, Page Borders, Reviewing, Equations, symbols.
 - ii) Spread Sheet - organize data, usage of formula, graphs, charts.
 - iii) Powerpoint - features of power point, guidelines for preparing an effective presentation.
- b) Network Configuration & Software Installation-Configuring TCP/IP, Proxy, and firewall settings. Installing application software, system software & tools.

OUTCOMES:

- Apply and practice logical ability to solve the problems.
- Understand C programming development environment, compiling, debugging, and linking and executing a program using the development environment
- Analyzing the complexity of problems, Modularize the problems into small modules and then convert them into programs
- Understand and apply the in-built functions and customized functions for solving the problems.
- Understand and apply the pointers, memory allocation techniques and use of files for dealing with variety of problems.
- Document and present the algorithms, flowcharts and programs in form of user-manuals
- Identification of various computer components, Installation of software

Note:

- a) All the Programs must be executed in the Linux Environment. (Mandatory)**
- b) The Lab record must be a print of the LATEX (.tex) Format.**

I Year - II Semester

L	T	P	C
4	0	0	3

ENGLISH -II

Introduction:

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training the students to acquire communicative competence, the syllabus has been designed to develop linguistic and communicative competence of the students of Engineering.

As far as the detailed Textbooks are concerned, the focus should be on the skills of listening, speaking, reading and writing. The nondetailed Textbooks are meant for extensive reading for pleasure and profit.

Thus the stress in the syllabus is primarily on the development of communicative skills and fostering of ideas.

Objectives:

1. To improve the language proficiency of the students in English with emphasis on LSRW skills.
2. To enable the students to study and comprehend the prescribed lessons and subjects more effectively relating to their theoretical and practical components.
3. To develop the communication skills of the students in both formal and informal situations.

LISTENING SKILLS:

Objectives:

1. To enable the students to appreciate the role of listening skill and improve their pronunciation.
2. To enable the students to comprehend the speech of people belonging to different backgrounds and regions.
3. To enable the students to listen for general content, to fill up information and for specific information.

SPEAKING SKILLS:

Objectives:

1. To make the students aware of the importance of speaking for their personal and professional communication.
2. To enable the students to express themselves fluently and accurately in social and professional success.
3. To help the students describe objects, situations and people.
4. To make the students participate in group activities like roleplays, discussions and debates.
5. To make the students participate in Just a Minute talks.

READING SKILLS:

Objectives:

1. To enable the students to comprehend a text through silent reading.
2. To enable the students to guess the meanings of words, messages and inferences of texts in given contexts.
3. To enable the students to skim and scan a text.
4. To enable the students to identify the topic sentence.
5. To enable the students to identify discourse features.
6. To enable the students to make intensive and extensive reading.

WRITING SKILLS:

Objectives:

1. To make the students understand that writing is an exact formal skills.
2. To enable the students to write sentences and paragraphs.
3. To make the students identify and use appropriate vocabulary.
4. To enable the students to narrate and describe.
5. To enable the students capable of note-making.
6. To enable the students to write coherently and cohesively.
7. To make the students to write formal and informal letters.
8. To enable the students to describe graphs using expressions of comparison.
9. To enable the students to write technical reports.

Methodology:

1. The class are to be learner-centered where the learners are to read the texts to get a comprehensive idea of those texts on their own with the help of the peer group and the teacher.
2. Integrated skill development methodology has to be adopted with focus on individual language skills as per the tasks/exercise.
3. The tasks/exercises at the end of each unit should be completed by the learners only and the teacher intervention is permitted as per the complexity of the task/exercise.
4. The teacher is expected to use supplementary material wherever necessary and also generate activities/tasks as per the requirement.

5. The teacher is permitted to use lecture method when a completely new concept is introduced in the class.

Assessment Procedure: Theory

1. The formative and summative assessment procedures are to be adopted (mid exams and end semester examination).
2. Neither the formative nor summative assessment procedures should test the memory of the content of the texts given in the textbook. The themes and global comprehension of the units in the present day context with application of the language skills learnt in the unit are to be tested.
3. Only new unseen passages are to be given to test reading skills of the learners. Written skills are to be tested from sentence level to essay level. The communication formats— emails, letters and reports-- are to be tested along with appropriate language and expressions.
4. Examinations:

I mid exam + II mid exam (15% for descriptive tests+10% for online tests)= 25%

(80% for the best of two and 20% for the other)

Assignments= 5%

End semester exams=70%

5. Three take home assignments are to be given to the learners where they will have to read texts from the reference books list or other sources and write their gist in their own words.

The following text books are recommended for study in I B.Tech II Semester (Common for all branches)and I B.Pharma II Sem of JNTU Kakinada from the academic year 2016-17 (**R-16 Regulations**)

DETAILED TEXTBOOK: ENGLISH ENCOUNTERS Published by **Maruthi Publishers**.

DETAILED NON-DETAIL:THE GREAT INDIAN SCIENTISTS Published by **Cengage learning**

The course content along with the study material is divided into six units.

UNIT 1:

1. ' The Greatest Resource- Education' from English Encounters

OBJECTIVE:

Schumacher describes the education system by saying that it was mere training, something more than mere knowledge of facts.

OUTCOME:

The lesson underscores that the ultimate aim of Education is to enhance wisdom.

2. 'A P J Abdul Kalam' from The Great Indian Scientists.

OBJECTIVE:

The lesson highlights Abdul Kalam's contributions to Indian science and the awards he received.

OUTCOME:

Abdul Kalam's simple life and service to the nation inspires the readers to follow in his footsteps.

UNIT 2:

1. 'A Dilemma' from English Encounters

OBJECTIVE: The lesson centres on the pros and cons of the development of science and technology.

OUTCOME: The lesson enables the students to promote peaceful co-existence and universal harmony among people and society.

2. 'C V Raman' from The Great Indian Scientists.

OBJECTIVE:

The lesson highlights the dedicated research work of C V Raman and his achievements in Physics.

OUTCOME:

The Achievements of C V Raman are inspiring and exemplary to the readers and all scientists.

UNIT 3:

1. 'Cultural Shock': Adjustments to new Cultural Environments from English Encounters.

OBJECTIVE:

The lesson depicts of the symptoms of Cultural Shock and the aftermath consequences.

OUTCOME: The lesson imparts the students to manage different cultural shocks due to globalization.

2. 'Homi Jehangir Bhabha' from The Great Indian Scientists.

OBJECTIVE:

The lesson highlights Homi Jehangir Bhabha's contributions to Indian nuclear programme as architect.

OUTCOME:

The seminal contributions of Homi Jehangir Bhabha to Indian nuclear programme provide an aspiration to the readers to serve the nation and strengthen it.

UNIT 4:

1. 'The Lottery' from English Encounters.

OBJECTIVE:

The lesson highlights insightful commentary on cultural traditions.

OUTCOME:

The theme projects society's need to re-examine its traditions when they are outdated.

2. 'Jagadish Chandra Bose' from The Great Indian Scientists.

OBJECTIVE:

The lesson gives an account of the unique discoveries and inventions of Jagadish Chandra Bose in Science.

OUTCOME: The Scientific discoveries and inventions of Jagadish Chandra Bose provide inspiration to the readers to make their own contributions to science and technology, and strengthen the nation.

UNIT 5:

1. 'The Health Threats of Climate Change' from English Encounters.

OBJECTIVE:

The essay presents several health disorders that spring out due to environmental changes

OUTCOME:

The lesson offers several inputs to protect environment for the sustainability of the future generations.

2. 'Prafulla Chandra Ray' from The Great Indian Scientists.

OBJECTIVE:

The lesson given an account of the experiments and discoveries in Pharmaceuticals of Prafulla Chandra Ray.

OUTCOME:

Prafulla Chandra Ray's scientific achievements and patriotic fervour provide inspiration to the reader.

UNIT 6:

1. ' The Chief Software Architect' from English Encounters

OBJECTIVE:

The lesson supports the developments of technology for the betterment of human life.

OUTCOME:

Pupil get inspired by eminent personalities who toiled for the present day advancement of software development.

2. ' Srinivasa Ramanujan' from The Great Indian Scientists.

OBJECTIVE:

The lesson highlights the extraordinary achievements of Srinivasa Ramanujan, a great mathematician and the most romantic figure in mathematics.

OUTCOME:

The lesson provides inspiration to the readers to think and tap their innate talents.

NOTE:

All the exercises given in the prescribed lessons in both detailed and non-detailed textbooks relating to the theme and language skills must be covered.

MODEL QUESTION PAPER FOR THEORY

PART- I

Six short answer questions on 6 unit themes

One question on eliciting student's response to any of the themes

PART-II

Each question should be from one unit and the last question can be a combination of two or more units.

Each question should have 3 sub questions: A,B & C

A will be from the main text: 5 marks

B from non-detailed text: 3 marks

C on grammar and Vocabulary: 6 marks

I Year - II Semester

L	T	P	C
4	0	0	3

MATHEMATICS-III
(Common to ALL branches of First Year B.Tech.)

Course Objectives:

1. The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course.
2. The skills derived from the course will help the student from a necessary base to develop analytic and design concepts.
3. Understand the most basic numerical methods to solve simultaneous linear equations.

Course Outcomes: At the end of the Course, Student will be able to:

1. Determine rank, Eigenvalues and Eigen vectors of a given matrix and solve simultaneous linear equations.
2. Solve simultaneous linear equations numerically using various matrix methods.
3. Determine double integral over a region and triple integral over a volume.
4. Calculate gradient of a scalar function, divergence and curl of a vector function. Determine line, surface and volume integrals. Apply Green, Stokes and Gauss divergence theorems to calculate line, surface and volume integrals.

UNIT I: Linear systems of equations:

Rank-Echelon form-Normal form – Solution of linear systems – Gauss elimination - Gauss Jordan- Gauss Jacobi and Gauss Seidal methods.Applications: Finding the current in electrical circuits.

UNIT II: Eigen values - Eigen vectors and Quadratic forms:

Eigen values - Eigen vectors– Properties – Cayley-Hamilton theorem - Inverse and powers of a matrix by using Cayley-Hamilton theorem- Diagonalization- Quadratic forms- Reduction of quadratic form to canonical form – Rank - Positive, negative and semi definite - Index – Signature.

Applications: Free vibration of a two-mass system.

UNIT III: Multiple integrals:

Curve tracing: Cartesian, Polar and Parametric forms.

Multiple integrals: Double and triple integrals – Change of variables – Change of order of integration.

Applications: Finding Areas and Volumes.

UNIT IV: Special functions:

Beta and Gamma functions- Properties - Relation between Beta and Gamma functions- Evaluation of improper integrals.

Applications: Evaluation of integrals.

UNIT V: Vector Differentiation:

Gradient- Divergence- Curl - Laplacian and second order operators -Vector identities.

Applications: Equation of continuity, potential surfaces

UNIT VI: Vector Integration:

Line integral – Work done – Potential function – Area- Surface and volume integrals Vector integral theorems: Greens, Stokes and Gauss Divergence theorems (without proof) and related problems.

Applications: Work done, Force.

Text Books:

1. **B.S.Grewal**, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. **N.P.Bali**, Engineering Mathematics, Lakshmi Publications.

Reference Books:

1. **Greenberg**, Advanced Engineering Mathematics, 2nd edition, Pearson edn
2. **Erwin Kreyszig**, Advanced Engineering Mathematics, 10th Edition, Wiley-India
3. **Peter O'Neil**, Advanced Engineering Mathematics, 7th edition, Cengage Learning.
4. **D.W. Jordan and T.Smith**, Mathematical Techniques, Oxford University Press.
5. **Srimanta Pal, Subodh C.Bhunia**, Engineering Mathematics, Oxford University Press.
6. **Dass H.K., Rajnish Verma. Er.**, Higher Engineering Mathematics, S. Chand Co. Pvt. Ltd, Delhi.

I Year - II Semester

L	T	P	C
4	0	0	3

APPLIED CHEMISTRY
(EEE, ECE, CSE, IT, EIE, E. Com. E.)

Knowledge of basic concepts of Chemistry for Engineering students will help them as professional engineers later in design and material selection, as well as utilizing the available resources.

Learning Objectives:

- Plastics are nowadays used in household appliances; also they are used as composites (FRP) in aerospace industries.
- Fuels as a source of energy are a basic need of any industry, particularly industries like thermal power stations, steel industry, fertilizer industry etc., and hence they are introduced.
- The basics for the construction of galvanic cells as well as some of the sensors used in instruments are introduced. Also if corrosion is to be controlled, one has to understand the mechanism of corrosion which itself is explained by electrochemical theory.
- With the increase in demand, a wide variety of materials are coming up; some of them have excellent engineering properties and a few of these materials are introduced.
- Understanding of crystal structures will help to understand the conductivity, semiconductors and superconductors. Magnetic properties are also studied.
- With the increase in demand for power and also with depleting sources of fossil fuels, the demand for alternative sources of fuels is increasing. Some of the prospective fuel sources are introduced.

UNIT I: HIGH POLYMERS AND PLASTICS

Polymerisation : Introduction- Mechanism of polymerization - Stereo regular polymers – methods of polymerization (emulsion and suspension) -Physical and mechanical properties – Plastics as engineering materials : advantages and limitations – Thermoplastics and Thermosetting plastics – Compounding and fabrication (4/5 techniques)- Preparation, properties and applications of polyethene, PVC, Bakelite Teflon and polycarbonates
Elastomers – Natural rubber- compounding and vulcanization – Synthetic rubbers : Buna S, Buna N, Thiokol and polyurethanes – Applications of elastomers.
Composite materials & Fiber reinforced plastics – Biodegradable polymers – Conducting polymers.

UNIT II: FUEL TECHNOLOGY

Fuels:- Introduction – Classification – Calorific value - HCV and LCV – Dulong’s formula – Bomb calorimeter – Numerical problems – Coal — Proximate and ultimate analysis – Significance of the analyses – Liquid fuels – Petroleum- Refining – Cracking – Synthetic petrol –Petrol knocking – Diesel knocking - Octane and Cetane ratings – Anti-knock agents – Power alcohol – Bio-diesel – Gaseous fuels – Natural gas. LPG and CNG – Combustion – Calculation of air for the combustion of a fuel – Flue gas analysis – Orsat apparatus – Numerical problems on combustion.

Explosives:- Introduction, classification, examples: RDX, TNT and ammonium nitrite - rocket fuels.

UNIT III: ELECTROCHEMICAL CELLS AND CORROSION

Galvanic cells - Reversible and irreversible cells – Single electrode potential – Electro chemical series and uses of this series- Standard electrodes (Hydrogen and Calomel electrodes) - Concentration Cells – Batteries: Dry Cell - Ni-Cd cells - Ni-Metal hydride cells - Li cells - Zinc – air cells.

Corrosion:- Definition – Theories of Corrosion (electrochemical) – Formation of galvanic cells by different metals, by concentration cells, by differential aeration and waterline corrosion – Passivity of metals – Pitting corrosion - Galvanic series – Factors which influence the rate of corrosion - Protection from corrosion – Design and material selection – Cathodic protection - Protective coatings: – Surface preparation – Metallic (cathodic and anodic) coatings - Methods of application on metals (Galvanizing, Tinning, Electroplating, Electroless plating)

UNIT IV: CHEMISTRY OF ADVANCED MATERIALS

Nano materials:- Introduction – Sol-gel method & chemical reduction method of preparation – Characterization by BET method and TEM methods - Carbon nano tubes and fullerenes: Types, preparation, properties and applications

Liquid crystals:- Introduction – Types – Applications

Superconductors :- Type-I & Type-2, properties & applications

Green synthesis:- Principles - 3 or 4 methods of synthesis with examples – R₄M₄ principles

UNIT V: SOLID STATE CHEMISTRY

Types of solids - close packing of atoms and ions - BCC , FCC, structures of rock salt - cesium chloride- spinel - normal and inverse spinels,

Non-elemental **semiconducting Materials:-** Stoichiometric, controlled valency & Chalcogen photo/semiconductors, Preparation of Semiconductors - Semiconductor Devices:- p-n junction diode as rectifier – junction transistor.

Insulators (electrical and electronic applications)

Magnetic materials:- Ferro and ferri magnetism. Hall effect and its applications.

UNIT VI: NON CONVENTIONAL ENERGY SOURCES AND STORAGE DEVICES

Solar Energy: - Introduction, application of solar energy, conversion of solar energy (Thermal conversion & photo conversion) – photovoltaic cell: design, working and its importance

Non-conventional energy sources:

- (i) Hydropower include setup a hydropower plant (schematic diagram)
- (ii) Geothermal energy: Introduction-schematic diagram of a geothermal power plant
- (iii) Tidal and wave power: Introduction- Design and working-movement of tides and their effect on sea level.
- (iv) Ocean thermal energy: Introduction, closed-cycle, ocean thermal energy conversion (OTEC), open cycle OTEC, hybrid OTEC, schematic diagram and explanation.
- (v) Biomass and biofuels

Fuel cells:- Introduction - cell representation, H₂-O₂ fuel cell: Design and working, advantages and limitations. Types of fuel cells: Alkaline fuel cell - methanol-oxygen - phosphoric acid fuel cells - molten carbonate fuel cells.

Outcomes: The advantages and limitations of plastic materials and their use in design would be understood. Fuels which are used commonly and their economics, advantages and limitations are discussed. Reasons for corrosion and some methods of corrosion control would be understood. The students would be now aware of materials like nano-materials and fullerenes and their uses. Similarly liquid crystals and superconductors are understood. The importance of green synthesis is well understood and how they are different from conventional methods is also explained. Conductance phenomenon is better understood. The students are exposed to some of the alternative fuels and their advantages and limitations.

Standard Books:

1. Engineering Chemistry by Jain and Jain; Dhanpat Rai Publishing Co.
2. Engineering Chemistry by Shikha Agarwal; Cambridge University Press, 2015 edition.

Reference Books:

1. Engineering Chemistry of Wiley India Pvt. Ltd., Vairam and others, 2014 edition (second).
2. Engineering Chemistry by Prasanth Rath, Cengage Learning, 2015 edition.
3. A text book of engineering Chemistry by S. S. Dara; S. Chand & Co Ltd., Latest Edition
4. Applied Chemistry by H.D. Gesser, Springer Publishers
5. Text book of Nano-science and nanotechnology by B.S. Murthy, P. Shankar and others, University Press, IIM

I Year - II Semester

L	T	P	C
4	0	0	3

OBJECT-ORIENTED PROGRAMMING THROUGH C++

OBJECTIVES:

- This course is designed to provide a comprehensive study of the C programming language. It stresses the strengths of C, which provide students with the means of writing efficient, maintainable and portable code. The nature of C language is emphasized in the wide variety of examples and applications. To learn and acquire art of computer programming. To know about some popular programming languages and how to choose
- Programming language for solving a problem.

UNIT-I: Introduction to C++

Difference between C and C++- Evolution of C++- The Object Oriented Technology- Disadvantage of Conventional Programming- Key Concepts of Object Oriented Programming- Advantage of OOP- Object Oriented Language.

UNIT-II: Classes and Objects & Constructors and Destructor

Classes in C++-Declaring Objects- Access Specifiers and their Scope- Defining Member Function-Overloading Member Function- Nested class, Constructors and Destructors, Introduction- Constructors and Destructor- Characteristics of Constructor and Destructor- Application with Constructor- Constructor with Arguments (parameterized Constructor- Destructors- Anonymous Objects.

UNIT-III: Operator Overloading and Type Conversion & Inheritance

The Keyword Operator- Overloading Unary Operator- Operator Return Type- Overloading Assignment Operator (=)- Rules for Overloading Operators, Inheritance, Reusability- Types of Inheritance- Virtual Base Classes- Object as a Class Member- Abstract Classes- Advantages of Inheritance-Disadvantages of Inheritance,

UNIT-IV: Pointers & Binding Polymorphisms and Virtual Functions

Pointer, Features of Pointers- Pointer Declaration- Pointer to Class- Pointer Object- The this Pointer- Pointer to Derived Classes and Base Class, Binding Polymorphisms and Virtual Functions, Introduction- Binding in C++- Virtual Functions- Rules for Virtual Function- Virtual Destructor.

UNIT-V: Generic Programming with Templates & Exception Handling

Generic Programming with Templates, Need for Templates- Definition of class Templates- Normal Function Templates- Over Loading of Template Function-Bubble Sort Using Function Templates- Difference Between Templates and Macros- Linked Lists with Templates, Exception Handling- Principles of Exception Handling- The Keywords try throw and catch- Multiple Catch Statements –Specifying Exceptions.

UNIT-VI: Overview of Standard Template Library

Overview of Standard Template Library- STL Programming Model- Containers- Sequence Containers- Associative Containers- Algorithms- Iterators- Vectors- Lists- Maps.

OUTCOMES:

- Understand the basic terminology used in computer programming
- Write, compile and debug programs in C language. Use different data types in a computer program.
- Design programs involving decision structures, loops and functions.
- Explain the difference between call by value and call by reference

Text Books:

1. A First Book of C++, Gary Bronson, Cengage Learning.
2. The Complete Reference C++, Herbert Schildt, TMH.
3. Programming in C++, Ashok N Kamathane, Pearson 2nd Edition.

Reference Books:

1. Object Oriented Programming C++, Joyce Farrell, Cengage.
2. C++ Programming: from problem analysis to program design, DS Malik, Cengage Learning.

I Year - II Semester

L	T	P	C
4	0	0	3

ENVIRONMENTAL STUDIES

Course Learning Objectives:

The objectives of the course is to impart

- Overall understanding of the natural resources
- Basic understanding of the ecosystem and its diversity
- Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities
- An understanding of the environmental impact of developmental activities
- Awareness on the social issues, environmental legislation and global treaties

Course Outcomes:

The student should have knowledge on

- The natural resources and their importance for the sustenance of the life and recognize the need to conserve the natural resources
- The concepts of the ecosystem and its function in the environment. The need for protecting the producers and consumers in various ecosystems and their role in the food web
- The biodiversity of India and the threats to biodiversity, and conservation practices to protect the biodiversity
- Various attributes of the pollution and their impacts and measures to reduce or control the pollution along with waste management practices
- Social issues both rural and urban environment and the possible means to combat the challenges
- The environmental legislations of India and the first global initiatives towards sustainable development.
- About environmental assessment and the stages involved in EIA and the environmental audit.
- Self Sustaining Green Campus with Environment Friendly aspect of – Energy, Water and Wastewater reuse Plantation, Rain water Harvesting, Parking Curriculum.

Syllabus:

UNIT – I Multidisciplinary nature of Environmental Studies: Definition, Scope and Importance –Sustainability: Stockholm and Rio Summit–Global Environmental Challenges: Global warming and climate change, Carbon Credits, acid rains, ozone layer depletion, population growth and explosion, effects. Role of information Technology in Environment and human health.

Ecosystems: Concept of an ecosystem. - Structure and function of an ecosystem. - Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession. - Food chains, food webs and ecological pyramids. - Introduction, types, characteristic features, structure and function of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems.

UNIT – II Natural Resources: Natural resources and associated problems

Forest resources – Use and over – exploitation, deforestation – Timber extraction – Mining, dams and other effects on forest and tribal people

Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems

Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, Sustainable mining of Granite, Lignite, Coal, Sea and River sands.

Food resources: World food problems, changes caused by non-agriculture activities-effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity

Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources Vs Oil and Natural Gas Extraction.

Land resources: Land as a resource, land degradation, Wasteland reclamation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

UNIT – III Biodiversity and its conservation: Definition: genetic, species and ecosystem diversity- classification - Value of biodiversity: consumptive use, productive use, social- Biodiversity at national and local levels. India as a mega-diversity nation - Hot-spots of biodiversity - Threats to biodiversity: habitat loss, man-wildlife conflicts - Endangered and endemic species of India – Conservation of biodiversity: conservation of biodiversity.

UNIT – IV Environmental Pollution: Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies, Sustainable Life Studies. Impact of Fire Crackers on Men and his well being.

Solid Waste Management: Sources, Classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products, Biomedical, Hazardous and e – waste management.

UNIT – V Social Issues and the Environment: Urban problems related to energy -Water conservation, rain water harvesting-Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Environmental Protection Act - Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act -Wildlife Protection Act -Forest Conservation Act-Issues involved in enforcement of environmental legislation. -Public awareness.

UNIT – VI Environmental Management: Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS, Environmental audit. Ecotourism, Green Campus – Green business and Green politics.

The student should Visit an Industry / Ecosystem and submit a report individually on any issues related to Environmental Studies course and make a power point presentation.

Text Books:

1. Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers, Vijayawada
2. Environmental Studies, R. Rajagopalan, 2nd Edition, 2011, Oxford University Press.
3. Environmental Studies, P. N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani;
Pearson Education, Chennai

Reference:

1. Text Book of Environmental Studies, Deeshita Dave & P. Udaya Bhaskar, Cengage Learning.
2. A Textbook of Environmental Studies, Shaashi Chawla, TMH, New Delhi
3. Environmental Studies, Benny Joseph, Tata McGraw Hill Co, New Delhi
4. Perspectives in Environment Studies, Anubha Kaushik, C P Kaushik, New Age International Publishers, 2014

I Year - II Semester

L	T	P	C
4	0	0	3

ENIGINEERING MECHANICS

Objectives: The students completing this course are expected to understand the concepts of forces and its resolution in different planes, resultant of force system, Forces acting on a body, their free body diagrams using graphical methods. They are required to understand the concepts of centre of gravity and moments of inertia and their application, Analysis of frames and trusses, different types of motion, friction and application of work - energy method.

UNIT – I

Objectives: The students are to be exposed to the concepts of force and friction, direction and its application.

Introduction to Engg. Mechanics – Basic Concepts.

Systems of Forces: Coplanar Concurrent Forces – Components in Space – Resultant – Moment of Force and its Application – Couples and Resultant of Force Systems.

Friction: Introduction, limiting friction and impending motion, coulomb's laws of dry friction, coefficient of friction, cone of friction

UNIT II

Objectives: The students are to be exposed to application of free body diagrams. Solution to problems using graphical methods and law of triangle of forces.

Equilibrium of Systems of Forces: Free Body Diagrams, Equations of Equilibrium of Coplanar Systems, Spatial Systems for concurrent forces. Lamis Theorm, Graphical method for the equilibrium of coplanar forces, Converse of the law of Triangle of forces, converse of the law of polygon of forces condition of equilibrium, analysis of plane trusses.

UNIT – III

Objectives : The students are to be exposed to concepts of centre of gravity.

Centroid: Centroids of simple figures (from basic principles) – Centroids of Composite Figures

Centre of Gravity: Centre of gravity of simple body (from basic principles), centre of gravity of composite bodies, Pappus theorems.

UNIT IV

Objective: The students are to be exposed to concepts of moment of inertia and polar moment of inertia including transfer methods and their applications.

Area moments of Inertia: Definition – Polar Moment of Inertia, Transfer Theorem, Moments of Inertia of Composite Figures, Products of Inertia, Transfer Formula for Product of Inertia.

Mass Moment of Inertia: Moment of Inertia of Masses, Transfer Formula for Mass Moments of Inertia, mass moment of inertia of composite bodies.

UNIT – V

Objectives: The students are to be exposed to motion in straight line and in curvilinear paths, its velocity and acceleration computation and methods of representing plane motion.

Kinematics: Rectilinear and Curvilinear motions – Velocity and Acceleration – Motion of Rigid Body – Types and their Analysis in Planar Motion. **Kinetics:** Analysis as a Particle and Analysis as a Rigid Body in Translation – Central Force Motion – Equations of Plane Motion – Fixed Axis Rotation – Rolling Bodies.

UNIT – VI

Objectives: The students are to be exposed to concepts of work, energy and particle motion

Work – Energy Method: Equations for Translation, Work-Energy Applications to Particle Motion, Connected System-Fixed Axis Rotation and Plane Motion. Impulse momentum method.

Text Books :

1. Engg. Mechanics - S.Timoshenko & D.H.Young., 4th Edn - , Mc Graw Hill publications.

References:

1. Engineering Mechanics statics and dynamics – R.C.Hibbeler, 11th Edn – Pearson Publ.
2. Engineering Mechanics, statics – J.L.Meriam, 6th Edn – Wiley India Pvt Ltd.
3. Engineering Mechanics, statics and dynamics – I.H.Shames, – Pearson Publ.
4. Mechanics For Engineers, statics - F.P.Beer & E.R.Johnston – 5th Edn Mc Graw Hill Publ.
5. Mechanics For Engineers, dynamics - F.P.Beer & E.R.Johnston – 5th Edn Mc Graw Hill Publ.
6. Theory & Problems of engineering mechanics, statics & dynamics – E.W.Nelson, C.L.Best & W.G. McLean, 5th Edn – Schaum's outline series - Mc Graw Hill Publ.
7. Singer's Engineering Mechanics: Statics And Dynamics, K. Vijay Kumar Reddy, J. Suresh Kumar, Bs Publications
8. Engineering Mechanics, Ferdinand . L. Singer, Harper – Collins.
9. Engineering Mechanics statics and dynamics , A Nelson , Mc Graw Hill publications

I Year - II Semester

L	T	P	C
0	0	3	2

APPLIED / ENGINEERING CHEMISTRY LABORATORY (*Common to all branches*)

1. Introduction to Chemistry laboratory – Molarity, Normality, Primary, secondary standard solutions, Volumetric titrations, Quantitative analysis, Qualitative analysis, etc.
2. Trial experiment - Determination of HCl using standard Na₂CO₃ solution.
3. Determination of alkalinity of a sample containing Na₂CO₃ and NaOH.
4. Determination of KMnO₄ using standard Oxalic acid solution.
5. Determination of Ferrous iron using standard K₂Cr₂O₇ solution.
6. Determination of Copper using standard K₂Cr₂O₇ solution.
7. Determination of temporary and permanent hardness of water using standard EDTA solution.
8. Determination of Copper using standard EDTA solution.
9. Determination of Iron by a Colorimetric method using thiocyanate as reagent.
10. Determination of pH of the given sample solution using pH meter.
11. Conductometric titration between strong acid and strong base.
12. Conductometric titration between strong acid and weak base.
13. Potentiometric titration between strong acid and strong base.
14. Potentiometric titration between strong acid and weak base.
15. Determination of Zinc using standard EDTA solution.
16. Determination of Vitamin – C.

Outcomes: The students entering into the professional course have practically very little exposure to lab classes. The experiments introduce volumetric analysis; redox titrations with different indicators; EDTA titrations; then they are exposed to a few instrumental methods of chemical analysis. Thus at the end of the lab course, the student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills.

Reference Books

1. A Textbook of Quantitative Analysis, Arthur J. Vogel.
2. Dr. Jyotsna Cherukuri (2012) *Laboratory Manual of engineering chemistry-II*, VGS Techno Series
3. Chemistry Practical Manual, Lorven Publications
4. K. Mukkanti (2009) *Practical Engineering Chemistry*, B.S. Publication

I Year - II Semester	ENGLISH - COMMUNICATION SKILLS	L	T	P	C
	LAB- II	0	0	3	2

PRESCRIBED LAB MANUAL FOR SEMESTER II:

'INTERACT: English Lab Manual for Undergraduate Students' Published by **Orient Blackswan Pvt Ltd.**

OBJECTIVES:

To enable the students to learn demonstratively the communication skills of listening, speaking, reading and writing.

OUTCOME:

A study of the communicative items in the laboratory will help the students become successful in the competitive world.

The course content along with the study material is divided into six units.

UNIT 1:

1. Debating
Practice work

UNIT 2:

1. Group Discussions
Practice work

UNIT 3:

1. Presentation Skills
Practice work

UNIT 4:

1. Interview Skills
Practice work

UNIT 5:

1. Email,
2. Curriculum Vitae
Practice work

UNIT 6:

1. Idiomatic Expressions
2. Common Errors in English
Practice work

Reference Books:

1. Strengthen your communication skills by Dr M Hari Prasad, Dr Salivendra Raju and Dr G Suvarna Lakshmi, Maruti Publications.
2. English for Professionals by Prof Eliah, B.S Publications, Hyderabad.
3. Unlock, Listening and speaking skills 2, Cambridge University Press
4. Spring Board to Success, Orient BlackSwan
5. A Practical Course in effective english speaking skills, PHI
6. Word power made handy, Dr shalini verma, Schand Company
7. Let us hear them speak, Jayashree Mohanraj, Sage texts
8. Professional Communication, Aruna Koneru, Mc Grawhill Education
9. Cornerstone, Developing soft skills, Pearson Education

I Year - II Semester

L	T	P	C
0	0	3	2

OBJECT-ORIENTED PROGRAMMING LAB

OBJECTIVE

- To strengthen their problem solving ability by applying the characteristics of an object- oriented approach.
- To introduce object oriented concepts in C++ and Java.

Programmig:

Exercise – 1 (Basics)

Write a Simple Program on printing “Hello World” and “Hello Name” where name is the input from the user

- a) Convert any two programs that are written in C into C++
- b) Write a description of using g++ (150 Words)

Exercise – 2 (Expressions Control Flow)

- a) Write a Program that computes the simple interest and compound interest payable on principal amount (in Rs.) of loan borrowed by the customer from a bank for a given period of time (in years) at specific rate of interest. Further determine whether the bank will benefit by charging simple interest or compound interest.
- b) Write a Program to calculate the fare for the passenger traveling in a bus. When a Passenger enters the bus, the conductor asks “What distance will you travel?” On knowing distance from passenger (as an approximate integer), the conductor mentions the fare to the passenger according to following criteria.

Exercise – 3 (Variables, Scope, Allocation)

- a) Write a program to implement call by value and call by reference using reference variable.
- b) Write a program to illustrate scope resolution, new and delete Operators. (Dynamic Memory Allocation)
- c) Write a program to illustrate Storage classes
- d) Write a program to illustrate Enumerations

Exercises –4 (Functions)

Write a program illustrating Inline Functions

- a) Write a program illustrate function overloading. Write 2 overloading functions for power.
- b) Write a program illustrate the use of default arguments for simple interest function.

Exercise -5 (Functions –Exercise Continued)

- a) Write a program to illustrate function overloading. Write 2 overloading functions for adding two numbers
- b) Write a program illustrate function template for power of a number.
- c) Write a program to illustrate function template for swapping of two numbers.

Exercise -6 (Classes Objects)

Create a Distance class with:

- feet and inches as data members
 - member function to input distance
 - member function to output distance
 - member function to add two distance objects
- a). Write a main function to create objects of DISTANCE class. Input two distances and output the sum.
 - b). Write a C++ Program to illustrate the use of Constructors and Destructors (use the above program.)
 - c) Write a program for illustrating function overloading in adding the distance between objects (use the above problem)
 - d). Write a C++ program demonstrating a BankAccount with necessary methods and variables

Exercise – 7 (Access)

Write a program for illustrating Access Specifiers public, private, protected

- a) Write a program implementing Friend Function
- b) Write a program to illustrate this pointer
- c) Write a Program to illustrate pointer to a class
- d)

Exercise -8 (Operator Overloading)

- a). Write a program to Overload Unary, and Binary Operators as Member Function, and Non Member Function.
 - i. Unary operator as member function
 - ii. Binary operator as nonmember function

b). Write a c ++ program to implement the overloading assignment = operator

c).Write a case study on Overloading Operators and Overloading Functions (150 Words)

Exercise -9 (Inheritance)

a) Write C++ Programs and incorporating various forms of Inheritance

- i) Single Inheritance
- ii) Hierarchical Inheritance
- iii) Multiple Inheritances
- iv) Multi-level inheritance
- v) Hybrid inheritance

b) Write a program to show Virtual Base Class

c) Write a case study on using virtual classes (150 Words)

Exercise-10 (Inheritance –Continued)

a) Write a Program in C++ to illustrate the order of execution of constructors and destructors in inheritance

b) Write a Program to *show* how *constructors* are invoked in *derived class*

Exercise -11 (Polymorphism)

a) Write a program to illustrate runtime polymorphism

b) Write a program to illustrate this pointer

c) Write a program illustrates pure virtual function and calculate the area of different shapes by using abstract class.

d) Write a case study on virtual functions (150 Words)

Exercise -12(Templates)

a) Write a C++ Program to illustrate template class

b) Write a Program to illustrate class templates with multiple parameters

c) Write a Program to illustrate member function templates

Exercise -13 (Exception Handling)

a).Write a Program for Exception Handling Divide by zero

b). Write a Program to rethrow an Exception

Exercise -14 (STL)

a) Write a Program to implement List and List Operations

b) Write a Program to implementVector andVector Operations

Exercise -15 (STLContinued)

a) Write a Program to implement Deque and Deque Operations

b) Write a Program to implement Map and Map Operations

OUTCOMES:

- Explain what constitutes an object-oriented approach to programming and identify potential benefits of object-oriented programming over other approaches.
- Apply an object-oriented approach to developing applications of varying complexities

II Year - I Semester

L	T	P	C
4	0	0	3

STATISTICS WITH R PROGRAMMING

OBJECTIVE:

After taking the course, students will be able to

- Use R for statistical programming, computation, graphics, and modeling,
- Write functions and use R in an efficient way,
- Fit some basic types of statistical models
- Use R in their own research,
- Be able to expand their knowledge of R on their own.

UNIT-I:

Introduction, How to run R, R Sessions and Functions, Basic Math, Variables, Data Types, Vectors, Conclusion, Advanced Data Structures, Data Frames, Lists, Matrices, Arrays, Classes.

UNIT-II:

R Programming Structures, Control Statements, Loops, - Looping Over Nonvector Sets,- If-Else, Arithmetic and Boolean Operators and values, Default Values for Argument, Return Values, Deciding Whether to explicitly call return- Returning Complex Objects, Functions are Objective, No Pointers in R, Recursion, A Quicksort Implementation-Extended Example: A Binary Search Tree.

UNIT-III:

Doing Math and Simulation in R, Math Function, Extended Example Calculating Probability-Cumulative Sums and Products-Minima and Maxima- Calculus, Functions for Statistical Distribution, Sorting, Linear Algebra Operation on Vectors and Matrices, Extended Example: Vector cross Product- Extended Example: Finding Stationary Distribution of Markov Chains, Set Operation, Input /out put, Accessing the Keyboard and Monitor, Reading and writer Files,

UNIT-IV:

Graphics, Creating Graphs, The Workhorse of R Base Graphics, the plot() Function – Customizing Graphs, Saving Graphs to Files.

UNIT-V:

Probability Distributions, Normal Distribution- Binomial Distribution- Poisson Distributions Other Distribution, Basic Statistics, Correlation and Covariance, T-Tests,-ANOVA.

UNIT-VI:

Linear Models, Simple Linear Regression, -Multiple Regression Generalized Linear Models, Logistic Regression, - Poisson Regression- other Generalized Linear Models-Survival Analysis, Nonlinear Models, Splines- Decision- Random Forests,

OUTCOMES:

At the end of this course, students will be able to:

- List motivation for learning a programming language
- Access online resources for R and import new function packages into the R workspace
- Import, review, manipulate and summarize data-sets in R
- Explore data-sets to create testable hypotheses and identify appropriate statistical tests
- Perform appropriate statistical tests using R Create and edit visualizations with

TEXT BOOKS:

- 1) The Art of R Programming, Norman Matloff, Cengage Learning
- 2) R for Everyone, Lander, Pearson

REFERENCE BOOKS:

- 1) R Cookbook, Paul Teetor, O'Reilly.
- 2) R in Action, Rob Kabacoff, Manning

II Year - I Semester

L	T	P	C
4	0	0	3

MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE

OBJECTIVES:

- To introduce the students to the topics and techniques of discrete methods and combinatorial reasoning.
- To introduce a wide variety of applications. The algorithmic approach to the solution of problems is fundamental in discrete mathematics, and this approach reinforces the close ties between this discipline and the area of computer science.

UNIT -I:

Mathematical Logic: Propositional Calculus: Statements and Notations, Connectives, Well Formed Formulas, Truth Tables, Tautologies, Equivalence of Formulas, Duality Law, Tautological Implications, Normal Forms, Theory of Inference for Statement Calculus, Consistency of Premises, Indirect Method of Proof. Predicate Calculus: Predicative Logic, Statement Functions, Variables and Quantifiers, Free and Bound Variables, Inference Theory for Predicate Calculus.

UNIT -II:

Set Theory: Introduction, Operations on Binary Sets, Principle of Inclusion and Exclusion, *Relations:* Properties of Binary Relations, Relation Matrix and Digraph, Operations on Relations, Partition and Covering, Transitive Closure, Equivalence, Compatibility and Partial Ordering Relations, Hasse Diagrams, *Functions:* Bijective Functions, Composition of Functions, Inverse Functions, Permutation Functions, Recursive Functions, Lattice and its Properties.

UNIT- III:

Algebraic Structures and Number Theory: *Algebraic Structures:* Algebraic Systems, Examples, General Properties, Semi Groups and Monoids, Homomorphism of Semi Groups and Monoids, Group, Subgroup, Abelian Group, Homomorphism, Isomorphism, *Number Theory:* Properties of Integers, Division Theorem, The Greatest Common Divisor, Euclidean Algorithm, Least Common Multiple, Testing for Prime Numbers, The Fundamental Theorem of Arithmetic, Modular Arithmetic (Fermat's Theorem and Euler's Theorem)

UNIT -IV:

Combinatorics: Basic of Counting, Permutations, Permutations with Repetitions, Circular Permutations, Restricted Permutations, Combinations, Restricted Combinations, Generating Functions of Permutations and Combinations, Binomial and Multinomial Coefficients, Binomial and Multinomial Theorems, The Principles of Inclusion–Exclusion, Pigeonhole Principle and its Application.

UNIT -V:

Recurrence Relations: Generating Functions, Function of Sequences, Partial Fractions, Calculating Coefficient of Generating Functions, Recurrence Relations, Formulation as Recurrence Relations, Solving Recurrence Relations by Substitution and Generating Functions, Method of Characteristic Roots, Solving Inhomogeneous Recurrence Relations

UNIT -VI:

Graph Theory: Basic Concepts of Graphs, Sub graphs, Matrix Representation of Graphs: Adjacency Matrices, Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs, Multigraphs, Planar Graphs, Euler's Formula, Graph Colouring and Covering, Chromatic Number, Spanning Trees, Algorithms for Spanning Trees (Problems Only and Theorems without Proofs).

OUTCOMES:

- Student will be able to demonstrate skills in solving mathematical problems
- Student will be able to comprehend mathematical principles and logic
- Student will be able to demonstrate knowledge of mathematical modeling and proficiency in using mathematical software
- Student will be able to manipulate and analyze data numerically and/or graphically using appropriate Software
- Student will be able to communicate effectively mathematical ideas/results verbally or in writing

TEXT BOOKS:

1. Discrete Mathematical Structures with Applications to Computer Science, J. P. Tremblay and P. Manohar, Tata McGraw Hill.
2. Elements of Discrete Mathematics-A Computer Oriented Approach, C. L. Liu and D. P. Mohapatra, 3rd Edition, Tata McGraw Hill.
3. Discrete Mathematics and its Applications with Combinatorics and Graph Theory, K. H. Rosen, 7th Edition, Tata McGraw Hill.

REFERENCE BOOKS:

1. Discrete Mathematics for Computer Scientists and Mathematicians, J. L. Mott, A. Kandel, T.P. Baker, 2nd Edition, Prentice Hall of India.
2. Discrete Mathematical Structures, BernandKolman, Robert C. Busby, Sharon Cutler Ross, PHI.
3. Discrete Mathematics, S. K. Chakraborty and B.K. Sarkar, Oxford, 2011.

II Year - I Semester

L	T	P	C
4	0	0	3

DIGITAL LOGIC DESIGN

OBJECTIVE:

- To introduce the basic tools for design with combinational and sequential digital logic and state machines.
- To learn simple digital circuits in preparation for computer engineering.

UNIT- I: Digital Systems and Binary Numbers

Digital Systems, Binary Numbers, Binary Numbers, Octal and Hexadecimal Numbers, Complements of Numbers, Complements of Numbers, Signed Binary Numbers, Arithmetic addition and subtraction

UNIT -II: Concept of Boolean algebra

Basic Theorems and Properties of Boolean algebra, Boolean Functions, Canonical and Standard Forms, Minterms and Maxterms,

UNIT- III: Gate level Minimization

Map Method, Two-Variable K-Map, Three-Variable K-Map, Four Variable K-Maps. Products of Sum Simplification, Sum of Products Simplification, Don't – Care Conditions, NAND and NOR Implementation, Exclusive-OR Function

UNIT- IV: Combinational Logic

Introduction, Analysis Procedure, Design Procedure, Binary Adder–Subtractor, Decimal Adder, Binary Multiplier, Decoders, Encoders, Multiplexers, HDL Models of Combinational Circuits

UNIT- V: Synchronous Sequential Logic

Introduction to Sequential Circuits, Storage Elements: Latches, Storage Elements: Flip-Flops, Analysis of Clocked **Sequential** Circuits, Mealy and Moore Models of Finite State Machines

UNIT -VI: Registers and Counters

Registers, Shift Registers, Ripple Counters, Synchronous Counters, Ring Counter, Johnson Counter, Ripple Counter

OUTCOMES:

A student who successfully fulfills the course requirements will have demonstrated:

- An ability to define different number systems, binary addition and subtraction, 2's complement representation and operations with this representation.
- An ability to understand the different switching algebra theorems and apply them for logic functions.
- An ability to define the Karnaugh map for a few variables and perform an algorithmic reduction of logic functions.
- An ability to define the other minimization methods for any number of variables Variable Entered Mapping (VEM) and Quine-McCluskey (QM) Techniques and perform an algorithmic reduction of logic functions.

TEXT BOOKS:

1. Digital Design, 5/e, M.Morris Mano, Michael D Ciletti, PEA.
2. Fundamentals of Logic Design, 5/e, Roth, Cengage.

REFERENCE BOOKS:

1. Digital Logic and Computer Design, M.Morris Mano, PEA.
2. Digital Logic Design, Leach, Malvino, Saha, TMH.
3. Modern Digital Electronics, R.P. Jain, TMH.

II Year - I Semester

L	T	P	C
4	0	0	3

PYTHON PROGRAMMING

OBJECTIVES:

- Introduction to Scripting Language
- Exposure to various problems solving approaches of computer science

UNIT – I:

Introduction:History of Python, Need of Python Programming, Applications Basics of Python Programming Using the REPL(Shell), Running Python Scripts, Variables, Assignment, Keywords, Input-Output, Indentation.

UNIT – II:

Types, Operators and Expressions: Types - Integers, Strings, Booleans; Operators- Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations Control Flow- if, if-elif-else, for, while, break, continue, pass

UNIT – III:

Data Structures Lists - Operations, Slicing, Methods; Tuples, Sets, Dictionaries, Sequences. Comprehensions.

UNIT – IV:

Functions - Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful Functions(Function Returning Values), Scope of the Variables in a Function - Global and Local Variables.

Modules: Creating modules, import statement, from. Import statement, name spacing,

Python packages, Introduction to PIP, Installing Packages via PIP, Using Python Packages

UNIT – V:

Object Oriented Programming OOP in Python: Classes, 'self variable', Methods, Constructor Method, Inheritance, Overriding Methods, Datahiding,

Error and Exceptions: Difference between an error and Exception, Handling Exception, try except block, Raising Exceptions, User Defined Exceptions

UNIT – VI:

Brief Tour of the Standard Library - Operating System Interface - String Pattern Matching, Mathematics, Internet Access, Dates and Times, Data Compression, Multithreading, GUI Programming, Turtle Graphics

Testing: Why testing is required ?, Basic concepts of testing, Unit testing in Python, Writing Test cases, Running Tests.

OUTCOMES:

- Making Software easily right out of the box.
- Experience with an interpreted Language.
- To build software for real needs.
- Prior Introduction to testing software

TEXT BOOKS

1. Python Programming: A Modern Approach, Vamsi Kurama, Pearson
2. Learning Python, Mark Lutz, Orielly

Reference Books:

1. Think Python, Allen Downey, Green Tea Press
2. Core Python Programming, W.Chun, Pearson.
3. Introduction to Python, Kenneth A. Lambert, Cengage

II Year - I Semester

L	T	P	C
4	0	0	3

DATA STRUCTURES THROUGH C++

OBJECTIVES:

- To be familiar with basic techniques of object oriented principles and exception handling using C++
- To be familiar with the concepts like Inheritance, Polymorphism
- Solve problems using data structures such as linear lists, stacks, queues, hash tables
- Be familiar with advanced data structures such as balanced search trees, AVL Trees, and B Trees.

UNIT-I: ARRAYS

Abstract Data Types and the C++ Class, An Introduction to C++ Class- Data Abstraction and Encapsulation in C++- Declaring Class Objects and Invoking Member Functions- Special Class Operations- Miscellaneous Topics- ADTs and C++Classes, The Array as an Abstract Data Type, The Polynomial Abstract Data type- Polynomial Representation- Polynomial Addition. Spares Matrices, Introduction- Sparse Matrix Representation- Transposing a Matrix- Matrix Multiplication, Representation of Arrays.

UNIT-II: STACKS AND QUEUES

Templates in C++, Template Functions- Using Templates to Represent Container Classes, The Stack Abstract Data Type, The Queue Abstract Data Type, Subtyping and Inheritance in C++, Evaluation of Expressions, Expression- Postfix Notation- Infix to Postfix.

UNIT-III: LINKED LISTS

Single Linked List and Chains, Representing Chains in C++, Defining a Node in C++- Designing a Chain Class in C++- Pointer manipulation in C++- Chain Manipulation Operations, The Template Class Chain, Implementing Chains with Templates- Chain Iterators- Chain Operations- Reusing a Class, Circular Lists, Available Space Lists, Linked Stacks and Queues, Polynomials, Polynomial Representation- Adding Polynomials- Circular List Representation of Polynomials, Equivalence Classes, Sparse Matrices, Sparse Matrix Representation- Sparse Matrix Input-Deleting a Sparse Matrix, Doubly Linked Lists, Generalized Lists, Representation of Generalized Lists- Recursive Algorithms for Lists- Reference Counts, Shared and Recursive Lists

UNIT-IV: TREES

Introduction, Terminology, Representation of Trees, Binary Trees, The Abstract Data Type, Properties of Binary Trees, Binary Tree Representations, Binary Tree Traversal and Tree Iterators, Introduction, Inorder Traversal Preorder Traversal, Postorder Traversal, Thread Binary Trees, Threads, Inorder Traversal of a Threaded Binary Tree, Inserting a Node into a Threaded Binary Tree, Heaps, Priority Queues, Definition of a Max Heap, Insertion into a Max Heap, Deletion from a Max Heap, Binary Search Trees, Definition, Searching a Binary Search Tree, Insertion into a Binary Search Tree, Deletion from a Binary Search Tree, Height of Binary Search Tree.

UNIT-V: GRAPHS

The Graph Abstract Data Type, Introduction, Definition, Graph Representation, Elementary Graph Operation, Depth First Search, Breadth First Search, Connected Components, Spanning Trees, Biconnected Components, Minimum Cost Spanning Trees, Kruskal S Algorithm, Prim s Algorithm Sollin' s Algorithm, Shortest Paths and Transitive Closure, Single Source/All Destination: Nonnegative Edge Cost, Single Source/All Destination: General Weights, All-Pairs Shortest Path, Transitive Closure.

UNIT-VI: SORTING

Insertion Sort, Quick Sort, Merge Sort Merging, Iterative Merge Sort, Recursive Merge Sort, Heap Sort.

OUTCOMES:

- Distinguish between procedures and object oriented programming.
- Apply advanced data structure strategies for exploring complex data structures.
- Compare and contrast various data structures and design techniques in the area of Performance.
- Implement data structure algorithms through C++. • Incorporate data structures into the applications such as binary search trees, AVL and B Trees
- Implement all data structures like stacks, queues, trees, lists and graphs and compare their Performance and trade offs

TEXT BOOKS:

1. Data structures, Algorithms and Applications in C++, S.Sahni, University Press (India) Pvt.Ltd, 2nd edition, Universities Press, Pvt. Ltd.
2. Data structures and Algorithm Analysis in C++, Mark Allen Weiss, Pearson Education. Ltd., Second Edition.
3. Data structures and Algorithms in C++, Michael T.Goodrich, R.Tamassia and .Mount, Wiley student edition, John Wiley and Sons.

REFERENCE BOOKS:

1. Data structures and algorithms in C++, 3rd Edition, Adam Drozdek, Thomson
2. Data structures using C and C++, Langsam, Augenstein and Tanenbaum, PHI.
3. Problem solving with C++, The OOP, Fourth edition, W.Savitch, Pearson education.

II Year - I Semester

L	T	P	C
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COMPUTER GRAPHICS

OBJECTIVES:

- To develop, design and implement two and three dimensional graphical structures
- To enable students to acquire knowledge Multimedia compression and animations
- To learn Creation, Management and Transmission of Multimedia objects.

UNIT-I:

2D Primitives Output primitives – Line, Circle and Ellipse drawing algorithms - Attributes of output primitives – Two dimensional Geometric transformations - Two dimensional viewing – Line, Polygon, Curve and Text clipping algorithms

UNIT-II:

3D Concepts Parallel and Perspective projections - Three dimensional object representation – Polygons, Curved lines, Splines, Quadric Surfaces, - Visualization of data sets - 3Dtransformations – Viewing -Visible surface identification.

UNIT-III:

Graphics Programming Color Models – RGB, YIQ, CMY, HSV – Animations – General Computer Animation, Raster, Keyframe - Graphics programming using OPENGL – Basic graphics primitives –Drawing three dimensional objects - Drawing three dimensional scenes

UNIT- IV:

Rendering Introduction to Shading models – Flat and Smooth shading – Adding texture to faces –Adding shadows of objects – Building a camera in a program – Creating shaded objects– Rendering texture – Drawing Shadows.

UNIT- V:

Fractals Fractals and Self similarity – Peano curves – Creating image by iterated functions – Mandelbrot sets – Julia Sets – Random Fractals

UNIT- VI:

Overview of Ray Tracing Intersecting rays with other primitives – Adding Surface texture – Reflections and Transparency – Boolean operations on Objects.

OUTCOMES:

- Know and be able to describe the general software architecture of programs that use 3D computer graphics.
- Know and be able to discuss hardware system architecture for computer graphics. This includes, but is not limited to: graphics pipeline, frame buffers, and graphic accelerators/co-processors.
- Know and be able to select among models for lighting/shading: Color, ambient light; distant and light with sources; Phong reflection model; and shading (flat, smooth, Gourand, Phong).

TEXT BOOKS:

1. Donald Hearn, Pauline Baker, Computer Graphics – C Version, second edition Pearson Education, 2004.
2. F.S. Hill, Computer Graphics using OpenGL, Second edition, Pearson Education, 2003.

REFERENCE BOOKS:

1. James D. Foley, Andries Van Dam, Steven K. Feiner, John F. Hughes, Computer Graphics- Principles and practice, Second Edition in C, Pearson Education, 2007.

II Year - I Semester

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DATASTRUCTURES THROUGH C++ LAB

OBJECTIVES:

- To develop skills to design and analyze simple linear and non linear data structures
- To Strengthen the ability to identify and apply the suitable data structure for the given real world problem
- To Gain knowledge in practical applications of data structures

List of Experiments:

1. Implementation of Singly linked list.
2. Implementation of Doubly linked list.
3. Implementation of Multistack in a Single Array.
4. Implementation of Circular Queue
5. Implementation of Binary Search trees.
6. Implementation of Hash table.
7. Implementation of Heaps.
8. Implementation of Breadth First Search Techniques.
9. Implementation of Depth First Search Techniques.
10. Implementation of Prim's Algorithm.
11. Implementation of Dijkstra's Algorithm.
12. Implementation of Kruskal's Algorithm
13. Implementation of MergeSort
14. Implementation of Quick Sort
15. Implementation of Data Searching using divide and conquer technique

OUTCOMES:

At the end of this lab session, the student will

- Be able to design and analyze the time and space efficiency of the data structure
- Be capable to identify the appropriate data structure for given problem

Have practical knowledge on the application of data structures

II Year - I Semester

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PYTHON PROGRAMMING LAB

Exercise 1 - Basics

- Running instructions in Interactive interpreter and a Python Script
- Write a program to purposefully raise Indentation Error and Correct it

Exercise 2 - Operations

- Write a program to compute distance between two points taking input from the user (Pythagorean Theorem)
- Write a program add.py that takes 2 numbers as command line arguments and prints its sum.

Exercise - 3 Control Flow

- Write a Program for checking whether the given number is a even number or not.
- Using a for loop, write a program that prints out the decimal equivalents of $1/2$, $1/3$, $1/4$, . . . , $1/10$
- Write a program using a for loop that loops over a sequence. What is sequence ?
- Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.

Exercise 4 - Control Flow - Continued

- Find the sum of all the primes below two million.
Each new term in the Fibonacci sequence is generated by adding the previous two terms. By starting with 1 and 2, the first 10 terms will be:

1, 2, 3, 5, 8, 13, 21, 34, 55, 89, ...

- By considering the terms in the Fibonacci sequence whose values do not exceed four million, find the sum of the even-valued terms.

Exercise - 5 - DS

- Write a program to count the numbers of characters in the string and store them in a dictionary data structure
- Write a program to use split and join methods in the string and trace a birthday with a dictionary data structure.

Exercise - 6 DS - Continued

- a) Write a program `combine_lists` that combines these lists into a dictionary.
- b) Write a program to count frequency of characters in a given file. Can you use character frequency to tell whether the given file is a Python program file, C program file or a text file?

Exercise - 7 Files

- a) Write a program to print each line of a file in reverse order.
- b) Write a program to compute the number of characters, words and lines in a file.

Exercise - 8 Functions

- a) Write a function `ball_collide` that takes two balls as parameters and computes if they are colliding. Your function should return a Boolean representing whether or not the balls are colliding.

Hint: Represent a ball on a plane as a tuple of (x, y, r) , r being the radius

If $(\text{distance between two balls centers}) \leq (\text{sum of their radii})$ then (they are colliding)

- b) Find mean, median, mode for the given set of numbers in a list.

Exercise - 9 Functions - Continued

- a) Write a function `nearly_equal` to test whether two strings are nearly equal. Two strings a and b are nearly equal when a can be generated by a single mutation on b .
- b) Write a function `dups` to find all duplicates in the list.
- c) Write a function `unique` to find all the unique elements of a list.

Exercise - 10 - Functions - Problem Solving

- a) Write a function `cumulative_product` to compute cumulative product of a list of numbers.
- b) Write a function `reverse` to reverse a list. Without using the `reverse` function.
- c) Write function to compute `gcd`, `lcm` of two numbers. Each function shouldn't exceed one line.

Exercise 11 - Multi-D Lists

- a) Write a program that defines a matrix and prints
- b) Write a program to perform addition of two square matrices
- c) Write a program to perform multiplication of two square matrices

Exercise - 12 - Modules

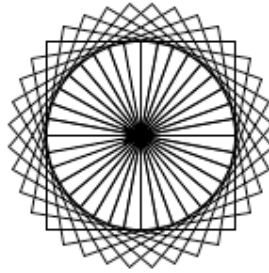
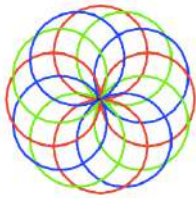
- a) Install packages `requests`, `flask` and explore them. using `(pip)`
- b) Write a script that imports `requests` and fetch content from the page. Eg. (Wiki)
- c) Write a simple script that serves a simple `HTTPResponse` and a simple `HTML Page`

Exercise - 13 OOP

- a) Class variables and instance variable and illustration of the self variable
 - i) Robot
 - ii) ATM Machine

Exercise - 14 GUI, Graphics

1. Write a GUI for an Expression Calculator using tk
2. Write a program to implement the following figures using turtle



Exercise - 15 - Testing

- a) Write a test-case to check the function `even_numbers` which return True on passing a list of all even numbers
- b) Write a test-case to check the function `reverse_string` which returns the reversed string

Exercise - 16 - Advanced

- a) Build any one classical data structure.
- b) Write a program to solve knapsack problem.

II Year – II Semester

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SOFTWARE ENGINEERING

OBJECTIVES

- To understand the software life cycle models.
- To understand the software requirements and SRS document.
- To understand the importance of modeling and modeling languages.
- To design and develop correct and robust software products.
- To understand the quality control and how to ensure good quality software.
- To understand the planning and estimation of software projects.
- To understand the implementation issues, validation and verification procedures.
- To understand the maintenance of software

UNIT-I:

Software and Software Engineering: The Nature of Software, The Unique Nature of WebApps, Software Engineering, Software Process, Software Engineering Practice, Software Myths.

Process Models: A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models, Specialized Process Models, The Unified Process, Personal and Team Process Models, Process Terminology, Product and Process.

UNIT-II:

Requirements Analysis And Specification: Requirements Gathering and Analysis, Software Requirement Specification (SRS), Formal System Specification.

Software Design: Overview of the Design Process, How to Characterise of a Design?, Cohesion and Coupling, Layered Arrangement of Modules, Approaches to Software Design

UNIT – III:

Function-Oriented Software Design: Overview of SA/SD Methodology, Structured Analysis, Developing the DFD Model of a System, Structured Design, Detailed Design, Design Review, over view of Object Oriented design.

User Interface Design: Characteristics of Good User Interface, Basic Concepts, Types of User Interfaces, Fundamentals of Component-based GUI Development, A User Interface Design Methodology.

UNIT – IV:

Coding And Testing: Coding, Code Review, Software Documentation, Testing, Unit Testing, Black-Box Testing, White-Box Testing, Debugging, Program Analysis Tool, Integration Testing, Testing Object-Oriented Programs, System Testing, Some General Issues Associated with Testing

UNIT – V:

Software Reliability And Quality Management: Software Reliability, Statistical Testing, Software Quality, Software Quality Management System, ISO 9000, SEI Capability Maturity Model.

Computer Aided Software Engineering: Case and its Scope, Case Environment, Case Support in Software Life Cycle, Other Characteristics of Case Tools, Towards Second Generation CASE Tool, Architecture of a Case Environment

UNIT – VI

Software Maintenance: Software maintenance, Maintenance Process Models, Maintenance Cost, Software Configuration Management.

Software Reuse: what can be reused? Why almost No Reuse So Far? Basic Issues in Reuse Approach, Reuse at Organization Level.

OUTCOMES

- Define and develop a software project from requirement gathering to implementation.
- Obtain knowledge about principles and practices of software engineering.
- Focus on the fundamentals of modeling a software project.
- Obtain knowledge about estimation and maintenance of software systems

TEXT BOOKS:

1. Software engineering A practitioner's Approach, Roger S. Pressman, Seventh Edition McGrawHill International Edition.
2. Fundamentals of Software Engineering, Rajib Mall, Third Edition, PHI.
3. Software Engineering, Ian Sommerville, Ninth edition, Pearson education

REFERENCE BOOKS:

1. Software Engineering : A Primer, Waman S Jawadekar, Tata McGraw-Hill, 2008
2. Software Engineering, A Precise Approach, Pankaj Jalote, Wiley India, 2010.
3. Software Engineering, Principles and Practices, Deepak Jain, Oxford University Press.
4. Software Engineering1: Abstraction and modeling, Diner Bjorner, Springer International edition, 2006.

II Year - II Semester

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JAVA PROGRAMMING

OBJECTIVES:

- Understanding the OOP's concepts, classes and objects, threads, files, applets, swings and act.
- This course introduces computer programming using the JAVA programming language with object-oriented programming principles.
- Emphasis is placed on event-driven programming methods, including creating and manipulating objects, classes, and using Java for network level programming and middleware development

UNIT-I:

Introduction to OOP, procedural programming language and object oriented language, principles of OOP, applications of OOP, history of java, java features, JVM, program structure.

Variables, primitive data types, identifiers, literals, operators, expressions, precedence rules and associativity, primitive type conversion and casting, flow of control.

UNIT-II:

Classes and objects, class declaration, creating objects, methods, constructors and constructor overloading, garbage collector, importance of static keyword and examples, this keyword, arrays, command line arguments, nested classes.

UNIT-III:

Inheritance, types of inheritance, super keyword, final keyword, overriding and abstract class. Interfaces, creating the packages, using packages, importance of CLASSPATH and java.lang package. Exception handling, importance of try, catch, throw, throws and finally block, user-defined exceptions, Assertions.

UNIT-IV:

Multithreading: introduction, thread life cycle, creation of threads, thread priorities, thread synchronization, communication between threads. Reading data from files and writing data to files, random access file,

UNIT-V:

Applet class, Applet structure, Applet life cycle, sample Applet programs. Event handling: event delegation model, sources of event, Event Listeners, adapter classes, inner classes.

UNIT-VI:

AWT: introduction, components and containers, Button, Label, Checkbox, Radio Buttons, List Boxes, Choice Boxes, Container class, Layouts, Menu and Scrollbar.

OUTCOMES:

- Understand Java programming concepts and utilize Java Graphical User Interface in Program writing.
- Write, compile, execute and troubleshoot Java programming for networking concepts.
- Build Java Application for distributed environment.
- Design and Develop multi-tier applications.
- Identify and Analyze Enterprise applications.

TEXT BOOKS:

1. The complete Reference Java, 8th edition, Herbert Schildt, TMH.
2. Programming in JAVA, Sachin Malhotra, SaurabhChoudary, Oxford.
3. Introduction to java programming, 7th edition by Y Daniel Liang, Pearson.

REFERENCE BOOKS:

1. Swing: Introduction, JFrame, JApplet, JPanel, Componets in Swings, Layout Managers in
2. Swings, JList and JScrollPane, Split Pane, JTabbedPane, JTree, JTable, Dialog Box.

II Year - II Semester

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ADVANCED DATA STRUCTURES

OBJECTIVES:

- Describe and implement a variety of advanced data structures (hash tables, priority queues, balanced search trees, graphs).
- Analyze the space and time complexity of the algorithms studied in the course.
- Identify different solutions for a given problem; analyze advantages and disadvantages to different solutions.
- Demonstrate an understanding of external memory and external search and sorting algorithms.
- Demonstrate an understanding of simple Entity-Relationship models for databases.

UNIT-I: SORTING

External Sorting, Introduction, K-way Merging - Buffer Handling for parallel Operation- Run Generation- Optimal Merging of Runs.

UNIT-II: HASHING

Introduction-Static Hashing- Hash Table- Hash Functions- Secure Hash Function- Overflow Handling- Theoretical Evaluation of Overflow Techniques, Dynamic Hashing- Motivation for Dynamic Hashing -Dynamic Hashing Using Directories- Directory less Dynamic, Hashing,

UNIT-III:PRIORITY QUEUES (HEAPS)

Model, Simple Implementation, Binary Heap-Structure Property-Heap-Order Property-Basic Heap Operations- Other Heap Operation, Applications of Priority Queues- The Selection Problem Event Simulation Problem, Binomial Queues- Binomial Queue Structure – Binomial Queue Operation- Implementation of Binomial Queues

UNIT-IV: EFFICIENT BINARY SEARCH TREES

Optimal Binary Search Trees, AVL Trees, Red-Black Trees, Definition- Representation of a Red- Black Tree- Searching a Red-Black Tree- Inserting into a Red Black Tree- Deletion from a Red-Black Tree- Joining Red-Black Trees, Splitting a Red-Black tree.

UNIT-V: MULTIWAY SEARCH TREES

M-Way Search Trees, Definition and Properties- Searching an M-Way Search Tree, B-Trees, Definition and Properties- Number of Elements in a B-tree- Insertion into B-Tree- Deletion from a B-Tree- B+-Tree Definition- Searching a B+-Tree- Insertion into B+-tree- Deletion from a B+-Tree.

UNIT-VI: DIGITAL SEARCH STRUCTURES

Digital Search Trees, Definition- Search, Insert and Delete- Binary tries and Patricia, Binary Tries, Compressed Binary Tries- Patricia, Multiway Tries- Definitions- Searching a Trie- Sampling Strategies- Insertion into a Trie- Deletion from a Trie- Keys with Different Length- Height of a Trie- Space Required and Alternative Node Structure- Prefix Search and Applications- Compressed Tries- Compressed Tries With Skip Fields- Compressed Tries With Labeled Edges- Space Required by a Compressed Tries, Tries and Internet Packet Forwarding , - IP Routing- 1-Bit Tries- Fixed-Stride Tries-Variable-Stride Tries.

OUTCOMES:

- Be able to understand and apply amortised analysis on data structures, including binary search trees, mergable heaps, and disjoint sets.
- Understand the implementation and complexity analysis of fundamental algorithms such as RSA, primality testing, max flow, discrete Fourier transform.
- Have an idea of applications of algorithms in a variety of areas, including linear programming and duality, string matching, game-theory

TEXT BOOKS:

1. Data Structures, a Pseudocode Approach, Richard F Gilberg, Behrouz A Forouzan, Cengage.
2. Fundamentals of DATA STRUCTURES in C: 2nd ed, , Horowitz , Sahani, Anderson-freed, Universities Press
3. Data structures and Algorithm Analysis in C, 2nd edition, Mark Allen Weiss, Pearson

REFERENCE BOOKS:

1. Web : <http://lcm.csa.iisc.ernet.in/dsa/dsa.html>
2. http://utubersity.com/?page_id=878
3. <http://freevideolectures.com/Course/2519/C-Programming-and-Data-Structures>
4. <http://freevideolectures.com/Course/2279/Data-Structures-And-Algorithms>
5. File Structures :An Object oriented approach with C++, 3rd ed, Michel J Folk, Greg Riccardi, Bill Zoellick
6. C and Data Structures: A Snap Shot oriented Treatise with Live examples from Science and Engineering, NB Venkateswarlu & EV Prasad, S Chand, 2010.

II Year - II Semester

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COMPUTER ORGANIZATION

OBJECTIVES:

- Understand the architecture of a modern computer with its various processing units. Also the Performance measurement of the computer system.
- In addition to this the memory management system of computer.

UNIT -I:

Basic Structure Of Computers: Functional unit, Basic Operational concepts, Bus structures, System Software, Performance, The history of computer development.

UNIT -II:

Machine Instruction and Programs:

Instruction and Instruction Sequencing: Register Transfer Notation, Assembly Language Notation, Basic Instruction Types,

Addressing Modes, Basic Input/output Operations, The role of Stacks and Queues in computer programming equation. Component of Instructions: Logic Instructions, shift and Rotate Instructions

UNIT -III:

Type of Instructions: Arithmetic and Logic Instructions, Branch Instructions, Addressing Modes, Input/output Operations

UNIT -IV:

INPUT/OUTPUT ORGANIZATION: Accessing I/O Devices, Interrupts: Interrupt Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices, Direct Memory Access, Buses: Synchronous Bus, Asynchronous Bus, Interface Circuits, Standard I/O Interface: Peripheral Component Interconnect (PCI) Bus, Universal Serial Bus (USB)

UNIT -V:

The MEMORY SYSTEMS: Basic memory circuits, Memory System Consideration, Read-Only Memory: ROM, PROM, EPROM, EEPROM, Flash Memory,

Cache Memories: Mapping Functions, INTERLEAVING

Secondary Storage: Magnetic Hard Disks, Optical Disks,

UNIT -VI:

Processing Unit: Fundamental Concepts: Register Transfers, Performing An Arithmetic Or Logic Operation, Fetching A Word From Memory, Execution of Complete Instruction, Hardwired Control,
Micro programmed Control: Microinstructions, Micro program Sequencing, Wide Branch Addressing Microinstructions with next –Address Field

OUTCOMES:

- Students can understand the architecture of modern computer.
- They can analyze the Performance of a computer using performance equation
- Understanding of different instruction types.
- Students can calculate the effective address of an operand by addressing modes
- They can understand how computer stores positive and negative numbers.
- Understanding of how a computer performs arithmetic operation of positive and negative numbers.

TEXT BOOKS:

1. Computer Organization, Carl Hamacher, Zvonks Vranesic, Safea Zaky, 5th Edition, McGraw Hill.
2. Computer Architecture and Organization, John P. Hayes, 3rd Edition, McGraw Hill.

REFERENCE BOOKS:

1. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson/PHI
2. Structured Computer Organization – Andrew S. Tanenbaum, 4th Edition PHI/Pearson
3. Fundamentals of Computer Organization and Design, - Sivarama Dandamudi Springer Int. Edition.
4. “Computer Organization and Design: The Hardware/Software Interface” by David A. Patterson and John L. Hennessy.
5. J .P. Hayes, "Computer Architecture and Organization", McGraw-Hill, 1998.

II Year – II Semester

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FORMAL LANGUAGE AND AUTOMATA THEORY

OBJECTIVE:

- Introduce the student to the concepts of Theory of computation in computer science
- The students should acquire insights into the relationship among formal languages, formal Grammars and automat.

UNIT – I: Finite Automata

Why Study Automata Theory? The Central Concepts of Automata Theory, Automation, Finite Automata, Transition Systems, Acceptance of a String by a Finite Automata, DFA, Design of DFAs, NFA, Design of NFA, Equivalence of DFA and NFA, Conversion of NFA into DFA, Finite Automata with E-Transition, Minimization of Finite Automata, Mealy and Moore Machines, Applications and Limitation of Finite Automata.

UNIT – II: Regular Expressions

Regular Expressions, Regular Sets, Identity Rules, Equivalence of two Regular Expressions, Manipulations of Regular Expressions, Finite Automata, and Regular Expressions, Inter Conversion, Equivalence between Finite Automata and Regular Expressions, Pumping Lemma, Closers Properties, Applications of Regular Expressions, Finite Automata and Regular Grammars, Regular Expressions and Regular Grammars.

UNIT – III: Context Free Grammars

Formal Languages, Grammars, Classification of Grammars, Chomsky Hierarchy Theorem, Context Free Grammar, Leftmost and Rightmost Derivations, Parse Trees, Ambiguous Grammars, Simplification of Context Free Grammars-Elimination of Useless Symbols, E-Productions and Unit Productions, Normal Forms for Context Free Grammars-Chomsky Normal Form and Greibach Normal Form, Pumping Lemma, Closure Properties, Applications of Context Free Grammars.

UNIT – IV: Pushdown Automata

Pushdown Automata, Definition, Model, Graphical Notation, Instantaneous Description Language Acceptance of pushdown Automata, Design of Pushdown Automata, Deterministic and Non – Deterministic Pushdown Automata, Equivalence of Pushdown Automata and Context Free Grammars Conversion, Two Stack Pushdown Automata, Application of Pushdown Automata.

UNIT – V: Turning Machine

Turing Machine, Definition, Model, Representation of Turing Machines-Instantaneous Descriptions, Transition Tables and Transition Diagrams, Language of a Turing Machine, Design of Turing Machines, Techniques for Turing Machine Construction, Types of Turing Machines, Church's Thesis, Universal Turing Machine, Restricted Turing Machine.

UNIT – VI: Computability

Decidable and Un-decidable Problems, Halting Problem of Turing Machines, Post's Correspondence Problem, Modified Post's Correspondence Problem, Classes of P and NP, NP-Hard and NP-Complete Problems.

OUTCOMES:

- Classify machines by their power to recognize languages,
- Employ finite state machines to solve problems in computing,
- Explain deterministic and non-deterministic machines,
- Comprehend the hierarchy of problems arising in the computer science

TEXT BOOKS:

1. Introduction to Automata Theory, Languages and Computation, J.E.Hopcroft, R.Motwani and J.D.Ullman, 3rd Edition, Pearson, 2008.
2. Theory of Computer Science-Automata, Languages and Computation, K.L.P.Mishra and N.Chandrasekharan, 3rd Edition, PHI, 2007.

REFERENCE BOOKS:

1. Formal Language and Automata Theory, K.V.N.Sunitha and N.Kalyani, Pearson, 2015.
2. Introduction to Automata Theory, Formal Languages and Computation, Shyamalendu Kandar, Pearson, 2013.
3. Theory of Computation, V.Kulkarni, Oxford University Press, 2013.
4. Theory of Automata, Languages and Computation, Rajendra Kumar, McGraw Hill, 2014.

II Year – II Semester

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PRINCIPLES OF PROGRAMMING LANGUAGES

OBJECTIVES:

- To understand and describe syntax and semantics of programming languages
- To understand data, data types, and basic statements
- To understand call-return architecture and ways of implementing them
- To understand object-orientation, concurrency, and event handling in programming languages
- To develop programs in non-procedural programming paradigms

UNIT- I:

Syntax and semantics: Evolution of programming languages, describing syntax, context, free grammars, attribute grammars, describing semantics, lexical analysis, parsing, recursive - decent bottom - up parsing

UNIT- II:

Data, data types, and basic statements: Names, variables, binding, type checking, scope, scope rules, lifetime and garbage collection, primitive data types, strings, array types, associative arrays, record types, union types, pointers and references, Arithmetic expressions, overloaded operators, type conversions, relational and boolean expressions , assignment statements , mixed mode assignments, control structures – selection, iterations, branching, guarded Statements

UNIT- III:

Subprograms and implementations: Subprograms, design issues, local referencing, parameter passing, overloaded methods, generic methods, design issues for functions, semantics of call and return, implementing simple subprograms, stack and dynamic local variables, nested subprograms, blocks, dynamic scoping

UNIT- IV:

Object- orientation, concurrency, and event handling: Object – orientation, design issues for OOP languages, implementation of object, oriented constructs, concurrency, semaphores, Monitors, message passing, threads, statement level concurrency, exception handling, event handling

UNIT -V:

Functional programming languages: Introduction to lambda calculus, fundamentals of functional programming languages, Programming with Scheme, – Programming with ML,

UNIT -VI:

Logic programming languages: Introduction to logic and logic programming, – Programming with Prolog, multi - paradigm languages

OUTCOMES:

- Describe syntax and semantics of programming languages
- Explain data, data types, and basic statements of programming languages
- Design and implement subprogram constructs, Apply object - oriented, concurrency, and event handling programming constructs
- Develop programs in Scheme, ML, and Prolog
- Understand and adopt new programming languages

TEXT BOOKS:

1. Robert W. Sebesta, “Concepts of Programming Languages”, Tenth Edition, Addison Wesley, 2012.
2. Programming Languages, Principles & Paradigms, 2ed, Allen B Tucker, Robert E Noonan, TMH

REFERENCE BOOKS:

1. R. Kent Dybvig, “The Scheme programming language”, Fourth Edition, MIT Press, 2009.
2. Jeffrey D. Ullman, “Elements of ML programming”, Second Edition, Prentice Hall, 1998.
3. Richard A. O'Keefe, “The craft of Prolog”, MIT Press, 2009.
4. W. F. Clocksin and C. S. Mellish, “Programming in Prolog: Using the ISO Standard”, Fifth Edition, Springer, 2003

II Year – II Semester

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ADVANCED DATA STRUCTURES LAB

OBJECTIVES:

- To understand heap and various tree structures like AVL, Red-black, B and Segment trees
- To understand the problems such as line segment intersection, convex shell and Voronoi diagram

Programming:

1. To perform various operations i.e., insertions and deletions on AVL trees.
2. To implement operations on binary heap.
 - i) Vertex insertion
 - ii) Vertex deletion
 - iii) Finding vertex
 - iv) Edge addition and deletion
3. To implement Prim's algorithm to generate a min-cost spanning tree.
4. To implement Krushkal's algorithm to generate a min-cost spanning tree.
5. To implement Dijkstra's algorithm to find shortest path in the graph.
6. To implementation of Static Hashing (Use Linear probing for collision resolution)
7. To implement of Huffmann coding.
8. To implement of B-tree.

OUTCOMES:

- Implement heap and various tree structure like AVL, Red-black, B and Segment trees
- Solve the problems such as line segment intersection, convex shell and Voronoi diagram

JAVA PROGRAMMING LAB

Exercise - 1 (Basics)

- a). Write a JAVA program to display default value of all primitive data type of JAVA
- b). Write a java program that display the roots of a quadratic equation $ax^2+bx=0$. Calculate the discriminate D and basing on value of D, describe the nature of root.
- c). Five Bikers Compete in a race such that they drive at a constant speed which may or may not be the same as the other. To qualify the race, the speed of a racer must be more than the average speed of all 5 racers. Take as input the speed of each racer and print back the speed of qualifying racers.
- d) Write a case study on **public static void main(250 words)**

Exercise - 2 (Operations, Expressions, Control-flow, Strings)

- a). Write a JAVA program to search for an element in a given list of elements using binary search mechanism.
- b). Write a JAVA program to sort for an element in a given list of elements using bubble sort
- (c). Write a JAVA program to sort for an element in a given list of elements using merge sort.
- (d) Write a JAVA program using StringBuffer to delete, remove character.

Exercise - 3 (Class, Objects)

- a). Write a JAVA program to implement class mechanism. – Create a class, methods and invoke them inside main method.
- b). Write a JAVA program to implement constructor.

Exercise - 4 (Methods)

- a). Write a JAVA program to implement constructor overloading.
- b). Write a JAVA program implement method overloading.

Exercise - 5 (Inheritance)

- a). Write a JAVA program to implement Single Inheritance
- b). Write a JAVA program to implement multi level Inheritance
- c). Write a java program for abstract class to find areas of different shapes

Exercise - 6 (Inheritance - Continued)

- a). Write a JAVA program give example for “super” keyword.
- b). Write a JAVA program to implement Interface. What kind of Inheritance can be achieved?

Exercise - 7 (Exception)

- a). Write a JAVA program that describes exception handling mechanism
- b). Write a JAVA program Illustrating Multiple catch clauses

Exercise – 8 (Runtime Polymorphism)

- a). Write a JAVA program that implements Runtime polymorphism
- b). Write a Case study on run time polymorphism, inheritance that implements in above problem

Exercise – 9 (User defined Exception)

- a). Write a JAVA program for creation of Illustrating throw
- b). Write a JAVA program for creation of Illustrating finally
- c). Write a JAVA program for creation of Java Built-in Exceptions
- d). Write a JAVA program for creation of User Defined Exception

Exercise – 10 (Threads)

- a). Write a JAVA program that creates threads by extending Thread class .First thread display “Good Morning “every 1 sec, the second thread displays “Hello “every 2 seconds and the third display “Welcome” every 3 seconds ,(Repeat the same by implementing Runnable)
- b). Write a program illustrating **isAlive** and **join ()**
- c). Write a Program illustrating Daemon Threads.

Exercise - 11 (Threads continuity)

- a). Write a JAVA program Producer Consumer Problem
- b). Write a case study on thread Synchronization after solving the above producer consumer problem

Exercise – 12 (Packages)

- a). Write a JAVA program illustrate class path
- b). Write a case study on including in class path in your os environment of your package.
- c). Write a JAVA program that import and use the defined your package in the previous Problem

Exercise - 13 (Applet)

- a). Write a JAVA program to paint like paint brush in applet.
- b) Write a JAVA program to display analog clock using Applet.
- c). Write a JAVA program to create different shapes and fill colors using Applet.

Exercise - 14 (Event Handling)

- a). Write a JAVA program that display the x and y position of the cursor movement using

Mouse.

- b). Write a JAVA program that identifies key-up key-down event user entering text in a Applet.

Exercise - 15 (Swings)

- a). Write a JAVA program to build a Calculator in Swings
- b). Write a JAVA program to display the digital watch in swing tutorial.

Exercise – 16 (Swings - Continued)

- a). Write a JAVA program that to create a single ball bouncing inside a JPanel.
- b). Write a JAVA program JTree as displaying a real tree upside down

III Year – I Semester

L	T	P	C
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COMPILER DESIGN

OBJECTIVES:

- Understand the basic concept of compiler design, and its different phases which will be helpful to construct new tools like LEX, YACC, etc.

UNIT – I

Introduction Language Processing, Structure of a compiler the evaluation of Programming language, The Science of building a Compiler application of Compiler Technology. Programming Language Basics.

Lexical Analysis-: The role of lexical analysis buffering, specification of tokens. Recognitions of tokens the lexical analyzer generator lexical

UNIT –II

Syntax Analysis -: The Role of a parser, Context free Grammars Writing A grammar, top down parsing bottom up parsing Introduction to Lr Parser.

UNIT –III

More Powerful LR parser (LR1, LALR) Using Armigers Grammars Equal Recovery in Lr parser Syntax Directed Transactions Definition, Evolution order of SDTS Application of SDTS. Syntax Directed Translation Schemes.

UNIT – IV

Intermediated Code: Generation Variants of Syntax trees 3 Address code, Types and Deceleration, Translation of Expressions, Type Checking. Canted Flow Back patching?

UNIT – V

Runtime Environments, Stack allocation of space, access to Non Local date on the stack Heap Management code generation – Issues in design of code generation the target Language Address in the target code Basic blocks and Flow graphs. A Simple Code generation.

UNIT –VI

Machine Independent Optimization. The principle sources of Optimization peep hole Optimization, Introduction to Date flow Analysis.

OUTCOMES:

- Acquire knowledge in different phases and passes of Compiler, and specifying different types of tokens by lexical analyzer, and also able to use the Compiler tools like LEX, YACC, etc.
- Parser and its types i.e. Top-down and Bottom-up parsers.
- Construction of LL, SLR, CLR and LALR parse table.
- Syntax directed translation, synthesized and inherited attributes.
- Techniques for code optimization.

TEXT BOOKS:

1. Compilers, Principles Techniques and Tools. Alfred V Aho, Monical S. Lam, Ravi Sethi Jeffery D. Ullman, 2nd edition, pearson, 2007
2. Compiler Design K. Muneeswaran, OXFORD
3. Principles of compiler design, 2nd edition, Nandhini Prasad, Elsevier.

REFERENCE BOOKS:

1. Compiler Construction, Principles and practice, Kenneth C Loudon, CENGAGE
2. Implementations of Compiler, A New approach to Compilers including the algebraic methods, Yunlinsu, SPRINGER

III Year – I Semester

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UNIX PROGRAMMING

OBJECTIVES:

- Written technical communication and effective use of concepts and terminology.
- Facility with UNIX command syntax and semantics.
- Ability to read and understand specifications, scripts and programs.
- Individual capability in problem solving using the tools presented within the class.
Students will demonstrate a mastery of the course materials and concepts within in class discussions.

UNIT-I

Introduction to unix-Brief History-What is Unix-Unix Components-Using Unix-Commands in Unix-Some Basic Commands-Command Substitution-Giving Multiple Commands.

UNIT-II

The File system –The Basics of Files-What’s in a File-Directories and File Names-Permissions-I Nodes-The Directory Hierarchy, File Attributes and Permissions-The File Command knowing the File Type-The Chmod Command Changing File Permissions-The Chown Command Changing the Owner of a File-The Chgrp Command Changing the Group of a File.

UNIT-III

Using the Shell-Command Line Structure-Met characters-Creating New Commands-Command Arguments and Parameters-Program Output as Arguments-Shell Variables- -More on I/O Redirection-Looping in Shell Programs.

UNIT-IV

Filters-The Grep Family-Other Filters-The Stream Editor Sed-The AWK Pattern Scanning and processing Language-Good Files and Good Filters.

UNIT-V

Shell Programming-Shell Variables-The Export Command-The Profile File a Script Run During Starting-The First Shell Script-The read Command-Positional parameters-The \$? Variable knowing the exit Status-More about the Set Command-The Exit Command-Branching Control Structures-Loop Control Structures-The Continue and Break Statement-The Expr Command: Performing Integer Arithmetic-Real Arithmetic in Shell Programs-The here Document(<<)-The Sleep Command-Debugging Scripts-The Script Command-The Eval Command-The Exec Command.

UNIT-VI

The Process-The Meaning-Parent and Child Processes-Types of Processes-More about Foreground and Background processes-Internal and External Commands-Process Creation-The Trap Command-The Stty Command-The Kill Command-Job Control.

OUTCOMES:

- Documentation will demonstrate good organization and readability.
- File processing projects will require data organization, problem solving and research.
- Scripts and programs will demonstrate simple effective user interfaces.
- Scripts and programs will demonstrate effective use of structured programming.
- Scripts and programs will be accompanied by printed output demonstrating completion of a test plan.
- Testing will demonstrate both black and glass box testing strategies.
- Project work will involve group participation.

TEXT BOOKS:

1. The Unix programming Environment by Brian W. Kernighan & Rob Pike, Pearson.
2. Introduction to Unix Shell Programming by M.G.Venkateshmurthy, Pearson.

REFERENCE BOOKS:

1. Unix and shell programming by B.M. Harwani, OXFORD university press.

III Year – I Semester

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OBJECT ORIENTED ANALYSIS & DESIGN USING UML

OBJECTIVE:

- To understand how to solve complex problems
- Analyze and design solutions to problems using object oriented approach
- Study the notations of Unified Modeling Language

UNIT-I:

Introduction: The Structure of Complex systems, The Inherent Complexity of Software, Attributes of Complex System, Organized and Disorganized Complexity, Bringing Order to Chaos, Designing Complex Systems, Evolution of Object Model, Foundation of Object Model, Elements of Object Model, Applying the Object Model.

UNIT-II:

Classes and Objects: Nature of object, Relationships among objects, Nature of a Class, Relationship among Classes, Interplay of Classes and Objects, Identifying Classes and Objects, Importance of Proper Classification, Identifying Classes and Objects, Key abstractions and Mechanisms.

UNIT-III:

Introduction to UML: Why we model, Conceptual model of UML, Architecture, Classes, Relationships, Common Mechanisms, Class diagrams, Object diagrams.

UNIT-IV:

Basic Behavioral Modeling: Interactions, Interaction diagrams, Use cases, Use case Diagrams, Activity Diagrams.

UNIT-V:

Advanced Behavioral Modeling: Events and signals, state machines, processes and Threads, time and space, state chart diagrams.

UNIT-VI:

Architectural Modeling: Component, Deployment, Component diagrams and Deployment diagrams.

Case Study: The Unified Library application.

OUTCOME:

- Ability to find solutions to the complex problems using object oriented approach
- Represent classes, responsibilities and states using UML notation
- Identify classes and responsibilities of the problem domain

TEXT BOOKS:

1. “Object- Oriented Analysis And Design with Applications”, Grady BOOCH, Robert A. Maksimchuk, Michael W. ENGLE, Bobbi J. Young, Jim Conallen, Kellia Houston, 3rd edition, 2013, PEARSON.
2. “The Unified Modeling Language User Guide”, Grady Booch, James Rumbaugh, Ivar Jacobson, 12th Impression, 2012, PEARSON.

REFERENCE BOOKS:

1. “Object-oriented analysis and design using UML”, Mahesh P. Matha, PHI
2. “Head first object-oriented analysis and design”, Brett D. McLaughlin, Gary Pollice, Dave West, O’Reilly
3. “Object-oriented analysis and design with the Unified process”, John W. Satzinger, Robert B. Jackson, Stephen D. Burd, Cengage Learning
1. “The Unified modeling language Reference manual”, James Rumbaugh, Ivar Jacobson, Grady Booch, Addison-Wesley

III Year – I Semester

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DATA BASE MANAGEMENT SYSTEMS

OBJECTIVES

- To learn the principles of systematically designing and using large scale Database Management Systems for various applications.

UNIT-I: An Overview of Database Management, Introduction- What is Database System- What is Database-Why Database- Data Independence- Relation Systems and Others- Summary, **Database system architecture, Introduction-** The Three Levels of Architecture-The External Level- the Conceptual Level- the Internal Level- Mapping- the Database Administrator-The Database Management Systems- Client/Server Architecture.

UNIT-II:

The E/R Models, The Relational Model, Relational Calculus, Introduction to Database Design, Database Design and Er Diagrams-Entities Attributes, and Entity Sets-Relationship and Relationship Sets-Conceptual Design With the Er Models, The Relational Model Integrity Constraints Over Relations- Key Constraints –Foreign Key Constraints-General Constraints, Relational Algebra and Calculus, Relational Algebra- Selection and Projection- Set Operation, Renaming – Joins- Division- More Examples of Queries, Relational Calculus, Tuple Relational Calculus- Domain Relational Calculus.

UNIT-III:

Queries, Constraints, Triggers: The Form of Basic SQL Query, Union, Intersect, and Except, Nested Queries, Aggregate Operators, Null Values, Complex Integrity Constraints in SQL, Triggers and Active Database.

UNIT-IV:

Schema Refinement (Normalization) : Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency(1NF, 2NF and 3 NF), concept of surrogate key, Boyce-codd normal form(BCNF), Lossless join and dependency preserving decomposition, Fourth normal form(4NF).

UNIT-V:

Transaction Management and Concurrency Control:

Transaction, properties of transactions, transaction log, and transaction management with SQL using commit rollback and save point.

Concurrency control for lost updates, uncommitted data, inconsistent retrievals and the Scheduler. Concurrency control with locking methods : lock granularity, lock types, two phase locking for ensuring serializability, deadlocks, Concurrency control with time stamp ordering : Wait/Die and Wound/Wait Schemes, Database Recovery management : Transaction recovery.

UNIT-VI:

Overview of Storages and Indexing, Data on External Storage- File Organization and Indexing – Clustered Indexing – Primary and Secondary Indexes, Index Data Structures, Hash-Based Indexing – Tree-Based Indexing, Comparison of File Organization

OUTCOMES

- Describe a relational database and object-oriented database.
- Create, maintain and manipulate a relational database using SQL
- Describe ER model and normalization for database design.
- Examine issues in data storage and query processing and can formulate appropriate solutions.
- Understand the role and issues in management of data such as efficiency, privacy, security, ethical responsibility, and strategic advantage.
- Design and build database system for a given real world problem

TEXT BOOKS:

1. Introduction to Database Systems, CJ Date, Pearson

2. Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, TATA McGraw Hill 3rd Edition

3. Database Systems - The Complete Book, H G Molina, J D Ullman, J Widom Pearson

REFERENCES BOOKS:

1. Data base Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.

2. Fundamentals of Database Systems, Elmasri Navrate Pearson Education

3. Introduction to Database Systems, C.J.Date Pearson Education

III Year – I Semester

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OPERATING SYSTEMS

OBJECTIVES:

- Study the basic concepts and functions of operating systems.
- Understand the structure and functions of OS.
- Learn about Processes, Threads and Scheduling algorithms.
- Understand the principles of concurrency and Deadlocks.
- Learn various memory management schemes.
- Study I/O management and File systems.
- Learn the basics of Linux system and perform administrative tasks on Linux Servers.

UNIT I

Introduction to Operating System Concept: Types of operating systems, operating systems concepts, operating systems services, Introduction to System call, System call types.

UNIT-II:

Process Management – Process concept, The process, Process State Diagram , Process control block, Process Scheduling- Scheduling Queues, Schedulers, Operations on Processes, Interprocess Communication, Threading Issues, Scheduling-Basic Concepts, Scheduling Criteria, Scheduling Algorithms.

UNIT-III:

Memory Management: Swapping, Contiguous Memory Allocation, Paging, structure of the Page Table, Segmentation

Virtual Memory Management:

Virtual Memory, Demand Paging, Page-Replacement Algorithms, Thrashing

UNIT-IV:

Concurrency: Process Synchronization, The Critical- Section Problem, Synchronization Hardware, Semaphores, Classic Problems of Synchronization, Monitors, Synchronization examples

Principles of deadlock – System Model, Deadlock Characterization, Deadlock Prevention, Detection and Avoidance, Recovery from Deadlock

UNIT-V:

File system Interface- the concept of a file, Access Methods, Directory structure, File system mounting, file sharing, protection.

File System implementation- File system structure, allocation methods, free-space management
Mass-storage structure overview of Mass-storage structure, Disk scheduling, Device drivers,

UNIT VI:

Linux System: Components of LINUX, Interprocess Communication, Synchronisation, Interrupt, Exception and System Call.

Android Software Platform: Android Architecture, Operating System Services, Android Runtime Application Development, Application Structure, Application Process management

OUTCOMES:

- Design various Scheduling algorithms.
- Apply the principles of concurrency.
- Design deadlock, prevention and avoidance algorithms.
- Compare and contrast various memory management schemes.
- Design and Implement a prototype file systems.
- Perform administrative tasks on Linux Servers
- Introduction to Android Operating System Internals

TEXT BOOK:

1. Operating System Concepts, Abraham Silberschatz, Peter Baer Galvin and Greg Gagne 9th Edition, John Wiley and Sons Inc., 2012.
2. Operating Systems – Internals and Design Principles, William Stallings, 7th Edition, Prentice Hall, 2011.
3. Operating Systems-S Halder, Alex A Aravind Pearson Education Second Edition 2016 .

REFERENCES:

1. Modern Operating Systems, Andrew S. Tanenbaum, Second Edition, Addison Wesley, 2001.
2. Operating Systems: A Design-Oriented Approach, Charles Crowley, Tata Mc Graw Hill Education”, 1996.
3. Operating Systems: A Concept-Based Approach, D M Dhamdhare, Second Edition, Tata Mc Graw-Hill Education, 2007.

III Year – I Semester

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UNIFIED MODELING LAB

OBJECTIVES:

- Construct UML diagrams for static view and dynamic view of the system.
- Generate creational patterns by applicable patterns for given context.
- Create refined model for given Scenario using structural patterns.
- Construct behavioral patterns for given applications.

Week 1:

Familiarization with Rational Rose or Umbrello

For each case study:

Week 2, 3 & 4:

For each case study:

- a) Identify and analyze events
- b) Identify Use cases
- c) Develop event table
- d) Identify & analyze domain classes
- e) Represent use cases and a domain class diagram using Rational Rose
- f) Develop CRUD matrix to represent relationships between use cases and problem domain classes

Week 5 & 6:

For each case study:

- a) Develop Use case diagrams
- b) Develop elaborate Use case descriptions & scenarios
- c) Develop prototypes (without functionality)
- d) Develop system sequence diagrams

Week 7, 8, 9 & 10:

For each case study:

- a) Develop high-level sequence diagrams for each use case
- b) Identify MVC classes / objects for each use case
- c) Develop Detailed Sequence Diagrams / Communication diagrams for each use case showing interactions among all the three-layer objects
- d) Develop detailed design class model (use GRASP patterns for responsibility assignment)
- e) Develop three-layer package diagrams for each case study

Week 11 & 12:

For each case study:

- a) Develop Use case Packages
- b) Develop component diagrams
- c) Identify relationships between use cases and represent them
- d) Refine domain class model by showing all the associations among classes

Week 13 onwards:

For each case study:

- a) Develop sample diagrams for other UML diagrams - state chart diagrams, activity diagrams and deployment diagrams

OUTCOMES:

- Understand the Case studies and design the Model.
- Understand how design patterns solve design problems.
- Develop design solutions using creational patterns.

Construct design solutions by using structural and behavioral patterns

OPERATING SYSEMS AND LINUX PROGRAMMING LAB

OBJECTIVES:

- To understand the design aspects of operating system.
- To study the process management concepts & Techniques.
- To study the storage management concepts.
- To familiarize students with theLinux environment
- To learn the fundamentals of shell scripting/programming
- To conceptualize Data Mining and the need for pre-processing.
- To learn the algorithms used for various types of Data Mining Problem

OPERATING SYSTEMS

1. Simulate the following CPU scheduling algorithms
a) Round Robin b) SJF c) FCFS d) Priority
2. Multiprogramming-Memory management- Implementation of fork (), wait (), exec() and exit (), System calls
3. Simulate the following
a) Multiprogramming with a fixed number of tasks (MFT)
b) Multiprogramming with a variable number of tasks (MVT)
4. Simulate Bankers Algorithm for Dead Lock Avoidance
5. Simulate Bankers Algorithm for Dead Lock Prevention.
6. Simulate the following page replacement algorithms.
a) FIFO b) LRU c) LFU
7. Simulate the following File allocation strategies
a) Sequenced b) Indexed c) Linked

LINUX PROGRAMMING

1. a) Study of Unix/Linux general purpose utility command list
man,who,cat, cd, cp, ps, ls, mv, rm, mkdir, rmdir, echo, more, date, time, kill, history, chmod, chown, finger, pwd, cal, logout, shutdown.
b) Study of vi editor.
c) Study of Bash shell, Bourne shell and C shell in Unix/Linux operating system.
d) Study of Unix/Linux file system (tree structure).
e) Study of .bashrc, /etc/bashrc and Environment variables.

2. Write a C program that makes a copy of a file using standard I/O, and system calls
3. Write a C program to emulate the UNIX `ls -l` command.
4. Write a C program that illustrates how to execute two commands concurrently with a command pipe.

Ex: - `ls -l | sort`

5. Write a C program that illustrates two processes communicating using shared memory
6. Write a C program to simulate producer and consumer problem using semaphores
7. Write C program to create a thread using pthreads library and let it run its function.
8. Write a C program to illustrate concurrent execution of threads using pthreads library.

OUTCOMES:

- To use Unix utilities and perform basic shell control of the utilities
- To use the Unix file system and file access control.
- To use of an operating system to develop software
- Students will be able to use Linux environment efficiently
- Solve problems using bash for shell scripting
- Will be able to implement algorithms to solve data mining problems using weka tool

III Year – I Semester

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DATA BASE MANAGEMENT SYSTEM LAB

OBJECTIVES:

- To provide a sound introduction to the discipline of database management as a subject in its own right, rather than as a compendium of techniques and product-specific tools.
- To familiarize the participant with the nuances of database environments towards an information-oriented data-processing oriented framework
- To give a good formal foundation on the relational model of data
- To present SQL and procedural interfaces to SQL comprehensively
- To give an introduction to systematic database design approaches covering conceptual design, logical design and an overview of physical design

List of Experiments:

SQL

1. Queries to facilitate acquaintance of Built-In Functions, String Functions, Numeric Functions, Date Functions and Conversion Functions.
2. Queries using operators in SQL
3. Queries to Retrieve and Change Data: Select, Insert, Delete, and Update
4. Queries using Group By, Order By, and Having Clauses
5. Queries on Controlling Data: Commit, Rollback, and Save point
6. Queries to Build Report in SQL *PLUS
7. Queries for Creating, Dropping, and Altering Tables, Views, and Constraints
8. Queries on Joins and Correlated Sub-Queries
9. Queries on Working with Index, Sequence, Synonym, Controlling Access, and Locking Rows for Update, Creating Password and Security features

PL/SQL

10. Write a PL/SQL Code using Basic Variable, Anchored Declarations, and Usage of

Assignment Operation

11. Write a PL/SQL Code Bind and Substitution Variables. Printing in PL/SQL
12. Write a PL/SQL block using SQL and Control Structures in PL/SQL
13. Write a PL/SQL Code using Cursors, Exceptions and Composite Data Types
14. Write a PL/SQL Code using Procedures, Functions, and Packages FORMS
15. Write a PL/SQL Code Creation of forms for any Information System such as Student Information System, Employee Information System etc. 18
16. Demonstration of database connectivity

OUTCOMES:

- Understand, appreciate and effectively explain the underlying concepts of database technologies
- Design and implement a database schema for a given problem-domain
- Normalize a database
- Populate and query a database using SQL DML/DDL commands.
- Declare and enforce integrity constraints on a database using a state-of-the-artRDBMS
- Programming PL/SQL including stored procedures, stored functions, cursors, packages.
- Design and build a GUI application using a 4GL

Note: The creation of sample database for the purpose of the experiments is expected to be predecided by the instructor.

Text Books/Suggested Reading:

1. Oracle: The Complete Reference by Oracle Press
2. Nilesh Shah, "Database Systems Using Oracle", PHI, 2007.
3. Rick F Vander Lans, "Introduction to SQL", Fourth Edition, Pearson Education, 2007

III Year – I Semester

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PROFESSIONAL ETHICS AND HUMAN VALUES

Course Objectives:

***To give basic insights and inputs to the student to inculcate Human values to grow as a responsible human beings with proper personality.**

***Professional Ethics instills the student to maintain ethical conduct and discharge their professional duties.**

UNIT I: Human Values:

Morals, Values and Ethics – Integrity –Trustworthiness - Work Ethics – Service Learning – Civic Virtue – Respect for others – Living Peacefully – Caring – Sharing – Honesty –Courage – Value Time – Co-operation – Commitment – Empathy – Self-confidence – Spirituality-Character.

UNIT: II: Principles for Harmony:

Truthfulness – Customs and Traditions -Value Education – Human Dignity – Human Rights – Fundamental Duties - Aspirations and Harmony (I, We & Nature) – Gender Bias - Emotional Intelligence – Salovey – Mayer Model – Emotional Competencies – Conscientiousness.

UNIT III: Engineering Ethics and Social Experimentation:

History of Ethics - Need of Engineering Ethics - Senses of Engineering Ethics- Profession and Professionalism —Self Interest - Moral Autonomy – Utilitarianism – Virtue Theory - Uses of Ethical Theories - Deontology- Types of Inquiry –Kohlberg’s Theory - Gilligan’s Argument – Heinz’s Dilemma - Comparison with Standard Experiments — Learning from the Past – Engineers as Managers – Consultants and Leaders – Balanced Outlook on Law - Role of Codes – Codes and Experimental Nature of Engineering.

UNIT IV: Engineers’ Responsibilities towards Safety and Risk:

Concept of Safety - Safety and Risk – Types of Risks – Voluntary v/sInvoluntary Risk – Consequences - Risk Assessment – Accountability – Liability - Reversible Effects - Threshold Levels of Risk - Delayed v/sImmediate Risk - Safety and the Engineer – Designing for Safety – Risk-Benefit Analysis-Accidents.

UNIT V: Engineers' Duties and Rights:

Concept of Duty - Professional Duties – Collegiality - Techniques for Achieving Collegiality – Senses of Loyalty - Consensus and Controversy - Professional and Individual Rights – Confidential and Proprietary Information - Conflict of Interest-Ethical egoism - Collective Bargaining – Confidentiality - Gifts and Bribes - Problem solving-Occupational Crimes-Industrial Espionage- Price Fixing-Whistle Blowing.

UNIT VI: Global Issues:

Globalization and MNCs –Cross Culture Issues - Business Ethics – Media Ethics - Environmental Ethics – Endangering Lives - Bio Ethics - Computer Ethics - War Ethics – Research Ethics -Intellectual Property Rights.

- Related Cases Shall be dealt where ever necessary.

Outcome:

***It gives a comprehensive understanding of a variety issues that are encountered by every professional in discharging professional duties.**

***It provides the student the sensitivity and global outlook in the contemporary world to fulfill the professional obligations effectively.**

References:

1. Professional Ethics by R. Subramaniam – Oxford Publications, New Delhi.
2. Ethics in Engineering by Mike W. Martin and Roland Schinzinger - Tata McGraw-Hill – 2003.
3. Professional Ethics and Morals by Prof.A.R.Aryasri, DharanikotaSuyodhana - Maruthi Publications.
4. Engineering Ethics by Harris, Pritchard and Rabins, Cengage Learning, New Delhi.
5. Human Values & Professional Ethics by S. B. Gogate, Vikas Publishing House Pvt. Ltd., Noida.
6. Engineering Ethics & Human Values by M.Govindarajan, S.Natarajan and V.S.SenthilKumar-PHI Learning Pvt. Ltd – 2009.
7. Professional Ethics and Human Values by A. Alavudeen, R.Kalil Rahman and M. Jayakumaran – University Science Press.
8. Professional Ethics and Human Values by Prof.D.R.Kiran-Tata McGraw-Hill - 2013
9. Human Values And Professional Ethics by Jayshree Suresh and B. S. Raghavan, S.Chand Publications

COMPUTER NETWORKS

OBJECTIVES:

- Understand state-of-the-art in network protocols, architectures, and applications.
- Process of networking research
- Constraints and thought processes for networking research
- Problem Formulation—Approach—Analysis—

UNIT – I:

Introduction: Network Topologies WAN, LAN, MAN. Reference models- The OSI Reference Model- the TCP/IP Reference Model - A Comparison of the OSI and TCP/IP Reference Models

UNIT – II:

Physical Layer – Fourier Analysis – Bandwidth Limited Signals – The Maximum Data Rate of a Channel - Guided Transmission Media, Digital Modulation and Multiplexing: Frequency Division Multiplexing, Time Division Multiplexing, Code Division Multiplexing

Data Link Layer Design Issues, Error Detection and Correction, Elementary Data Link Protocols, Sliding Window Protocols

UNIT – III:

The Data Link Layer - Services Provided to the Network Layer – Framing – Error Control – Flow Control, Error Detection and Correction – Error-Correcting Codes – Error Detecting Codes, Elementary Data Link Protocols- A Utopian Simplex Protocol-A Simplex Stop and Wait Protocol for an Error free channel-A Simplex Stop and Wait Protocol for a Noisy Channel, Sliding Window Protocols-A One Bit Sliding Window Protocol-A Protocol Using Go-Back-N- A Protocol Using Selective Repeat

UNIT – IV:

The Medium Access Control Sublayer-The Channel Allocation Problem-Static Channel Allocation-Assumptions for Dynamic Channel Allocation, Multiple Access Protocols-Aloha-Carrier Sense Multiple Access Protocols-Collision-Free Protocols-Limited Contention Protocols-Wireless LAN Protocols, Ethernet-Classic Ethernet Physical Layer-Classic Ethernet MAC Sublayer Protocol-Ethernet Performance-Fast Ethernet Gigabit Ethernet-10-Gigabit Ethernet-Retrospective on Ethernet, Wireless Lans-The 802.11 Architecture and Protocol Stack-The 802.11 Physical Layer-The802.11 MAC Sublayer Protocol-The 805.11 Frame Structure-Services

UNIT – V:

Design Issues-The Network Layer Design Issues – Store and Forward Packet Switching-Services Provided to the Transport layer- Implementation of Connectionless Service-Implementation of Connection Oriented Service-Comparison of Virtual Circuit and Datagram Networks, Routing Algorithms-The Optimality principle-Shortest path Algorithm, Congestion Control Algorithms-Approaches to Congestion Control-Traffic Aware Routing-Admission Control-Traffic Throttling-Load Shedding.

UNIT – VI:

Transport Layer – The Internet Transport Protocols: Udp, the Internet Transport Protocols: Tcp
Application Layer –The Domain Name System: The DNS Name Space, Resource Records, Name Servers, Electronic Mail: Architecture and Services, The User Agent, Message Formats, Message Transfer, Final Delivery

OUTCOMES:

- Understand OSI and TCP/IP models
- Analyze MAC layer protocols and LAN technologies
- Design applications using internet protocols
- Understand routing and congestion control algorithms
- Understand how internet works

TEXT BOOKS:

1. Tanenbaum and David J Wetherall, Computer Networks, 5th Edition, Pearson Edu, 2010
2. Computer Networks: A Top Down Approach, Behrouz A. Forouzan, FirouzMosharraf, McGraw Hill Education

REFERENCE BOOKS:

1. Larry L. Peterson and Bruce S. Davie, “Computer Networks - A Systems Approach” (5th ed), Morgan Kaufmann/ Elsevier, 2011

III Year – II Semester

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DATA WARE HOUSING AND DATA MINING

OBJECTIVES:

- Students will be enabled to understand and implement classical models and algorithms in data warehousing and data mining.
- They will learn how to analyze the data, identify the problems, and choose the relevant models and algorithms to apply.
- They will further be able to assess the strengths and weaknesses of various methods and algorithms and to analyze their behavior.

UNIT –I:

Introduction: Why Data Mining? What Is Data Mining? 1.3 What Kinds of Data Can Be Mined? 1.4 What Kinds of Patterns Can Be Mined? Which Technologies Are Used? Which Kinds of Applications Are Targeted? Major Issues in Data Mining. Data Objects and Attribute Types, Basic Statistical Descriptions of Data, Data Visualization, Measuring Data Similarity and Dissimilarity

UNIT –II:

Data Pre-processing: Data Preprocessing: An Overview, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization

UNIT –III:

Classification: Basic Concepts, General Approach to solving a classification problem, Decision Tree Induction: Working of Decision Tree, building a decision tree, methods for expressing an attribute test conditions, measures for selecting the best split, Algorithm for decision tree induction.

UNIT –IV:

Classification: Alternative Techniques, Bayes' Theorem, Naïve Bayesian Classification, Bayesian Belief Networks

UNIT –V

Association Analysis: Basic Concepts and Algorithms: Problem Definition, Frequent Item Set generation, Rule generation, compact representation of frequent item sets, FP-Growth Algorithm. (Tan & Vipin)

UNIT –VI

Cluster Analysis: Basic Concepts and Algorithms: Overview: What Is Cluster Analysis? Different Types of Clustering, Different Types of Clusters; K-means: The Basic K-means Algorithm, K-means Additional Issues, Bisecting K-means, Strengths and Weaknesses; Agglomerative Hierarchical Clustering: Basic Agglomerative Hierarchical Clustering Algorithm DBSCAN: Traditional Density Center-Based Approach, DBSCAN Algorithm, Strengths and Weaknesses. (Tan & Vipin)

OUTCOMES:

- Understand stages in building a Data Warehouse
- Understand the need and importance of preprocessing techniques
- Understand the need and importance of Similarity and dissimilarity techniques
- Analyze and evaluate performance of algorithms for Association Rules.
- Analyze Classification and Clustering algorithms

TEXT BOOKS:

1. Introduction to Data Mining: Pang-Ning Tan & Michael Steinbach, Vipin Kumar, Pearson.
2. Data Mining concepts and Techniques, 3/e, Jiawei Han, Michel Kamber, Elsevier.

REFERENCE BOOKS:

1. Data Mining Techniques and Applications: An Introduction, Hongbo Du, Cengage Learning.
2. Data Mining : VikramPudi and P. Radha Krishna, Oxford.
3. Data Mining and Analysis - Fundamental Concepts and Algorithms; Mohammed J. Zaki, Wagner Meira, Jr, Oxford
4. Data Warehousing Data Mining & OLAP, Alex Berson, Stephen Smith, TMH.

III Year – II Semester

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DESIGN AND ANALYSIS OF ALGORITHMS

OBJECTIVES:

Upon completion of this course, students will be able to do the following:

- Analyze the asymptotic performance of algorithms.
- Write rigorous correctness proofs for algorithms.
- Demonstrate a familiarity with major algorithms and data structures.
- Apply important algorithmic design paradigms and methods of analysis.
- Synthesize efficient algorithms in common engineering design situations

UNIT-I:

Introduction: What is an Algorithm, Algorithm Specification, Pseudocode Conventions Recursive Algorithm, Performance Analysis, Space Complexity, Time Complexity, Amortized Complexity, Amortized Complexity, Asymptotic Notation, Practical Complexities, Performance Measurement.

UNIT-II:

Dived and Conquer: General Method, Defective Chessboard, Binary Search, Finding the Maximum and Minimum, Merge Sort, Quick Sort, Performance Measurement, Randomized Sorting Algorithms.

UNIT-III:

The Greedy Method: The General Method, Knapsack Problem, Job Sequencing with Deadlines, Minimum-cost Spanning Trees, Prim's Algorithm, Kruskal's Algorithms, An Optimal Randomized Algorithm, Optimal Merge Patterns, Single Source Shortest Paths.

UNIT-IV:

Dynamic Programming: All - Pairs Shortest Paths, Single – Source Shortest paths General Weights, String Edition, 0/1 Knapsack, Reliability Design,

UNIT-V:

Backtracking: The General Method, The 8-Queens Problem, Sum of Subsets, Graph Coloring , Hamiltonian Cycles.

UNIT-VI:

Branch and Bound: The Method, Least cost (LC) Search, The 15-Puzzle: an Example, Control Abstraction for LC-Search, Bounding, FIFO Branch-and-Bound, LC Branch and Bound, 0/1 Knapsack Problem, LC Branch-and Bound Solution, FIFO Branch-and-Bound Solution, Traveling Salesperson.

OUTCOMES:

Students who complete the course will have demonstrated the ability to do the following:

- Argue the correctness of algorithms using inductive proofs and invariants.
- Analyze worst-case running times of algorithms using asymptotic analysis.
- Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize divide-and-conquer algorithms. Derive and solve recurrences describing the performance of divide-and-conquer algorithms.
- Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize dynamic-programming algorithms, and analyze them.
- Describe the greedy paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize greedy algorithms, and analyze them.

TEXT BOOKS:

1. Fundamentals of computer algorithms E. Horowitz S. Sahni, University Press
2. Introduction to Algorithms Thomas H. Cormen, PHI Learning

REFERENCE BOOKS

1. The Design and Analysis of Computer Algorithms, Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman
2. Algorithm Design, Jon Kleinberg, Pearson.

III Year – II Semester

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SOFTWARE TESTING METHODOLOGIES

OBJECTIVE:

Fundamentals for various testing methodologies.

- Describe the principles and procedures for designing test cases.
- Provide supports to debugging methods.
- Acts as the reference for software testing techniques and strategies.

UNIT-I:

Introduction: Purpose of Testing, Dichotomies, Model for Testing, Consequences of Bugs, Taxonomy of Bugs.

Flow graphs and Path testing: Basics Concepts of Path Testing, Predicates, Path Predicates and Achievable Paths, Path Sensitizing, Path Instrumentation, Application of Path Testing.

UNIT-II:

Transaction Flow Testing: Transaction Flows, Transaction Flow Testing Techniques.

Dataflow testing: Basics of Dataflow Testing, Strategies in Dataflow Testing, Application of Dataflow Testing.

UNIT-III:

Domain Testing: Domains and Paths, Nice & Ugly Domains, Domain testing, Domains and Interfaces Testing, Domain and Interface Testing, Domains and Testability.

Paths, Path products and Regular expressions: Path Products & Path Expression, Reduction Procedure, Applications, Regular Expressions & Flow Anomaly Detection.

UNIT-IV:

Syntax Testing: Why, What and How, A Grammar for formats, Test Case Generation, Implementation and Application and Testability Tips.

Logic Based Testing: Overview, Decision Tables, Path Expressions, KV Charts, and Specifications.

UNIT – V:

State, State Graphs and Transition Testing: State Graphs, Good & Bad State Graphs, State Testing, and Testability Tips.

Graph Matrices and Application:-Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm.

UNIT -VI:

Software Testing Tools: Introduction to Testing, Automated Testing, Concepts of Test Automation, Introduction to list of tools like Win runner, Load Runner, Jmeter, About Win Runner ,Using Win runner, Mapping the GUI, Recording Test, Working with Test, Enhancing Test, Checkpoints, Test Script Language, Putting it all together, Running and Debugging Tests, Analyzing Results, Batch Tests, Rapid Test Script Wizard.

OUTCOME:

- Understand the basic testing procedures.
- Able to support in generating test cases and test suites.
- Able to test the applications manually by applying different testing methods and automation tools.
- Apply tools to resolve the problems in Real time environment.

TEXT BOOKS:

1. Software testing techniques – Boris Beizer, Dreamtech, second edition.
2. Software Testing- Yogesh Singh, Camebridge

REFERENCE BOOKS:

1. The Craft of software testing - Brian Marick, Pearson Education.
2. Software Testing, 3rd edition, P.C. Jorgensen, Aurbach Publications (Dist.by SPD).
3. Software Testing, N.Chauhan, Oxford University Press.
4. Introduction to Software Testing, P.Ammann&J.Offutt, Cambridge Univ.Press.
5. Effective methods of Software Testing, Perry, John Wiley, 2nd Edition, 1999.
6. Software Testing Concepts and Tools, P.NageswaraRao, dreamtech Press
7. Win Runner in simple steps by Hakeem Shittu, 2007Genixpress.
8. Foundations of Software Testing, D.Graham& Others, Cengage Learning.

III Year – II Semester

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ARTIFICIAL INTELLIGENCE
(Open Elective)

OBJECTIVES:

- To have a basic proficiency in a traditional AI language including an ability to write simple to intermediate programs and an ability to understand code written in that language.
- To have an understanding of the basic issues of knowledge representation and blind and heuristic search, as well as an understanding of other topics such as minimax, resolution, etc. that play an important role in AI programs.
- To have a basic understanding of some of the more advanced topics of AI such as learning, natural language processing, agents and robotics, expert systems, and planning

UNIT-I:

Introduction to artificial intelligence: Introduction ,history, intelligent systems, foundations of AI, applications, tic-tac-tie game playing, development of ai languages, current trends in AI

UNIT-II:

Problem solving: state-space search and control strategies :Introduction, general problem solving, characteristics of problem, exhaustive searches, heuristic search techniques, iterative-deepening a*, constraint satisfaction

Problem reduction and game playing: Introduction, problem reduction, game playing, alpha-beta pruning, two-player perfect information games

UNIT-III:

Logic concepts: Introduction, propositional calculus, propositional logic, natural deduction system, axiomatic system, semantic tableau system in propositional logic, resolution refutation in propositional logic, predicate logic

UNIT-IV:

Knowledge representation: Introduction, approaches to knowledge representation, knowledge representation using semantic network, extended semantic networks for KR, knowledge representation using frames **advanced knowledge representation techniques:** Introduction, conceptual dependency theory, script structure, cyc theory, case grammars, semantic web

UNIT-V:

Expert system and applications: Introduction phases in building expert systems, expert system versus traditional systems, rule-based expert systems blackboard systems truth maintenance systems, application of expert systems, list of shells and tools

UNIT-VI:

Uncertainty measure: probability theory: Introduction, probability theory, Bayesian belief networks, certainty factor theory, dempster-shafer theory

Fuzzy sets and fuzzy logic: Introduction, fuzzy sets, fuzzy set operations, types of membership functions, multi valued logic, fuzzy logic, linguistic variables and hedges, fuzzy propositions, inference rules for fuzzy propositions, fuzzy systems.

OUTCOMES:

- Identify problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem.
- Formalize a given problem in the language/framework of different AI methods (e.g., as a search problem, as a constraint satisfaction problem, as a planning problem, as a Markov decision process, etc).
- Implement basic AI algorithms (e.g., standard search algorithms or dynamic programming).
- Design and carry out an empirical evaluation of different algorithms on problem formalization, and state the conclusions that the evaluation supports.

TEXT BOOKS:

1. Artificial Intelligence- Saroj Kaushik, CENGAGE Learning,
2. Artificial intelligence, A modern Approach , 2nded, Stuart Russel, Peter Norvig, PEA
3. Artificial Intelligence- Rich, Kevin Knight, Shiv Shankar B Nair, 3rded, TMH
4. Introduction to Artificial Intelligence, Patterson, PHI

REFERNCE BOOKS:

1. Atificial intelligence, structures and Strategies for Complex problem solving, -George F Lugar, 5thed, PEA
2. Introduction to Artificial Intelligence, Ertel, Wolf Gang, Springer
3. Artificial Intelligence, A new Synthesis, Nils J Nilsson, Elsevier

INTERNET OF THINGS

(Open Elective)

OBJECTIVES:

- Identify problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem.
- Formalize a given problem in the language/framework of different AI methods (e.g., as a search problem, as a constraint satisfaction problem, as a planning problem, as a Markov decision process, etc).
- Implement basic AI algorithms (e.g., standard search algorithms or dynamic programming).
- Design and carry out an empirical evaluation of different algorithms on problem formalization, and state the conclusions that the evaluation supports.

UNIT - I:

The Internet of Things: An Overview of Internet of things, Internet of Things Technology, behind IoTs Sources of the IoTs, M2M Communication, Examples OF IoTs, Design Principles For Connected Devices

UNIT – II:

Business Models for Business Processes in the Internet of Things ,IoT/M2M systems LAYERS AND designs standardizations ,Modified OSI Stack for the IoT/M2M Systems ,ETSI M2M domains and High-level capabilities ,Communication Technologies, Data Enrichment and Consolidation and Device Management Gateway Ease of designing and affordability

UNIT – III:

Design Principles for the Web Connectivity for connected-Devices, Web Communication protocols for Connected Devices, Message Communication protocols for Connected Devices, Web Connectivity for connected-Devices.

UNIT– IV:

Internet Connectivity Principles, Internet connectivity, Application Layer Protocols: HTTP, HTTPS, FTP, Telnet.

UNIT– V:

Data Acquiring, Organizing and Analytics in IoT/M2M, Applications/Services/Business Processes, IOT/M2M Data Acquiring and Storage, Business Models for Business Processes in

the Internet Of Things, Organizing Data, Transactions, Business Processes, Integration and Enterprise Systems.

UNIT – VI

Data Collection, Storage and Computing Using a Cloud Platform for IoT/M2M Applications/Services, Data Collection, Storage and Computing Using cloud platform Everything as a service and Cloud Service Models, IOT cloud-based services using the Xively (Pachube/COSM), Nimbits and other platforms Sensor, Participatory Sensing, Actuator, Radio Frequency Identification, and Wireless, Sensor Network Technology, Sensors Technology ,Sensing the World.

OUTCOMES:

- Demonstrate knowledge and understanding of the security and ethical issues of the Internet of Things
- Conceptually identify vulnerabilities, including recent attacks, involving the Internet of Things
- Develop critical thinking skills
- Compare and contrast the threat environment based on industry and/or device type

TEXTBOOKS:

- Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill Higher Education
- Internet of Things, A.Bahgya and V.Madisetti, Univesity Press, 2015

REFERNCE BOOKS:

1. Designingthe Internet of Things, Adrian McEwen and Hakim Cassimally, Wiley
2. Getting Started with the Internet of Things CunoPfister , Oreilly

CYBER SECURITY

(Open Elective)

OBJECTIVES:

- The Cyber security Course will provide the students with foundational Cyber Security principles, Security architecture, risk management, attacks, incidents, and emerging IT and IS technologies.
- Students will gain insight into the importance of Cyber Security and the integral role of Cyber Security professionals.

UNIT- I: Introduction to Cybercrime:

Introduction, Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security ,Who are Cybercriminals? , Classifications of Cybercrimes, Cybercrime: The Legal Perspectives, Cybercrimes: An Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes, Cybercrime Era: Survival Mantra for the Netizens

UNIT -II: Cyber offenses:

How Criminals Plan Them –Introduction, How Criminals Plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector Cloud Computing.

UNIT -III: Cybercrime Mobile and Wireless Devices:

Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication Service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

UNIT -IV: Tools and Methods Used in Cybercrime:

Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks, Phishing and Identity Theft:Introduction,Phishing,IdentityTheft(IDTheft)

UNIT -V: Cybercrimes and Cyber security:

Why Do We Need Cyber laws: The Indian Context, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario in India, Consequences of Not Addressing the Weakness in Information Technology Act, Digital Signatures and the Indian IT Act, Information Security Planning and Governance, Information Security Policy Standards, Practices, The information Security Blueprint, Security education, Training and awareness program, Continuing Strategies.

UNIT -VI: Understanding Computer Forensics:

Introduction, Historical Background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber forensics and Digital Evidence, Forensics Analysis of E-Mail, Digital Forensics Life Cycle, Chain of Custody Concept, Network Forensics, Approaching a Computer Forensics Investigation, Computer Forensics and Steganography, Relevance of the OSI 7 Layer Model to Computer Forensics, Forensics and Social Networking Sites: The Security/Privacy Threats, Computer Forensics from Compliance Perspective, Challenges in Computer Forensics, Special Tools and Techniques, Forensics Auditing, Antiforensics

OUTCOMES:

- Cyber Security architecture principles
- Identifying System and application security threats and vulnerabilities
- Identifying different classes of attacks
- Cyber Security incidents to apply appropriate response
- Describing risk management processes and practices
- Evaluation of decision making outcomes of Cyber Security scenarios

TEXT BOOKS:

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole, SunitBelapure, Wiley.
2. Principles of Information Security, MichealE.Whitman and Herbert J.Mattord, Cengage Learning.

REFERENCES:

1. Information Security, Mark Rhodes, Ousley, MGH.

DIGITAL SIGNAL PROCESSING

(Open Elective)

OBJECTIVES:

- To study DFT and its computation
- To study the design techniques for digital filters
- To study the finite word length effects in signal processing
- To study the non-parametric methods of power spectrum estimations
- To study the fundamentals of digital signal processors.

UNIT -I

Discrete Fourier Transform

DFT and its properties, Relation between DTFT and DFT, FFT computations using Decimation in time and Decimation in frequency algorithms, Overlap-add and save methods

UNIT -II

Infinite Impulse Response Digital Filters

Review of design of analogue Butterworth and Chebyshev Filters, Frequency transformation in analogue domain - Design of IIR digital filters using impulse invariance technique - Design of digital filters using bilinear transform - pre warping - Realization using direct, cascade and parallel forms.

UNIT- III

Finite Impulse Response Digital Filters

Symmetric and Ant symmetric FIR filters - Linear phase FIR filters - Design using Hamming, Henning and Blackman Windows - Frequency sampling method - Realization of FIR filters - Transversal, Linear phase and Polyphase structures.

UNIT -IV

Finite Word Length Effects

Fixed point and floating point number representations - Comparison - Truncation and Rounding errors - Quantization noise - derivation for quantization noise power - coefficient quantization error - Product quantization error –

UNIT -V

Overflow error - Round off noise power - limit cycle oscillations due to product round off and overflow errors - signal scaling

UNIT -VI

Multirate Signal Processing

Introduction to Multirate signal processing-Decimation-Interpolation-Polyphase implementation of FIR filters for interpolator and decimator -Multistage implementation of sampling rate conversion- Design of narrow band filters - Applications of Multirate signal processing.

OUTCOMES:

- an ability to apply knowledge of Mathematics, science, and engineering
- an ability to design and conduct experiments and interpret data
- an ability to design a system, component or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- an ability to function as part of a multi-disciplinary team

TEXT BOOKS:

1. John G Proakis and Manolakis, "Digital Signal Processing Principles, Algorithms and Applications", Pearson, Fourth Edition, 2007.
2. S.Salivahanan, A. Vallavaraj, C. Gnanapriya, Digital Signal Processing, TMH/McGraw HillInternational, 2007

REFERENCE BOOKS:

1. E.C. Ifeachor and B.W. Jervis, " Digital signal processing - A practical approach", Second edition, Pearson, 2002.
2. S.K. Mitra, Digital Signal Processing, A Computer Based approach, Tata Mc GrawHill, 1998.
3. P.P.Vaidyanathan, Multirate Systems & Filter Banks, Prentice Hall, Englewood cliffs, NJ, 1993.
4. Johny R. Johnson, Introduction to Digital Signal Processing, PHI, 2006.

EMBEDDED SYSTEMS

(Open Elective)

OBJECTIVES:

- Technology capabilities and limitations of the hardware, software components
- Methods to evaluate design tradeoffs between different technology choices.
- Design Methodologies

UNIT-I:

Introduction to Embedded systems: What is an embedded system Vs. General computing system, history, classification, major application areas, and purpose of embedded systems. Core of embedded system, memory, sensors and actuators, communication interface, embedded firmware, other system components, PCB and passive components.

UNIT-II:

8-bit microcontrollers architecture: Characteristics, quality attributes application specific, domain specific, embedded systems. Factors to be considered in selecting a controller, 8051 architecture, memory organization, registers, oscillator unit, ports, source current, sinking current, design examples.

UNIT-III:

RTOS and Scheduling, Operating basics, types, RTOS, tasks, process and threads, multiprocessing and multitasking, types of multitasking, non preemptive, preemptive scheduling.

UNIT-IV:

Task communication of RTOS, Shared memory, pipes, memory mapped objects, message passing, message queue, mailbox, signaling, RPC and sockets, task communication/synchronization issues, racing, deadlock, live lock, the dining philosopher's problem.

UNIT-V:

The producer-consumer problem, Reader writers problem, Priority Inversion, Priority ceiling, Task Synchronization techniques, busy waiting, sleep and wakery, semaphore, mutex, critical section objects, events, device, device drivers, how to clause an RTOS, Integration and testing of embedded hardware and fire ware.

UNIT-VI:

Simulators, emulators, Debuggers, Embedded Product Development life cycle (EDLC), Trends in embedded Industry, Introduction to ARM family of processor.

OUTCOMES:

Understand the basics of an embedded system

- Program an embedded system
- Design, implement and test an embedded system.

Identify the unique characteristics of real-time systems

- Explain the general structure of a real-time system
- Define the unique design problems and challenges of real-time systems

TEXT BOOK:

1. Introduction to embedded systems Shibu. K.V, TMH, 2009.

REFERENCE BOOKS:

1. Ayala &Gadre: The 8051 Microcontroller & Embedded Systems using Assembly and C, CENGAGE
2. Embedded Systems, Rajkamal, TMH, 2009.
3. Embedded Software Primer, David Simon, Pearson.
4. The 8051 Microcontroller and Embedded Systems, Mazidi, Mazidi, Pearson,.

ROBOTICS

(Open Elective)

OBJECTIVES:

- To introduce the basic concepts, parts of robots and types of robots.
- To make the student familiar with the various drive systems for robot, sensors and their applications in robots and programming of robots.
- To discuss about the various applications of robots, justification and implementation of robot.

UNIT- I:

Introduction

Specifications of Robots- Classifications of robots – Work envelope - Flexible automation versus Robotic technology – Applications of Robots
ROBOT KINEMATICS AND DYNAMICS
Positions,

UNIT-II:

Orientations and frames, Mappings

Changing descriptions from frame to frame, Operators: Translations, Rotations and Transformations - Transformation Arithmetic - D-H Representation - Forward and inverse Kinematics Of Six Degree of Freedom Robot Arm – Robot Arm dynamics

UNIT- III:

Robot Drives and Power Transmission Systems

Robot drive mechanisms, hydraulic – electric – servomotor- stepper motor - pneumatic drives, Mechanical transmission method - Gear transmission, Belt drives, cables, Roller chains, Link - Rod systems - Rotary-to-Rotary motion conversion, Rotary-to-Linear motion conversion, Rack and Pinion drives, Lead screws, Ball Bearing screws,

UNIT -IV:

Manipulators

Construction of Manipulators, Manipulator Dynamic and Force Control, Electronic and Pneumatic manipulators

UNIT- V:

Robot End Effectors

Classification of End effectors – Tools as end effectors. Drive system for grippers-Mechanical adhesive-vacuum-magnetic-grippers. Hooks&scoops. Gripper force analysis and gripper design. Active and passive grippers.

UNIT -VI:

Path planning & Programming

Trajectory planning and avoidance of obstacles, path planning, skew motion, joint integrated motion – straight line motion-Robot languages-computer control and Robot software.

OUTCOMES:

- The Student must be able to design automatic manufacturing cells with robotic control using
- The principle behind robotic drive system, end effectors, sensor, machine vision robot Kinematics and programming.

TEXT BOOKS:

1. Deb S. R. and Deb S., “Robotics Technology and Flexible Automation”, Tata McGraw Hill Education Pvt. Ltd, 2010.
2. John J. Craig, “Introduction to Robotics”, Pearson, 2009.
3. Mikell P. Groover et. al., "Industrial Robots - Technology, Programming and Applications", McGraw Hill, New York, 2008.

REFERENCE BOOKS:

1. Richard D Klafter, Thomas A Chmielewski, Michael Negin, "Robotics Engineering – An Integrated Approach", Eastern Economy Edition, Prentice Hall of India Pvt. Ltd., 2006.
2. Fu K S, Gonzalez R C, Lee C.S.G, "Robotics: Control, Sensing, Vision and Intelligence", McGraw Hill, 1987

III Year – II Semester

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NETWORK PROGRAMMING LAB

OBJECTIVES:

- To write, execute and debug c programs which use Socket API.
- To understand the use of client/server architecture in application development
- To understand how to use TCP and UDP based sockets and their differences.
- To get acquainted with unix system internals like Socket files, IPC structures.
- To Design reliable servers using both TCP and UDP sockets

Prerequisites:

Knowledge of C Programming, Basic commands of UNIX.

List of Programs

1. Understanding and using of commands like ifconfig, netstat, ping, arp, telnet, ftp, finger, traceroute, whoisetc. Usage of elementary socket system calls (socket (), bind(), listen(), accept(),connect(),send(),recv(),sendto(),recvfrom()).
2. Implementation of Connection oriented concurrent service (TCP).
3. Implementation of Connectionless Iterative time service (UDP).
4. Implementation of Select system call.
5. Implementation of gesockopt (), setsockopt () system calls.
6. Implementation of getpeername () system call.
7. Implementation of remote command execution using socket system calls.
8. Implementation of Distance Vector Routing Algorithm.
9. Implementation of SMTP.

10. Implementation of FTP.

11. Implementation of HTTP.

12. Implementation of RSA algorithm.

Note: Implement programs 2 to 7 in C and 8 to 12 in JAVA.

OUTCOMES:

- Understand and explain the basic concepts of Grid Computing;
- Explain the advantages of using Grid Computing within a given environment;
- Prepare for any upcoming Grid deployments and be able to get started with a potentially available Grid setup.
- Discuss some of the enabling technologies e.g. high-speed links and storage area networks.
- Build computer grids.

SUGGESTED READING:

SOFTWARE TESTING LAB

OBJECTIVES:

- Demonstrate the UML diagrams with ATM system descriptions.
- Demonstrate the working of software testing tools with c language.
- Study of testing tools- win runner, selenium etc.
- Writing test cases for various applications

- 1 Write programs in ‘C’ Language to demonstrate the working of the following constructs:
 - i) do...while
 - ii) while....do
 - iii) if...else
 - iv) switch
 - v) for
- 2 “A program written in ‘C’ language for Matrix Multiplication fails” Introspect the causes for its failure and write down the possible reasons for its failure.
- 3 Take any system (e.g. ATM system) and study its system specifications and report the various bugs.
- 4 Write the test cases for any known application (e.g. Banking application)
- 5 Create a test plan document for any application (e.g. Library Management System)
- 6 Study of Win Runner Testing Tool and its implementation
 - a) Win runner Testing Process and Win runner User Interface.
 - b) How Win Runner identifies GUI(Graphical User Interface) objects in an application and describes the two modes for organizing GUI map files.
 - c) How to record a test script and explains the basics of Test Script Language (TSL).
 - d) How to synchronize a test when the application responds slowly.
 - e) How to create a test that checks GUI objects and compare the behaviour of GUI objects in different versions of the sample application.
 - f) How to create and run a test that checks bitmaps in your application and run the test on different versions of the sample application and examine any differences, pixel by pixel.

- g) How to Create Data-Driven Tests which supports to run a single test on several sets of data from a data table.
 - h) How to read and check text found in GUI objects and bitmaps.
 - i) How to create a batch test that automatically runs the tests.
 - j) How to update the GUI object descriptions which in turn supports test scripts as the application changes.
- 7 Apply Win Runner testing tool implementation in any real time applications.

OUTCOMES:

- Find practical solutions to the problems
 - Solve specific problems alone or in teams
 - Manage a project from beginning to end
 - Work independently as well as in teams
- Define, formulate and analyze a problem

III Year – II Semester

L	T	P	C
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DATA WARE HOUSING AND DATA MINING LAB

OBJECTIVES:

- Practical exposure on implementation of well known data mining tasks.
- Exposure to real life data sets for analysis and prediction.
- Learning performance evaluation of data mining algorithms in a supervised and an unsupervised setting.
- Handling a small data mining project for a given practical domain.

System/Software Requirements:

- **Intel based desktop PC**
- **WEKA TOOL**

1. Demonstration of preprocessing on dataset student.arff
2. Demonstration of preprocessing on dataset labor.arff
3. Demonstration of Association rule process on dataset contactlenses.arff using apriori algorithm
4. Demonstration of Association rule process on dataset test.arff using apriori algorithm
5. Demonstration of classification rule process on dataset student.arff using j48 algorithm
6. Demonstration of classification rule process on dataset employee.arff using j48 algorithm
7. Demonstration of classification rule process on dataset employee.arff using id3 algorithm
8. Demonstration of classification rule process on dataset employee.arff using naïve bayes algorithm
9. Demonstration of clustering rule process on dataset iris.arff using simple k-means
10. Demonstration of clustering rule process on dataset student.arff using simple k- means.

OUTCOMES:

- The data mining process and important issues around data cleaning, pre-processing and integration.
- The principle algorithms and techniques used in data mining, such as clustering, association mining, classification and prediction..

III Year - II Semester

L	T	P	C
0	2	0	0

INTELLECTUAL PROPERTY RIGHTS AND PATENTS

Objectives:

***To know the importance of Intellectual property rights, which plays a vital role in advanced Technical and Scientific disciplines.**

***Imparting IPR protections and regulations for further advancement, so that the students can familiarize with the latest developments.**

Unit I: Introduction to Intellectual Property Rights (IPR)

Concept of Property - Introduction to IPR – International Instruments and IPR - WIPO - TRIPS – WTO -Laws Relating to IPR - IPR Tool Kit - Protection and Regulation - Copyrights and Neighboring Rights – Industrial Property – Patents - Agencies for IPR Registration – Traditional Knowledge –Emerging Areas of IPR - Layout Designs and Integrated Circuits – Use and Misuse of Intellectual Property Rights.

Unit II: Copyrights and Neighboring Rights

Introduction to Copyrights – Principles of Copyright Protection – Law Relating to Copyrights - Subject Matters of Copyright – Copyright Ownership – Transfer and Duration – Right to Prepare Derivative Works –Rights of Distribution – Rights of Performers – Copyright Registration – Limitations – Infringement of Copyright – Relief and Remedy – Case Law - Semiconductor Chip Protection Act.

UNIT III: Patents

Introduction to Patents - Laws Relating to Patents in India – Patent Requirements – Product Patent and Process Patent - Patent Search - Patent Registration and Granting of Patent - Exclusive Rights – Limitations - Ownership and Transfer — Revocation of Patent – Patent Appellate Board - Infringement of Patent – Compulsory Licensing — Patent Cooperation Treaty – New developments in Patents – Software Protection and Computer related Innovations.

UNIT IV: Trademarks

Introduction to Trademarks – Laws Relating to Trademarks – Functions of Trademark – Distinction between Trademark and Property Mark – Marks Covered under Trademark Law - Trade Mark Registration – Trade Mark Maintenance – Transfer of rights - Deceptive Similarities - Likelihood of Confusion - Dilution of Ownership – Trademarks Claims and Infringement – Remedies – Passing Off Action.

UNIT V: Trade Secrets

Introduction to Trade Secrets – General Principles - Laws Relating to Trade Secrets - Maintaining Trade Secret – Physical Security – Employee Access Limitation – Employee Confidentiality Agreements – Breach of Contract –Law of Unfair Competition – Trade Secret Litigation – Applying State Law.

UNIT VI: Cyber Law and Cyber Crime

Introduction to Cyber Law – Information Technology Act 2000 - Protection of Online and Computer Transactions - E-commerce - Data Security – Authentication and Confidentiality - Privacy - Digital Signatures – Certifying Authorities - Cyber Crimes - Prevention and Punishment – Liability of Network Providers.

- Relevant Cases Shall be dealt where ever necessary.

Outcome:

- * **IPR Laws and patents pave the way for innovative ideas which are instrumental for inventions to seek Patents.**
- ***Student get an insight on Copyrights, Patents and Software patents which are instrumental for further advancements.**

References:

1. Intellectual Property Rights (Patents & Cyber Law), Dr. A. Srinivas. Oxford University Press, New Delhi.
2. Deborah E.Bouchoux: Intellectual Property, Cengage Learning, New Delhi.
3. PrabhuddhaGanguli: Intellectual Property Rights, Tata Mc-Graw –Hill, New Delhi
4. Richard Stim: Intellectual Property, Cengage Learning, New Delhi.
5. Kompal Bansal &Parishit Bansal Fundamentals of IPR for Engineers, B. S. Publications (Press).
6. Cyber Law - Texts & Cases, South-Western's Special Topics Collections.
7. R.Radha Krishnan, S.Balasubramanian: Intellectual Property Rights, Excel Books. New Delhi.
8. M.Ashok Kumar and MohdIqbal Ali: Intellectual Property Rights, Serials Pub.

IV Year – I Semester

L	T	P	C
4	0	0	3

CRYPTOGRAPHY AND NETWORK SECURITY

OBJECTIVES:

- In this course the following principles and practice of cryptography and network security are covered:
- Classical systems, symmetric block ciphers (DES, AES, other contemporary symmetric ciphers)
- Public-key cryptography (RSA, discrete logarithms),
- Algorithms for factoring and discrete logarithms, cryptographic protocols, hash functions, authentication, key management, key exchange, signature schemes,
- Email and web security, viruses, firewalls, digital right management, and other topics.

UNIT- I:

Basic Principles

Security Goals, Cryptographic Attacks, Services and Mechanisms, Mathematics of Cryptography

UNIT- II:

Symmetric Encryption

Mathematics of Symmetric Key Cryptography, Introduction to Modern Symmetric Key Ciphers, Data Encryption Standard, Advanced Encryption Standard.

UNIT- III:

Asymmetric Encryption

Mathematics of Asymmetric Key Cryptography, Asymmetric Key Cryptography

UNIT- IV:

Data Integrity, Digital Signature Schemes & Key Management

Message Integrity and Message Authentication, Cryptographic Hash Functions, Digital Signature, Key Management.

UNIT -V:

Network Security-I

Security at application layer: PGP and S/MIME, Security at the Transport Layer: SSL and TLS

UNIT -VI:

Network Security-II

Security at the Network Layer: IPSec, System Security

OUTCOMES:

- To be familiar with information security awareness and a clear understanding of its importance.
- To master fundamentals of secret and public cryptography
- To master protocols for security services
- To be familiar with network security threats and countermeasures
- To be familiar with network security designs using available secure solutions (such as PGP,
- SSL, IPSec, etc)

TEXT BOOKS:

- 1) Cryptography and Network Security, Behrouz A Forouzan, Debdeep Mukhopadhyay, (3e) Mc Graw Hill.
- 2) Cryptography and Network Security, William Stallings, (6e) Pearson.
- 3) Everyday Cryptography, Keith M. Martin, Oxford.

REFERENCE BOOKS:

- 1) Network Security and Cryptography, Bernard Meneges, Cengage Learning.

IV Year – I Semester

L	T	P	C
4	0	0	3

SOFTWARE ARCHITECTURE AND DESIGN PATTERNS

OBJECTIVES:

The course should enable the student:

- To understand interrelationships, principles and guidelines governing architecture and evolution over time.
- To understand various architectural styles of software systems.
- To understand design patterns and their underlying object oriented concepts.
- To understand implementation of design patterns and providing solutions to real world software design problems.
- To understand patterns with each other and understanding the consequences of combining patterns on the overall quality of a system.

UNIT-I:

Envisioning Architecture

The Architecture Business Cycle, What is Software Architecture, Architectural patterns, reference models, reference architectures, architectural structures and views.

Creating and Architecture Quality Attributes, Achieving qualities, Architectural styles and patterns, designing the Architecture, Documenting software architectures, Reconstructing Software Architecture.

UNIT-II:

Analyzing Architectures

Architecture Evaluation, Architecture design decision making, ATAM, CBAM

Moving from One System to Many

Software Product Lines, Building systems from off the shelf components, Software architecture in future.

UNIT-III:

Patterns

Pattern Description, Organizing catalogs, role in solving design problems, Selection and usage.

Creational Patterns

Abstract factory, Builder, Factory method, Prototype, Singleton

UNIT-IV:

Structural Patterns

Adapter, Bridge, Composite, Decorator, Façade, Flyweight, PROXY.

UNIT-V:

Behavioral Patterns

Chain of responsibility, command, Interpreter, iterator, mediator, memento, observer, state, strategy, template method, visitor.

UNIT-VI:

Case Studies

A-7E – A case study in utilizing architectural structures, The World Wide Web - a case study in Interoperability, Air Traffic Control – a case study in designing for high availability, Celsius Tech – a case study in product line development.

A Case Study (Designing a Document Editor): Design Problems, Document Structure, Formatting, Embellishing the User Interface, Supporting Multiple Look-and-Feel Standards, Supporting Multiple Window Systems, User Operations, Spelling Checking and Hyphenation.

TEXT BOOKS:

1. Software Architecture in Practice, second edition, Len Bass, Paul Clements & Rick Kazman, Pearson Education, 2003.
2. Design Patterns, Erich Gamma, Pearson Education, 1995.

REFERENCE BOOKS:

1. Beyond Software architecture, Luke Hohmann, Addison wesley, 2003.
2. Software architecture, David M. Dikel, David Kane and James R. Wilson, Prentice Hall PTR, 2001
3. Software Design, David Budgen, second edition, Pearson education, 2003
4. Head First Design patterns, Eric Freeman & Elisabeth Freeman, O'REILLY, 2007.
5. Design Patterns in Java, Steven John Metsker & William C. Wake, Pearson education, 2006
6. J2EE Patterns, Deepak Alur, John Crupi & Dan Malks, Pearson education, 2003.
7. Design Patterns in C#, Steven John metsker, Pearson education, 2004.
8. Pattern Oriented Software Architecture, F.Buschmann & others, John Wiley & Sons.

IV Year – I Semester

L	T	P	C
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WEB TECHNOLOGIES

OBJECTIVES:

- This course is designed to introduce students with no programming experience to the programming languages and techniques associated with the World Wide Web. The course will introduce web-based media-rich programming tools for creating interactive web pages.

UNIT-I: HTML, CSS

Basic Syntax, Standard HTML Document Structure, Basic Text Markup, Images, Hypertext Links, Lists, Tables, Forms, HTML5

CSS: Levels of Style Sheets, Style Specification Formats, Selector Forms, The Box Model, Conflict Resolution

UNIT-II:

Java script

The Basic of Java script: Objects, Primitives Operations and Expressions, Screen Output and Keyboard Input, Control Statements, Object Creation and Modification, Arrays, Functions, Constructors, Pattern Matching using Regular Expressions

DHTML: Positioning Moving and Changing Elements

UNIT-III:

XML: Document type Definition, XML schemas, Document object model, XSLT, DOM and SAX Approaches,

AJAX A New Approach: Introduction to AJAX, Integrating PHP and AJAX.

UNIT-IV:

PHP Programming: Introducing PHP: Creating PHP script, Running PHP script.

Working with variables and constants: Using variables, Using constants, Data types, Operators. **Controlling program flow:** Conditional statements, Control statements, Arrays, functions. Working with forms and Databases such as MySQL.

UNIT-V:

Introduction to PERL, Operators and if statements, Program design and control structures, Arrays, Hashes and File handling, Regular expressions, Subroutines, Retrieving documents from the web with Perl.

UNIT-VI:

Introduction to Ruby, Variables, types, simple I/O, Control, Arrays, Hashes, Methods, Classes, Iterators, Pattern Matching. Overview of Rails.

OUTCOMES:

- Analyze a web page and identify its elements and attributes.
- Create web pages using XHTML and Cascading Styles sheets.
- Build dynamic web pages.
- Build web applications using PHP.
- Programming through PERL and Ruby
- Write simple client-side scripts using AJAX

TEXT BOOKS:

1. Programming the World Wide Web, Robert W Sebesta, 7ed, Pearson.
2. Web Technologies, Uttam K Roy, Oxford
3. The Web Warrior Guide to Web Programming, Bai, Ekedahl, Farrelll, Gosselin, Zak, Karparhi, MacIntyre, Morrissey, Cengage

REFERENCE BOOKS:

1. Ruby on Rails Up and Running, Lightning fast Web development, Bruce Tate, Curt Hibbs, Oreilly (2006)
2. Programming Perl, 4ed, Tom Christiansen, Jonathan Orwant, Oreilly (2012)
3. Web Technologies, HTML< JavaScript, PHP, Java, JSP, XML and AJAX, Black book, Dream Tech.
4. An Introduction to Web Design, Programming, Paul S Wang, Sanda S Katila, Cengage Learning
5. <http://www.upriss.org.uk/perl/PerlCourse.html>

IV Year – I Semester

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MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS
(Common to all Branches)

• **Course Objectives:**

- The Learning objectives of this paper is to understand the concept and nature of Managerial Economics and its relationship with other disciplines and also to understand the Concept of Demand and Demand forecasting, Production function, Input Output relationship, Cost-Output relationship and Cost-Volume-Profit Analysis.
- To understand the nature of markets, Methods of Pricing in the different market structures and to know the different forms of Business organization and the concept of Business Cycles.
- To learn different Accounting Systems, preparation of Financial Statement and uses of different tools for performance evaluation. Finally, it is also to understand the concept of Capital, Capital Budgeting and the techniques used to evaluate Capital Budgeting proposals.

UNIT-I

Introduction to Managerial Economics and demand Analysis:

Definition of Managerial Economics –Scope of Managerial Economics and its relationship with other subjects –Concept of Demand, Types of Demand, Determinants of Demand- Demand schedule, Demand curve, Law of Demand and its limitations- Elasticity of Demand, Types of Elasticity of Demand and Measurement- Demand forecasting and Methods of forecasting, Concept of Supply and Law of Supply.

UNIT – II:

Production and Cost Analyses:

Concept of Production function- Cobb-Douglas Production function- Leontief production function - Law of Variable proportions-Isoquants and Isocosts and choice of least cost factor combination-Concepts of Returns to scale and Economies of scale-Different cost concepts: opportunity costs, explicit and implicit costs- Fixed costs, Variable Costs and Total costs –Cost – Volume-Profit analysis-Determination of Breakeven point(simple problems)-Managerial significance and limitations of Breakeven point.

UNIT – III:

Introduction to Markets, Theories of the Firm & Pricing Policies:

Market Structures: Perfect Competition, Monopoly, Monopolistic competition and Oligopoly – Features – Price and Output Determination – Managerial Theories of firm: Marris and Williamson’s models – other Methods of Pricing: Average cost pricing, Limit Pricing, Market Skimming Pricing, Internet Pricing: (Flat Rate Pricing, Usage sensitive pricing) and Priority Pricing.

UNIT – IV:

Types of Business Organization and Business Cycles:

Features and Evaluation of Sole Trader, Partnership, Joint Stock Company – State/Public Enterprises and their forms – Business Cycles : Meaning and Features – Phases of a Business Cycle.

Unit – V:

Introduction to Accounting & Financing Analysis:

Introduction to Double Entry Systems – Preparation of Financial Statements-Analysis and Interpretation of Financial Statements-Ratio Analysis – Preparation of Funds flow and cash flow statements (Simple Problems)

UNIT – VI:

Capital and Capital Budgeting: Capital Budgeting: Meaning of Capital-Capitalization-Meaning of Capital Budgeting-Time value of money- Methods of appraising Project profitability: Traditional Methods(pay back period, accounting rate of return) and modern methods(Discounted cash flow method, Net Present Value method, Internal Rate of Return Method and Profitability Index)

Course Outcome:

- *The Learner is equipped with the knowledge of estimating the Demand and demand elasticities for a product and the knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs.
- * One is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units.
- *The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis and to evaluate various investment project proposals with the help of capital budgeting techniques for decision making.

TEXT BOOKS

1. Dr. N. AppaRao, Dr. P. Vijay Kumar: ‘Managerial Economics and Financial Analysis’, Cengage Publications, New Delhi – 2011
2. Dr. A. R. Aryasri – Managerial Economics and Financial Analysis, TMH 2011
3. Prof. J.V.Prabhakararao, Prof. P. Venkatarao. ‘Managerial Economics and Financial Analysis’, Ravindra Publication.

REFERENCES:

1. Dr. B. Kuberudu and Dr. T. V. Ramana: Managerial Economics & Financial Analysis, Himalaya Publishing House, 2014.
2. V. Maheswari: Managerial Economics, Sultan Chand.2014
3. Suma Damodaran: Managerial Economics, Oxford 2011.
4. VanithaAgarwal: Managerial Economics, Pearson Publications 2011.
5. Sanjay Dhameja: Financial Accounting for Managers, Pearson.
6. Maheswari: Financial Accounting, Vikas Publications.
7. S. A. Siddiqui & A. S. Siddiqui: Managerial Economics and Financial Analysis, New Age International Publishers, 2012
8. Ramesh Singh, Indian Economy, 7th Edn., TMH2015
9. Pankaj Tandon A Text Book of Microeconomic Theory, Sage Publishers, 2015
10. Shailaja Gajjala and Usha Munipalle, Univerities press, 2015

IV Year – I Semester

L	T	P	C
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BIG DATA ANALYTICS

(Elective - 1)

OBJECTIVES:

- Optimize business decisions and create competitive advantage with Big Data analytics
- Introducing Java concepts required for developing map reduce programs
- Derive business benefit from unstructured data
- Imparting the architectural concepts of Hadoop and introducing map reduce paradigm
- To introduce programming tools PIG & HIVE in Hadoop ecosystem.

UNIT-I

Data structures in Java: Linked List, Stacks, Queues, Sets, Maps; Generics: Generic classes and Type parameters, Implementing Generic Types, Generic Methods, Wrapper Classes, Concept of Serialization

UNIT-II

Working with Big Data: Google File System, Hadoop Distributed File System (HDFS) – Building blocks of Hadoop (Namenode, Datanode, Secondary Namenode, JobTracker, TaskTracker), Introducing and Configuring Hadoop cluster (Local, Pseudo-distributed mode, Fully Distributed mode), Configuring XML files.

UNIT-III

Writing MapReduce Programs: A Weather Dataset, Understanding Hadoop API for MapReduce Framework (Old and New), Basic programs of Hadoop MapReduce: Driver code, Mapper code, Reducer code, RecordReader, Combiner, Partitioner

UNIT-IV

Hadoop I/O: The Writable Interface, WritableComparable and comparators, Writable Classes: Writable wrappers for Java primitives, Text, BytesWritable, NullWritable, ObjectWritable and GenericWritable, Writable collections, Implementing a Custom Writable: Implementing a RawComparator for speed, Custom comparators

UNIT-V

Pig: Hadoop Programming Made Easier

Admiring the Pig Architecture, Going with the Pig Latin Application Flow, Working through the ABCs of Pig Latin, Evaluating Local and Distributed Modes of Running Pig Scripts, Checking out the Pig Script Interfaces, Scripting with Pig Latin

UNIT-VI

Applying Structure to Hadoop Data with Hive:

Saying Hello to Hive, Seeing How the Hive is Put Together, Getting Started with Apache Hive, Examining the Hive Clients, Working with Hive Data Types, Creating and Managing Databases and Tables, Seeing How the Hive Data Manipulation Language Works, Querying and Analyzing Data

OUTCOMES:

- Preparing for data summarization, query, and analysis.
- Applying data modeling techniques to large data sets
- Creating applications for Big Data analytics
- Building a complete business data analytic solution

TEXT BOOKS:

1. Big Java 4th Edition, Cay Horstmann, Wiley John Wiley & Sons, INC
2. Hadoop: The Definitive Guide by Tom White, 3rd Edition, O'reilly
3. Hadoop in Action by Chuck Lam, MANNING Publ.
4. Hadoop for Dummies by Dirk deRoos, Paul C.Zikopoulos, Roman B.Melnyk,Bruce Brown, Rafael Coss

REFERENCE BOOKS:

1. Hadoop in Practice by Alex Holmes, MANNING Publ.
2. Hadoop MapReduce Cookbook, SrinathPerera, ThilinaGunarathne

SOFTWARE LINKS:

1. Hadoop: <http://hadoop.apache.org/>
2. Hive: <https://cwiki.apache.org/confluence/display/Hive/Home>
3. Piglatin: <http://pig.apache.org/docs/r0.7.0/tutorial.html>

INFORMATION RETRIEVAL SYSTEMS

(Elective - 1)

OBJECTIVES

- To provide the foundation knowledge in information retrieval.
- To equip students with sound skills to solve computational search problems.
- To appreciate how to evaluate search engines.
- To appreciate the different applications of information retrieval techniques in the Internet or Web environment.
- To provide hands-on experience in building search engines and/or hands-on experience in evaluating search engines.

UNIT - I:

Introduction to Information Storage and Retrieval System: Introduction, Domain Analysis of IR systems and other types of Information Systems, IR System Evaluation.

Introduction to Data Structures and Algorithms related to Information Retrieval: Basic Concepts, Data structures, Algorithms

UNIT- II:

Inverted files: Introduction, Structures used in Inverted Files, Building Inverted file using a sorted array, Modifications to Basic Techniques.

UNIT -III:

Signature Files: Introduction, Concepts of Signature Files, Compression, Vertical Partitioning, Horizontal Partitioning.

UNIT- IV:

New Indices for Text: PAT Trees and PAT Arrays: Introduction, PAT Tree structure, algorithms on the PAT Trees, Building PAT trees as PATRICA Trees, PAT representation as arrays.

UNIT- V:

Stemming Algorithms: Introduction, Types of Stemming Algorithms, Experimental Evaluations of Stemming to Compress Inverted Files

UNIT- VI:

Thesaurus Construction: Introduction, Features of Thesauri, Thesaurus Construction, Thesaurus construction from Texts, Merging existing Thesauri

OUTCOMES

- Identify basic theories in information retrieval systems
- Identify the analysis tools as they apply to information retrieval systems
- Understands the problems solved in current IR systems
- Describes the advantages of current IR systems
- Understand the difficulty of representing and retrieving documents.
- Understand the latest technologies for linking, describing and searching the web.

TEXT BOOK:

1. Frakes, W.B., Ricardo Baeza-Yates: Information Retrieval Data Structures and Algorithms, Prentice Hall, 1992.
2. Modern Information Retrieval by Yates Pearson Education.
3. Information Storage & Retrieval by Robert Korfhage – John Wiley & Sons.

REFERENCES:

1. Kowalski, Gerald, Mark T Maybury: Information Retrieval Systems: Theory and Implementation, Kluwer Academic Press, 1997.
2. Information retrieval Algorithms and Heuristics, 2ed, Springer

MOBILE COMPUTING

(Elective - 1)

OBJECTIVE:

- To make the student understand the concept of mobile computing paradigm, its novel applications and limitations.
- To understand the typical mobile networking infrastructure through a popular GSM protocol
- To understand the issues and solutions of various layers of mobile networks, namely MAC layer, Network Layer & Transport Layer
- To understand the database issues in mobile environments & data delivery models.
- To understand the ad hoc networks and related concepts.
- To understand the platforms and protocols used in mobile environment.

UNIT- I

Introduction: Mobile Communications, Mobile Computing – Paradigm, Promises/Novel Applications and Impediments and Architecture; Mobile and Handheld Devices, Limitations of Mobile and Handheld Devices.

GSM – Services, System Architecture, Radio Interfaces, Protocols, Localization, Calling, Handover, Security, New Data Services, GPRS.

UNIT –II

(Wireless) Medium Access Control (MAC) : Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals), SDMA, FDMA, TDMA, CDMA, Wireless LAN/(IEEE 802.11)

UNIT –III

Mobile Network Layer: IP and Mobile IP Network Layers, Packet Delivery and Handover Management, Location Management, Registration, Tunneling and Encapsulation, Route Optimization, DHCP.

UNIT –IV

Mobile Transport Layer: Conventional TCP/IP Protocols, Indirect TCP, Snooping TCP, Mobile TCP, Other Transport Layer Protocols for Mobile Networks.

Database Issues: Database Hoarding & Caching Techniques, Client-Server Computing & Adaptation, Transactional Models, Query processing, Data Recovery Process & QoS Issues.

UNIT- V

Data Dissemination and Synchronization : Communications Asymmetry, Classification of Data Delivery Mechanisms, Data Dissemination, Broadcast Models, Selective Tuning and Indexing Methods, Data Synchronization – Introduction, Software, and Protocols.

UNIT- VI

Mobile Ad hoc Networks (MANETs) : Introduction, Applications & Challenges of a MANET, Routing, Classification of Routing Algorithms, Algorithms such as DSR, AODV, DSDV, etc. , Mobile Agents, Service Discovery.

Protocols and Platforms for Mobile Computing :WAP, Bluetooth, XML, J2ME, Java Card, PalmOS, Windows CE, SymbianOS, Linux for Mobile Devices, Android.

OUTCOMES:

- Able to think and develop new mobile application.
- Able to take any new technical issue related to this new paradigm and come up with a solution(s).
- Able to develop new ad hoc network applications and/or algorithms/protocols.
- Able to understand & develop any existing or new protocol related to mobile environment

TEXT BOOKS:

1. Jochen Schiller, “Mobile Communications”, Addison-Wesley, Second Edition, 2009.
2. Raj Kamal, “Mobile Computing”, Oxford University Press, 2007, ISBN: 0195686772

REFERENCE BOOKS:

1. ASOKE K TALUKDER, HASAN AHMED, ROOPA R YAVAGAL, “Mobile Computing, Technology Applications and Service Creation” Second Edition, Mc Graw Hill.
2. UWE Hansmann, LotharMerk, Martin S. Nocklous, Thomas Stober, “Principles of Mobile Computing,” Second Edition, Springer.

IV Year – I Semester

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4	0	0	3

CLOUD COMPUTING

(Elective - 2)

OBJECTIVES:

- The student will learn about the cloud environment, building software systems and components that scale to millions of users in modern internetcloud concepts capabilities across the various cloud service models including Iaas, Paas, Saas, and developing cloud based software applications on top of cloud platforms.

UNIT -I: Systems modeling, Clustering and virtualization

Scalable Computing over the Internet, Technologies for Network based systems, System models for Distributed and Cloud Computing, Software environments for distributed systems and clouds, Performance, Security And Energy Efficiency

UNIT- II:Virtual Machines and Virtualization of Clusters and Data Centers

Implementation Levels of Virtualization, Virtualization Structures/ Tools and mechanisms, Virtualization of CPU, Memory and I/O Devices, Virtual Clusters and Resource Management, Virtualization for Data Center Automation.

UNIT- III: Cloud Platform Architecture

Cloud Computing and service Models, Architectural Design of Compute and Storage Clouds, Public Cloud Platforms, Inter Cloud Resource Management, Cloud Security and Trust Management. Service Oriented Architecture, Message Oriented Middleware.

UNIT -IV: Cloud Programming and Software Environments

Features of Cloud and Grid Platforms, Parallel & Distributed Programming Paradigms, Programming Support of Google App Engine, Programming on Amazon AWS and Microsoft Azure, Emerging Cloud Software Environments.

UNIT- V: Cloud Resource Management and Scheduling

Policies and Mechanisms for Resource Management Applications of Control Theory to Task Scheduling on a Cloud, Stability of a Two Level Resource Allocation Architecture, Feedback Control Based on Dynamic Thresholds. Coordination of Specialized Autonomic Performance Managers, Resource Bundling, Scheduling Algorithms for Computing Clouds, Fair Queuing, Start Time Fair Queuing, Borrowed Virtual Time, Cloud Scheduling Subject to Deadlines, Scheduling MapReduce Applications Subject to Deadlines.

UNIT- VI: Storage Systems

Evolution of storage technology, storage models, file systems and database, distributed file systems, general parallel file systems. Google file system. Apache Hadoop, Big Table, Megastore, Amazon Simple Storage Service (S3)

OUTCOMES:

- Understanding the key dimensions of the challenge of Cloud Computing
- Assessment of the economics , financial, and technological implications for selecting cloud computing for own organization
- Assessing the financial, technological, and organizational capacity of employer's for actively initiating and installing cloud-based applications.
- Assessment of own organizations' needs for capacity building and training in cloud computing-related IT areas

TEXT BOOKS:

1. Distributed and Cloud Computing, Kai Hwang, Geoffrey C. Fox, Jack J. Dongarra MK Elsevier.
2. Cloud Computing, Theory and Practice, Dan C Marinescu, MK Elsevier.
3. Cloud Computing, A Hands on approach, ArshadeepBahga, Vijay Madiseti, University Press

REFERNCE BOOKS:

1. Cloud Computing, A Practical Approach, Anthony T Velte, Toby J Velte, Robert Elsenpeter, TMH
2. Mastering Cloud Computing, Foundations and Application Programming, Raj Kumar Buyya, Christen vecctiola, S Tammaraiselvi, TMH

SOFTWARE PROJECT MANAGEMENT

(Elective - 2)

OBJECTIVES:

- To study how to plan and manage projects at each stage of the software development life cycle (SDLC)
- To train software project managers and other individuals involved in software project planning and tracking and oversight in the implementation of the software project management process.
- To understand successful software projects that support organization's strategic goals

UNIT -I:Introduction

Project, Management, Software Project Management activities, Challenges in software projects, Stakeholders, Objectives & goals

Project Planning: Step-wise planning, Project Scope, Project Products & deliverables, Project activities, Effort estimation, Infrastructure

UNIT -II:Project Approach

Lifecycle models, Choosing Technology, Prototyping

Iterative & incremental Process Framework: Lifecycle phases, Process Artifacts, Process workflows (Book 2)

UNIT -III:Effort estimation & activity Planning

Estimation techniques, Function Point analysis, SLOC, COCOMO, Use case-based estimation , Activity Identification Approaches, Network planning models, Critical path analysis

UNIT -IV: Risk Management

Risk categories, Identification, Assessment, Planning and management, PERT technique, Monte Carlo approach

UNIT -V:Project Monitoring & Control, Resource Allocation

Creating a framework for monitoring & control, Progress monitoring, Cost monitoring, Earned value Analysis, Defects Tracking, Issues Tracking, Status reports, Types of Resources, Identifying resource requirements, Resource scheduling

UNIT -VI:Software Quality

Planning Quality, Defining Quality - ISO 9016, Quality Measures, Quantitative Quality Management Planning, Product Quality & Process Quality

Metrics, Statistical Process Control Capability Maturity Model, Enhancing software Quality (Book3)

OUTCOMES:

- To match organizational needs to the most effective software development model
- To understand the basic concepts and issues of software project management
- To effectively Planning the software projects
- To implement the project plans through managing people, communications and change
- To select and employ mechanisms for tracking the software projects
- To conduct activities necessary to successfully complete and close the Software projects
- To develop the skills for tracking and controlling software deliverables
- To create project plans that address real-world management challenges

TEXT BOOKS:

1. Software Project Management, Bob Hughes & Mike Cotterell, TATA Mcgraw-Hill
2. Software Project Management, Walker Royce: Pearson Education, 2005.
3. Software Project Management in practice, Pankaj Jalote, Pearson.

REFERENCE BOOKS:

1. Software Project Management, Joel Henry, Pearson Education.

SCRIPTING LANGUAGES

(Elective - 2)

OBJECTIVES:

- The course demonstrates an in depth understanding of the tools and the scripting languages necessary for design and development of applications dealing with Bio-information/ Bio-data.
- The instructor is advised to discuss examples in the context of Bio-data/ Bio-information application development.

UNIT - I

Introduction to PERL and Scripting Scripts and Programs, Origin of Scripting , Scripting Today, Characteristics of Scripting Languages, Uses for Scripting Languages, Web Scripting, and the universe of Scripting Languages. PERL- Names and Values, Variables, Scalar Expressions, Control Structures, arrays, list, hashes, strings, pattern and regular expressions, subroutines.

UNIT - II

Advanced perl Finer points of looping, pack and unpack, file system, eval, data structures, packages, modules, objects, interfacing to the operating system, Creating Internet ware applications, Dirty Hands Internet Programming, security Issues.

UNIT- III

PHP Basics PHP Basics- Features, Embedding PHP Code in your Web pages, Outputting the data to the browser, Data types, Variables, Constants, expressions, string interpolation, control structures, Function, Creating a Function, Function Libraries, Arrays, strings and Regular Expressions.

UNIT - IV

Advanced PHP Programming PHP and Web Forms, Files, PHP Authentication and Methodologies -Hard Coded, File Based, Database Based, IP Based, Login Administration, Uploading Files with PHP, Sending Email using PHP, PHP Encryption Functions, the Mcrypt package, Building Web sites for the World.

UNIT -V

TCL Structure, syntax, Variables and Data in TCL, Control Flow, Data Structures, input/output, procedures , strings , patterns, files, Advance TCL- eval, source, exec and uplevel commands, Name spaces, trapping errors, event driven programs, making applications internet aware, Nuts and Bolts Internet Programming, Security Issues, C Interface. Tk-Visual Tool Kits, Fundamental Concepts of Tk, Tk by example, Events and Binding , Perl-Tk.

UNIT- VI

Python Introduction to Python language, python-syntax, statements, functions, Built-in-functions and Methods, Modules in python, Exception Handling. Integrated Web Applications in Python – Building Small, Efficient Python Web Systems, Web Application Framework.

OUTCOMES:

- To master the theory behind scripting and its relationship to classic programming.
- To survey many of the modern and way cool language features that show up frequently in scripting languages.
- To gain some fluency programming in Ruby, JavaScript, Perl, Python, and related languages.
- To design and implement one's own scripting language.

TEXT BOOKS:

1. The World of Scripting Languages, David Barron, Wiley Publications.
2. Python Web Programming, Steve Holden and David Beazley, New Riders Publications.
3. Beginning PHP and MySQL, 3rd Edition, Jason Gilmore, Apress Publications (Dream tech)

REFERENCE BOOKS:

1. Open Source Web Development with LAMP using Linux, Apache, MySQL, Perl and PHP, J.Lee and B.Ware (Addison Wesley) Pearson Education.
2. Programming Python, M.Lutz,SPD.
3. PHP 6 Fast and Easy Web Development, Julie Meloni and Matt Telles, Cengage Learning Publications.
4. PHP 5.1, I.Bayross and S.Shah, The X Team, SPD.
5. Core Python Programming, Chun, Pearson Education.
6. Guide to Programming with Python, M.Dawson, Cengage Learning.
7. Perl by Example, E.Quigley, Pearson Education.

IV Year – I Semester

L	T	P	C
0	0	3	2

SOFTWARE ARCHITECTURE AND DESIGN PATTERNS LAB

Software Architecture Lab

The course project is divided in 6 small components that will be performed during the different lab sessions; there are, in principle, 7 lab sessions. The project consists of the design and implementation of the software architecture of a Weather Mapping System (WMS). Implementation will take place both in Java and C++ (combination of both languages). Each lab assignment consists of a theoretical part and a practical part, which are defined in specific lab assignment statements that are posted at least one or two weeks before the session.

Report and demo (if applicable) for each assignment is due for the following session.

1. Tool Presentation

This session is an introductory session; there is no lab assignment for this session.

Introduction to working with an industrial strength software development environment, namely Rational Rose: how to write and maintain a UML specification; configuration management; architecture design; CORBA-IDL document generation; Java code generation from a UML model etc.

Presentation of the Project: Weather Mapping System.

2. Use Case View

Design of the Use Case View. Risk Analysis.

3: Logical View

Design of the Logical View of the Weather Mapping System (WMS).

4: Integrating Patterns in the Architecture

Integration of selected architectural and design patterns in the logical view obtained previously.

5: Implementation, Process, and Deployment Views

Design of the implementation, process, and deployment views for the Weather Mapping System.

6: Component and Interprocess Communication Design

Generation from the previous architecture design of CORBA Interfaces and Components Definitions.

7: Implementation of WMS

Implementation of the Weather Mapping System (Java & C++), with a particular emphasis on the Interprocess communication mechanism and the software components identified.

Lab Reports:

Lab reports should include:

- The answers to the questions included in the assignment statement. The answers should motivate briefly your design choices.
- The printout of the diagrams and related documents (e.g. class, use cases, operations descriptions etc.) produced using Rational Rose.

Reference: <http://www.ece.uvic.ca/~itraore/seng422-06/eng422-06.html>

Design Patterns Lab

S. No	Programs
1.	Use case Diagram for Librarian Scenario
2.	Using UML design Abstract factory design pattern
3.	Using UML design Adapter-class Design pattern
4.	Using UML design Adapter-object Design pattern
5.	Using UML design Strategy Design pattern
6.	Using UML design Builder Design pattern
7.	Using UML design Bridge Design pattern
8.	Using UML design Decorator Design pattern
9.	User gives a print command from a word document. Design to represent this chain of responsibility Design pattern
10.	Design a Flyweight Design pattern
11.	Using UML design Facade Design pattern

12. Using UML design Iterator Design pattern .
13. Using UML design Mediator Design pattern
14. Using UML design Proxy Design pattern
15. Using UML design Visitor Design pattern

WEB TECHNOLOGIES LAB

OBJECTIVES:

- To acquire knowledge of XHTML, Java Script and XML to develop web applications
- Ability to develop dynamic web content using Java Servlets and JSP
- To understand JDBC connections and Java Mail API
- To understand the design and development process of a complete web application

1. Design the following static web pages required for an online book store web site.

1) **HOME PAGE:**

The static home page must contain three **frames**.

Top frame: Logo and the college name and links to Home page, Login page, Registration page, Catalogue page and Cart page (the description of these pages will be given below).

Left frame: At least four links for navigation, which will display the catalogue of respective links.

For e.g.: When you click the link “MCA” the catalogue for MCABooks should be displayed in the Right frame.

Right frame: The *pages to the links in the left frame must be loaded here*. Initially this page contains description of the web site.

Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
mca mba BCA	Description of the Web Site			









2) **login page**

Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
MCA MBA BCA	<p>Login : <input type="text" value="11a51f0003"/></p> <p>Password: <input type="password" value="*****"/></p> <p><input type="button" value="Submit"/> <input type="button" value="Reset"/></p>			

3) CATALOGUE PAGE:

The catalogue page should contain the details of all the books available in the web site in a table. The details should contain the following:

1. Snap shot of Cover Page.
2. Author Name.
3. Publisher.
4. Price.
5. Add to cart button.

Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
MCA		Book : XML Bible Author : Winston Publication : Wiely	\$ 40.5	
MBA				
BCA		Book : AI Author : S.Russel Publication : Princeton hall	\$ 63	
		Book : Java 2 Author : Watson Publication : BPB publications	\$ 35.5	
		Book : HTML in 24 hours Author : Sam Peter Publication : Sam	\$ 50	

4. REGISTRATION PAGE:

Create a “registration form “with the following fields

- 1) Name (Text field)
- 2) Password (password field)
- 3) E-mail id (text field)
- 4) Phone number (text field)
- 5) Sex (radio button)
- 6) Date of birth (3 select boxes)
- 7) Languages known (check boxes – English, Telugu, Hindi, Tamil)
- 8) Address (text area)

5. Design a web page using CSS (Cascading Style Sheets) which includes the following:

- 1) Use different font, styles:

In the style definition you define how each selector should work (font, color etc.).

Then, in the body of your pages, you refer to these selectors to activate the styles

6. Write an XML file which will display the Book information which includes the following:

- 1) Title of the book
- 2) Author Name
- 3) ISBN number
- 4) Publisher name
- 5) Edition
- 6) Price

Write a Document Type Definition (DTD) to validate the above XML file.

7. Write Ruby program reads a number and calculates the factorial value of it and prints the Same.
8. Write a Ruby program which counts number of lines in a text files using its regular Expressions facility.
9. Write a Ruby program that uses iterator to find out the length of a string.
10. Write simple Ruby programs that uses arrays in Ruby.
11. Write programs which uses associative arrays concept of Ruby.
12. Write Ruby program which uses Math module to find area of a triangle.
13. Write Ruby program which uses tk module to display a window
14. Define complex class in Ruby and do write methods to carry operations on complex objects.
15. Write a program which illustrates the use of associative arrays in perl.
16. Write perl program takes set names along the command line and prints whether they are regular files or special files
17. Write a perl program to implement UNIX 'passed' program
18. An example perl program to connect to a MySQL database table and executing simple commands.
19. Example PHP program for cotactus page.
20. User Authentication:
Assume four users user1, user2, user3 and user4 having the passwords pwd1, pwd2, pwd3 and pwd4 respectively. Write a PHP for doing the following.
 1. Create a Cookie and add these four user id's and passwords to this Cookie.
 2. Read the user id and passwords entered in the Login form (week1) and authenticate with the values (user id and passwords) available in the cookies.If he is a valid user (i.e., user-name and password match) you should welcome him by name (user-name) else you should display "You are not an authenticated user".
Use init-parameters to do this.
21. Example PHP program for registering users of a website and login.
22. Install a database(MySql or Oracle).
Create a table which should contain at least the following fields: name, password, email-id, phone number(these should hold the data from the registration form).
Write a PHP program to connect to that database and extract data from the tables and display them. Experiment with various SQL queries.
Insert the details of the users who register with the web site, whenever a new user clicks the submit button in the registration page (week2).

23. Write a PHP which does the following job:

Insert the details of the 3 or 4 users who register with the web site (week9) by using registration form. Authenticate the user when he submits the login form using the user name and password from the database (similar to week8 instead of cookies).

24. Create tables in the database which contain the details of items (books in our case like Book name , Price, Quantity, Amount) of each category. Modify your catalogue page (week 2) in such a way that you should connect to the database and extract data from the tables and display them in the catalogue page using PHP

25. HTTP is a stateless protocol. Session is required to maintain the state.

The user may add some items to cart from the catalog page. He can check the cart page for the selected items. He may visit the catalogue again and select some more items. Here our interest is the selected items should be added to the old cart rather than a new cart. Multiple users can do the same thing at a time (i.e., from different systems in the LAN using the ip-address instead of local host). This can be achieved through the use of sessions. Every user will have his own session which will be created after his successful login to the website. When the user logs out his session should get invalidated (by using the method session. Invalidate ()).

Modify your catalogue and cart PHP pages to achieve the above mentioned functionality using sessions.

OUTCOMES:

- Students will be able to develop static web sites using XHTML and Java Scripts
- To implement XML and XSLT for web applications
- Develop Dynamic web content using Java Servlets and JSP
- To develop JDBC connections and implement a complete Dynamic web application

DISTRIBUTED SYSTEMS

OBJECTIVES:

- Provides an introduction to the fundamentals of distributed computer systems, assuming the availability of facilities for data transmission, IPC mechanisms in distributed systems, Remote procedure calls.
- Expose students to current technology used to build architectures to enhance distributed Computing infrastructures with various computing principles

UNIT-I:

Characterization of Distributed Systems: Introduction, Examples of Distributed Systems, Resource Sharing and the Web, Challenges.

System Models: Introduction, Architectural Models- Software Layers, System Architecture, Variations, Interface and Objects, Design Requirements for Distributed Architectures, Fundamental Models- Interaction Model, Failure Model, Security Model.

UNIT-II:

Interprocess Communication: Introduction, The API for the Internet Protocols- The Characteristics of Interprocess communication, Sockets, UDP Datagram Communication, TCP Stream Communication; External Data Representation and Marshalling; Client Server Communication; Group Communication- IP Multicast- an implementation of group communication, Reliability and Ordering of Multicast.

UNIT-III:

Distributed Objects and Remote Invocation: Introduction, Communication between Distributed Objects- Object Model, Distributed Object Model, Design Issues for RMI, Implementation of RMI, Distributed Garbage Collection; Remote Procedure Call, Events and Notifications, Case Study: JAVA RMI

UNIT-IV:

Operating System Support: Introduction, The Operating System Layer, Protection, Processes and Threads –Address Space, Creation of a New Process, Threads.

UNIT-V:

Distributed File Systems: Introduction, File Service Architecture; Peer-to-Peer Systems: Introduction, Napster and its Legacy, Peer-to-Peer Middleware, Routing Overlays.

Coordination and Agreement: Introduction, Distributed Mutual Exclusion, Elections, Multicast Communication.

UNIT-VI:

Transactions & Replications: Introduction, System Model and Group Communication, Concurrency Control in Distributed Transactions, Distributed Dead Locks, Transaction Recovery; Replication-Introduction, Passive (Primary) Replication, Active Replication.

OUTCOMES:

- Develop a familiarity with distributed file systems.
- Describe important characteristics of distributed systems and the salient architectural features of such systems.
- Describe the features and applications of important standard protocols which are used in distributed systems.
- Gaining practical experience of inter-process communication in a distributed environment

TEXT BOOKS:

1. Ajay D Kshemkalyani, MukeshSinghal, “Distributed Computing, Principles, Algorithms and Systems”, Cambridge
2. George Coulouris, Jean Dollimore, Tim Kindberg, “Distributed Systems- Concepts and Design”, Fourth Edition, Pearson Publication

REFERENCE BOOKS

1. Distributed-Systems-Principles-Paradigms-Tanenbaum PHI

IV Year – II Semester

L	T	P	C
4	0	0	3

MANAGEMENT SCIENCE

Course Objectives:

***To familiarize with the process of management and to provide basic insight into select contemporary management practices**

***To provide conceptual knowledge on functional management and strategic management.**

UNIT I

Introduction to Management: Concept –nature and importance of Management –Generic Functions of Management – Evaluation of Management thought- Theories of Motivation – Decision making process-Designing organization structure- Principles of organization – Organizational typology- International Management: Global Leadership and Organizational behavior Effectiveness(GLOBE) structure

UNIT II

Operations Management: Principles and Types of Management – Work study- Statistical Quality Control- Control charts (P-chart, R-chart, and C-chart) Simple problems- Material Management: Need for Inventory control- EOQ, ABC analysis (simple problems) and Types of ABC analysis (HML, SDE, VED, and FSN analysis).

UNIT III

Functional Management: Concept of HRM, HRD and PMIR- Functions of HR Manager- Wage payment plans(Simple Problems) – Job Evaluation and Merit Rating - Marketing Management- Functions of Marketing – Marketing strategies based on product Life Cycle, Channels of distributions. Operationlizing change through performance management.

UNIT IV

Project Management: (PERT/CPM): Development of Network – Difference between PERT and CPM Identifying Critical Path- Probability- Project Crashing (Simple Problems)

Unit V

Strategic Management: Vision, Mission, Goals, Strategy – Elements of Corporate Planning Process – Environmental Scanning – SWOT analysis- Steps in Strategy Formulation and Implementation, Generic Strategy Alternatives. Global strategies, theories of Multinational Companies.

UNIT VI

Contemporary Management Practice: Basic concepts of MIS, MRP, Justin- Time(JIT) system, Total Quality Management(TQM), Six sigma and Capability Maturity Model(CMM) Levies, Supply Chain Management , Enterprise Resource Planning (ERP), Business Process outsourcing (BPO), Business process Re-engineering and Bench Marking, Balanced Score Card.

Course Outcome:

***After completion of the Course the student will acquire the knowledge on management functions, global leadership and organizational behavior.**

***Will familiarize with the concepts of functional management project management and strategic management.**

Text Books

1. Dr. P. Vijaya Kumar & Dr. N. Appa Rao, '*Management Science*' Cengage, Delhi, 2012.
2. Dr. A. R. Aryasri, '*Management Science*' TMH 2011.

References:

1. Koontz & Weihrich: '*Essentials of management*' TMH 2011
2. Seth & Rastogi: *Global Management Systems*, Cengage learning , Delhi, 2011
3. Robbins: *Organizational Behaviour*, Pearson publications, 2011
4. Kanishka Bedi: *Production & Operations Management*, Oxford Publications, 2011
5. Philip Kotler & Armstrong: *Principles of Marketing*, Pearson publications
6. Biswajit Patnaik: *Human Resource Management*, PHI, 2011
7. Hitt and Vijaya Kumar: *Starategic Management*, Cengage learning
8. Prem Chadha: *Performance Management*, Trinity Press(An imprint of Laxmi Publications Pvt. Ltd.) Delhi 2015.
9. Anil Bhat& Arya Kumar : *Principles of Management*, Oxford University Press, New Delhi, 2015.

MACHINE LEARNING

OBJECTIVES:

- Familiarity with a set of well-known supervised, unsupervised and semi-supervised learning algorithms.
- The ability to implement some basic machine learning algorithms
- Understanding of how machine learning algorithms are evaluated

UNIT -I:The ingredients of machine learning, Tasks: the problems that can be solved with machine learning, **Models:** the output of machine learning, **Features,** the workhorses of machine learning. **Binary classification and related tasks:** Classification, Scoring and ranking, Class probability estimation

UNIT- II:Beyond binary classification:Handling more than two classes, Regression, Unsupervised and descriptive learning. **Concept learning:** The hypothesis space, Paths through the hypothesis space, Beyond conjunctive concepts

UNIT- III: Tree models: Decision trees, Ranking and probability estimation trees, Tree learning as variance reduction. **Rule models:**Learning ordered rule lists, Learning unordered rule sets, Descriptive rule learning, First-order rule learning

UNIT -IV:Linear models: The least-squares method, The perceptron: a heuristic learning algorithm for linear classifiers, Support vector machines, obtaining probabilities from linear classifiers, Going beyond linearity with kernel methods.**Distance Based Models:** Introduction, Neighbours and exemplars, Nearest Neighbours classification, Distance Based Clustering, Hierarchical Clustering.

UNIT- V:Probabilistic models: The normal distribution and its geometric interpretations, Probabilistic models for categorical data, Discriminative learning by optimising conditional likelihood Probabilistic models with hidden variables.**Features:** Kinds of feature, Feature transformations, Feature construction and selection. **Model ensembles:** Bagging and random forests, Boosting

UNIT- VI: Dimensionality Reduction: Principal Component Analysis (PCA), Implementation and demonstration. **Artificial Neural Networks:**Introduction, Neural network representation, appropriate problems for neural network learning, Multilayer networks and the back propagation algorithm.

OUTCOMES:

- Recognize the characteristics of machine learning that make it useful to real-world Problems.
- Characterize machine learning algorithms as supervised, semi-supervised, and Unsupervised.
- Have heard of a few machine learning toolboxes.
- Be able to use support vector machines.
- Be able to use regularized regression algorithms.
- Understand the concept behind neural networks for learning non-linear functions.

TEXT BOOKS:

1. Machine Learning: The art and science of algorithms that make sense of data, Peter Flach, Cambridge.
2. Machine Learning, Tom M. Mitchell, MGH.

REFERENCE BOOKS:

1. Understanding Machine Learning: From Theory to Algorithms, Shai Shalev-Shwartz, Shai Ben-David, Cambridge.
2. Machine Learning in Action, Peter Harington, 2012, Cengage.

IV Year – II Semester

L	T	P	C
4	0	0	3

CONCURRENT AND PARALLEL PROGRAMMING
(Elective - 3)

OBJECTIVES:

- Improvement of students comprehension of CPP, new programming concepts, paradigms and idioms
- Change of 'mood' regarding Concurrency counter-intuitiveness
- Proactive attitude: theoretical teaching shouldn't be so dull
- Multipath, individually paced, stop-and-replay, personalized learning process
- Frequent assessment of learning advances on the subject

UNIT- 1

Concurrent versus sequential programming. Concurrent programming constructs and race condition. Synchronization primitives.

UNIT-II

Processes and threads. Interprocess communication. Livelock and deadlocks, starvation, and deadlock prevention. Issues and challenges in concurrent programming paradigm and current trends.

UNIT-III

Parallel algorithms – sorting, ranking, searching, traversals, prefix sum etc.,

UNIT- IV

Parallel programming paradigms – Data parallel, Task parallel, Shared memory and message passing, Parallel Architectures, GPGPU, pthreads, STM,

UNIT-V

OpenMP, OpenCL, Cilk++, Intel TBB, CUDA

UNIT-VI

Heterogeneous Computing: C++AMP, OpenCL

OUTCOMES:

- Understanding improvement of CPP concepts presented
- The number of reinforcement–exercises assigned
- The time required for the resolution of exercises
- Compliance level with the new model of theoretical teaching

TEXT BOOKS:

1. Mordechai Ben-Ari. Principles of Concurrent and Distributed Programming, Prentice-Hall International.
2. Greg Andrews. Concurrent Programming: Principles and Practice, Addison Wesley.
3. Gadi Taubenfeld. Synchronization Algorithms and Concurrent Programming, Pearson.
4. M. Ben-Ari. Principles of Concurrent Programming, Prentice Hall.
5. Fred B. Schneider. On Concurrent Programming, Springer.
6. Brinch Hansen. The Origins of Concurrent Programming: From Semaphor

ARTIFICIAL NEURAL NETWORKS

(Elective-3)

OBJECTIVES:

- Understand the role of neural networks in engineering, artificial intelligence, and cognitive modeling.
- Provide knowledge of supervised learning in neural networks
- Provide knowledge of computation and dynamical systems using neural networks
- Provide knowledge of reinforcement learning using neural networks.
- Provide knowledge of unsupervised learning using neural networks.
- Provide hands-on experience in selected applications

UNIT-I: Introduction and ANN Structure.

Biological neurons and artificial neurons. Model of an ANN. Activation functions used in ANNs. Typical classes of network architectures.

UNIT-II

Mathematical Foundations and Learning mechanisms. Re-visiting vector and matrix algebra. State-space concepts. Concepts of optimization. Error-correction learning. Memory-based learning. Hebbian learning. Competitive learning.

UNIT-III

Single layer perceptrons. Structure and learning of perceptrons. Pattern classifier - introduction and Bayes' classifiers. Perceptron as a pattern classifier. Perceptron convergence. Limitations of a perceptrons.

UNIT-IV: Feed forward ANN.

Structures of Multi-layer feed forward networks. Back propagation algorithm. Back propagation - training and convergence. Functional approximation with back propagation. Practical and design issues of back propagation learning.

UNIT-V: Radial Basis Function Networks.

Pattern separability and interpolation. Regularization Theory. Regularization and RBF networks. RBF network design and training. Approximation properties of RBF.

UNIT-VI: Support Vector machines.

Linear separability and optimal hyperplane. Determination of optimal hyperplane. Optimal hyperplane for nonseparable patterns. Design of an SVM. Examples of SVM.

OUTCOMES:

- This course has been designed to offer as a graduate-level/ final year undergraduate level elective subject to the students of any branch of engineering/ science, having basic foundations of matrix algebra, calculus and preferably (not essential) with a basic knowledge of optimization.
- Students and researchers desirous of working on pattern recognition and classification, regression and interpolation from sparse observations; control and optimization are expected to find this course useful. The course covers theories and usage of artificial neural networks (ANN) for problems pertaining to classification (supervised/ unsupervised) and regression.
- The course starts with some mathematical foundations and the structures of artificial neurons, which mimics biological neurons in a grossly scaled down version. It offers mathematical basis of learning mechanisms through ANN. The course introduces perceptrons, discusses its capabilities and limitations as a pattern classifier and later develops concepts of multilayer perceptrons with back propagation learning.

TEXT BOOKS:

1. Simon Haykin, "Neural Networks: A comprehensive foundation", Second Edition, Pearson Education Asia.
2. Satish Kumar, "Neural Networks: A classroom approach", Tata McGraw Hill, 2004.

REFERENCE BOOKS:

1. Robert J. Schalkoff, "Artificial Neural Networks", McGraw-Hill International Editions, 1997.

OPERATION RESEARCH

(Elective - 3)

OBJECTIVE:

- Identify and develop operational research models from the verbal description of the real system.
- Understand the mathematical tools that are needed to solve optimisation problems.
- Use mathematical software to solve the proposed models.
- Develop a report that describes the model and the solving technique, analyse the results and propose recommendations in language understandable to the decision-making processes in Management Engineering

UNIT-I:

Introduction to Operations Research: Basics definition, scope, objectives, phases, models and limitations of Operations Research. Linear Programming Problem – Formulation of LPP, Graphical solution of LPP. Simplex Method, Artificial variables, big-M method, two-phase method, degeneracy and unbound solutions.

UNIT-II:

Transportation Problem. Formulation, solution, unbalanced Transportation problem. Finding basic feasible solutions – Northwest corner rule, least cost method and Vogel's approximation method. Optimality test: the stepping stone method and MODI method

UNIT-III:

Assignment model. Formulation. Hungarian method for optimal solution. Solving unbalanced problem. Traveling salesman problem and assignment problem Sequencing models. Solution of Sequencing Problem – Processing n Jobs through 2 Machines – Processing n Jobs through 3 Machines – Processing 2 Jobs through m machines – Processing n Jobs through m Machines

UNIT-IV:

Dynamic programming. Characteristics of dynamic programming. Dynamic programming approach for Priority Management employment smoothening, capital budgeting, Stage Coach/Shortest Path, cargo loading and Reliability problems Games Theory. Competitive games, rectangular game, saddle point, minimax (maximin) method of optimal strategies, value of the game. Solution of games with saddle points, dominance principle. Rectangular games without saddle point – mixed strategy for 2 X 2 games

UNIT-V:

Replacement Models. Replacement of Items that Deteriorate whose maintenance costs increase with time without change in the money value. Replacement of items that fail suddenly: individual replacement policy, group replacement policy

UNIT-VI:

Inventory models. Inventory costs. Models with deterministic demand – model (a) demand rate uniform and production rate infinite, model (b) demand rate non-uniform and production rate infinite, model (c) demand rate uniform and production rate finite.

OUTCOME:

- Methodology of Operations Research.
- Linear programming: solving methods, duality, and sensitivity analysis.
- Integer Programming.
- Network flows.
- Multi-criteria decision techniques.
- Decision making under uncertainty and risk.
- Game theory. Dynamic programming.

TEXT BOOKS:

1. P. Sankara Iyer, "Operations Research", Tata McGraw-Hill, 2008.
2. A.M. Natarajan, P. Balasubramani, A. Tamilarasi, "Operations Research", Pearson Education, 2005.

REFERENCE BOOKS:

1. J K Sharma. "Operations Research Theory & Applications, 3e", Macmillan India Ltd, 2007.
2. P. K. Gupta and D. S. Hira, "Operations Research", S. Chand & co., 2007.
3. J K Sharma., "Operations Research, Problems and Solutions, 3e", Macmillan India Ltd
4. N.V.S. Raju, "Operations Research", HI-TECH, 2002

IV Year – II Semester

L	T	P	C
0	3	0	2

SEMINAR

IV Year – II Semester

L	T	P	C
0	0	0	10

PROJECT



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
(Established by Andhra Pradesh Act No.30 of 2008)

Kakinada – 533 003, Andhra Pradesh (India)

ACADEMIC REGULATIONS R19 FOR M. Tech (REGULAR) DEGREE COURSE

Applicable for the students of M. Tech (Regular) Course from the Academic Year 2019-20 onwards. The M. Tech Degree of Jawaharlal Nehru Technological University Kakinada shall be conferred on candidates who are admitted to the program and who fulfil all the requirements for the award of the Degree.

1.0 ELIGIBILITY FOR ADMISSIONS

Admission to the above program shall be made subject to eligibility, qualification and specialization as prescribed by the University from time to time.

Admissions shall be made on the basis of merit/rank obtained by the candidates at the qualifying Entrance Test conducted by the University or on the basis of any other order of merit as approved by the University, subject to reservations as laid down by the Govt. from time to time.

2.0 AWARD OF M. Tech DEGREE

2.1 A student shall be declared eligible for the award of the M. Tech Degree, if he pursues a course of study in not less than two and not more than four academic years.

2.2 **The student shall register for all 68 credits and secure all the 68 credits.**

2.3 The minimum instruction days in each semester are 90.

3.0 PROGRAMME OF STUDY

The following specializations are offered at present for the M. Tech Programme of study.

M.Tech

1. M.Tech- Structural Engineering
2. M. Tech- Transportation Engineering
3. M.Tech- Infrastructure Engineering & Management
4. M. Tech - Computer Aided Structural Engineering
5. M. Tech - Soil Mechanics and Foundation Engineering
6. M. Tech- Environmental Engineering
7. M.Tech-Geo-Informatics
8. M.Tech-Spatial Information Technology
9. M.Tech- Civil Engineering

10. M. Tech-Highway Engineering
11. M.Tech -Geo-Technical Engineering
12. M.Tech- Remote Sensing
- 11. M.Tech- Power Electronics**
12. M.Tech- Power & Industrial Drives
13. M.Tech- Power Electronics & Electrical Drives
14. M.Tech- Power System Control & Automation
15. M.Tech- Power Electronics & Drives
- 16. M.Tech- Power Systems**
17. M.Tech- Power Systems Engineering
18. M.Tech- High Voltage Engineering
19. M.Tech- Power Electronics and Power Systems
20. M.Tech- Power System and Control
21. M.Tech- Power Electronics & Systems
22. M.Tech- Electrical Machines and Drives
23. M.Tech- Advanced Power Systems
24. M.Tech- Power Systems with Emphasis on High Voltage Engineering
25. M.Tech- Control Engineering
26. M.Tech- Control Systems
27. M.Tech- Electrical Power Engineering
28. M.Tech- Power Engineering & Energy System
29. M.Tech- Thermal Engineering
- 30. M.Tech- CAD/CAM**
31. M.Tech- Machine Design
32. M.Tech- Computer Aided Design and Manufacture
33. M.Tech- Advanced Manufacturing Systems
34. M.Tech-Computer Aided Analysis & Design
35. M.Tech- Mechanical Engineering Design
36. M.Tech- Systems and Signal Processing
37. M.Tech- Digital Electronics and Communication Systems
38. M.Tech- Electronics & Communications Engineering
39. M.Tech- Communication Systems
40. M.Tech- Communication Engineering & Signal Processing
41. M.Tech- Microwave and Communication Engineering
42. M.Tech- Telematics
43. M.Tech- Digital Systems & Computer Electronics
44. M.Tech- Embedded System
45. M.Tech- VLSI
- 46. M.Tech- VLSI Design**
47. M.Tech- VLSI System Design
48. M.Tech- Embedded System & VLSI Design

49. M.Tech- VLSI & Embedded System
50. M.Tech- VLSI Design & Embedded Systems
51. M.Tech- Image Processing
52. M.Tech- Digital Image Processing
53. M.Tech- Computers & Communication
54. M.Tech- Computers & Communication Engineering
55. M.Tech- Instrumentation & Control Systems
56. M.Tech – VLSI & Micro Electronics
57. M.Tech – Digital Electronics & Communication Engineering
58. M.Tech- Embedded System & VLSI
59. M.Tech- Computer Science & Engineering
60. M.Tech- Computer Science
61. M.Tech- Computer Science & Technology
62. M.Tech- Computer Networks
63. M.Tech- Computer Networks & Information Security
64. M.Tech- Information Technology
65. M.Tech- Software Engineering
66. M.Tech- Neural Networks
67. M.Tech- Chemical Engineering
68. M.Tech- Biotechnology
69. M.Tech- Nano Technology
70. M.Tech- Food Processing
71. M.Tech- Avionics
72. M. Tech- Mining Engineering
73. M. Tech- Auto mobile Engineering
74. M. Tech- Agricultural Engineering
75. M. Tech - Material Science and Technology

and any other course as approved by AICTE/ University from time to time.

3.0 B. Departments offering M. Tech Programmes with specializations are noted below:

Civil Engg.	<ol style="list-style-type: none"> 1. M.Tech. - Structural Engineering 2. M.Tech. - Computer Aided Structural Engineering 3. M.Tech - Infrastructure Engineering & Management 4. M.Tech - Civil Engineering 5. M. Tech - Soil Mechanics and Foundation Engineering 6. M.Tech - Geo-Technical Engineering 7. M.Tech - Transportation Engineering 8. M.Tech - Environmental Engineering 9. M.Tech - Geo-Informatics 10. M. Tech-Highway Engineering
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<p style="text-align: center;">EEE</p>	<ol style="list-style-type: none"> 1. M.Tech- Power Electronics 2. M.Tech- Power & Industrial Drives 3. M.Tech- Power Electronics & Electrical Drives 4. M.Tech- Power System Control & Automation 5. M.Tech- Power Electronics & Drives 6. M.Tech- Power Systems 7. M.Tech- Power Systems Engineering 8. M.Tech- High Voltage Engineering 9. M.Tech- Power Electronics and Power Systems 10. M.Tech- Power System and Control 11. M.Tech- Power Electronics & Systems 12. M.Tech- Electrical Machines and Drives 13. M.Tech- Advanced Power Systems 14. M.Tech- Power Systems with Emphasis on High Voltage Engineering 15. M.Tech- Control Engineering 16. M.Tech- Control Systems 17. M.Tech- Electrical Power Engineering 18. M.Tech- Power Engineering & Energy System
<p style="text-align: center;">ME</p>	<ol style="list-style-type: none"> 1. M.Tech- Thermal Engineering 2. M.Tech- CAD/CAM 3. M.Tech- Machine Design 4. M.Tech- Computer Aided Design and Manufacture 5. M.Tech- Advanced Manufacturing Systems 6. M.Tech-Computer Aided Analysis & Design 7. M.Tech- Mechanical Engineering Design 8. M.Tech- Mining Engineering 9. M. Tech- Automobile Engineering
<p style="text-align: center;">ECE</p>	<ol style="list-style-type: none"> 1. M.Tech- Systems and Signal Processing 2. M.Tech- Digital Electronics and Communication Systems 3. M.Tech- Electronics & Communications Engineering 4. M.Tech- Communication Systems 5. M.Tech- Communication Engineering & Signal Processing 6. M.Tech- Microwave and Communication Engineering 7. M.Tech- Telematics 8. M.Tech- Digital Systems & Computer Electronics 9. M.Tech- Embedded System 10. M.Tech- VLSI 11. M.Tech- VLSI Design 12. M.Tech- VLSI System Design 13. M.Tech- Embedded System & VLSI Design 14. M.Tech- VLSI & Embedded System 15. M.Tech- VLSI Design & Embedded Systems

	<ul style="list-style-type: none"> 16. M.Tech- Image Processing 17. M.Tech- Digital Image Processing 18. M.Tech- Computers & Communication 19. M.Tech- Computers & Communication Engineering 20. M.Tech- Instrumentation & Control Systems 21. M.Tech – VLSI & Micro Electronics 22. M.Tech – Digital Electronics & Communication Engineering 23. M.Tech- Embedded System & VLSI
CSE	<ul style="list-style-type: none"> 1. M.Tech- Computer Science & Engineering 2. M.Tech- Computer Science 3. M.Tech- Computer Science & Technology 4. M.Tech- Computer Networks 5. M.Tech- Computer Networks & Information Security 6. M.Tech- Information Technology 7. M.Tech- Software Engineering 8. M.Tech- Neural Networks 9. M.Tech- Cyber Security 10. MCA
Metallurgical Engineering	<ul style="list-style-type: none"> 1. M. Tech - Material Science and Technology
Inter disciplinary	<ul style="list-style-type: none"> 2. M.Tech - Chemical Engineering 3. M.Tech – Bio-technology 4. M.Tech – Nano-Technology 5. M.Tech- Food Processing Technology 6. M.Tech- Avionics 7. M.Tech - Remote Sensing 8. M.Tech - Spatial Information Technology 9. M.Tech - Environmental Engineering & Management 10. M.Tech – Renewable Energy 11. M.Tech – Environmental Occupational Health & Safety 12. M.Tech - Agricultural Engineering
MBA	<ul style="list-style-type: none"> 1. MBA Regular 2. Integrate MBA 3. MBA (Agribusiness Management/Entrepreneurship) 4. MBA (Master in Hospital Administration) 5. MBA (Logistics and Supply Chain Management) 6. Dual Degree MBA (Previously MAM)

4.0 ATTENDANCE

- 4.1 A student shall be eligible to write University examinations if he acquires a minimum of 75% of attendance in aggregate of all the subjects/courses, and with minimum 50% in each and every course including practicals.
- 4.2 Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester shall be granted by the College Academic Committee.
- 4.3 Shortage of Attendance **below** 65% in aggregate shall not be condoned and not eligible to write their end semester examination of that class.
- 4.4 Students whose shortage of attendance is not condoned in any semester are not eligible to write their end semester examination of that class.
- 4.5 A prescribed fee shall be payable towards condonation of shortage of attendance.
- 4.6 A student shall not be promoted to the next semester unless, he satisfies the attendance requirement of the present semester, as applicable. They may seek re-admission into that semester when offered next. If any candidate fulfills the attendance requirement in the present semester, he shall not be eligible for re-admission into the same class.

5.0 EVALUATION

The performance of the candidate in each semester shall be evaluated subject-wise, with a maximum of 100 marks for theory and 100 marks for practical, on the basis of Internal Evaluation and End Semester Examination.

- 5.1 For the theory subjects 75 marks shall be awarded based on the performance in the End Semester Examination and 25 marks shall be awarded based on the Internal Evaluation. The internal evaluation shall be made based on the **average** of the marks secured in the two Mid Term-Examinations conducted-one in the middle of the Semester and the other immediately after the completion of instruction. Each mid term examination shall be conducted for a total duration of 120 minutes with 4 questions (without choice) each question for 10 marks, and it will be reduced to 25 marks. End semester examination is conducted for 75 marks for all FIVE (5) questions (one question from one unit) to be answered (either or).
- 5.2 For practical subjects, 75 marks shall be awarded based on the performance in the End Semester Examinations and 25 marks shall be awarded based on the day-to-day performance as Internal Marks. The internal evaluation based on the day to day work-5 marks, record- 5 marks and the remaining 15 marks to be awarded by conducting an internal laboratory test. The end examination shall be conducted by the examiners, with a breakup marks of Procedure-20, Experimentation-30, Results-10, Viva-voce-15.
- 5.3 For Mini Project with Seminar, a student under the supervision of a faculty member, shall collect the literature on a topic and critically review the literature and submit it to the department in a report form and shall make an oral presentation before the Project Review Committee consisting of Head of the Department, supervisor/mentor and two other senior faculty members of the department. For Mini Project with Seminar, there will be only

internal evaluation of 100 marks. A candidate has to secure a minimum of 50% of marks to be declared successful.

- 5.4 A candidate shall be deemed to have secured the minimum academic requirement in a subject if he secures a minimum of 40% of marks in the End semester Examination and a minimum aggregate of 50% of the total marks in the End Semester Examination and Internal Evaluation taken together.
- 5.5 In case the candidate does not secure the minimum academic requirement in any subject (as specified in 5.4) he has to re-appear for the End semester Examination in that subject. A candidate shall be given **one** chance to re-register for each subject provided the internal marks secured by a candidate **are less than 50% and has failed in the end examination.** In such a case, the candidate must re-register for the subject(s) and secure the required minimum attendance. The candidate's attendance in the re-registered subject(s) shall be calculated separately to decide upon his eligibility for writing the end examination in those subject(s). In the event of the student taking another chance, his internal marks and end examination marks obtained in the previous attempt shall stand cancelled. For re-registration the candidates have to apply to the University through the college by paying the requisite fees and get approval from the University before the start of the semester in which re-registration is required.
- 5.6 In case the candidate secures less than the required attendance in any re-registered subject(s), he shall not be permitted to write the End Examination in that subject. He shall again re-register the subject when next offered.
- 5.7 Laboratory examination for M. Tech. courses must be conducted with two Examiners, one of them being the Laboratory Class Teacher or teacher of the respective college and the second examiner shall be appointed by the University from the panel of examiners submitted by the respective college.

6.0 EVALUATION OF PROJECT/DISSERTATION WORK

Every candidate shall be required to submit a thesis or dissertation on a topic approved by the Project Review Committee.

- 6.1 A Project Review Committee (PRC) shall be constituted with Head of the Department and two other senior faculty members in the department.
- 6.2 Registration of Dissertation/Project Work: A candidate is permitted to register for the project work after satisfying the attendance requirement of all the subjects, both theory and practical.
- 6.3 After satisfying 6.2, a candidate has to submit, in consultation with his project supervisor, the title, objective and plan of action of his project work for approval. The student can initiate the Project work, only after obtaining the approval from the Project Review Committee (PRC).
- 6.4 If a candidate wishes to change his supervisor or topic of the project, he can do so with the approval of the Project Review Committee (PRC). However, the PRC shall examine whether or not the change of topic/supervisor leads to a major change of his initial plans of project proposal. If yes, his date of registration for the project work starts from the date of change of Supervisor or topic as the case may be.
- 6.5 Continuous assessment of Dissertation-I and Dissertation-II during the Semester(s) will be monitored by the PRC.

- 6.6 A candidate shall submit his status report in two stages to the PRC, at least with a gap of 3 months between them.
- 6.7 The work on the project shall be initiated at the beginning of the II year and the duration of the project is two semesters. A candidate is permitted to submit Project Thesis only after successful completion of theory and practical course with the approval of PRC not earlier than 40 weeks from the date of registration of the project work. The candidate has to pass all the theory and practical subjects before submission of the Thesis.
- 6.8 Three copies of the Project Thesis certified by the supervisor shall be submitted to the College/School/Institute.
- 6.9 The thesis shall be adjudicated by one examiner selected by the University. For this, the Principal of the College shall submit a panel of 5 examiners, eminent in that field, with the help of the guide concerned and head of the department.
- 6.10 If the report of the examiner is not favourable, the candidate shall revise and resubmit the Thesis, in the time frame as decided by the PRC. If the report of the examiner is unfavorable again, the thesis shall be summarily rejected. The candidate has to re-register for the project and complete the project within the stipulated time after taking the approval from the University.
- 6.11 The Head of the Department shall coordinate and make arrangements for the conduct of Viva-Voce examination.
- 6.12 If the report of the examiner is favourable, Viva-Voce examination shall be conducted by a board consisting of the Supervisor, Head of the Department and the examiner who adjudicated the Thesis. The Board shall jointly report the candidate's work for a maximum of 100 marks as one of the following:
- A. Excellent
 - B. Good
 - C. Satisfactory
 - D. Unsatisfactory
- 6.13 If the report of the Viva-Voce is unsatisfactory (ie, < 50 marks), the candidate shall retake the Viva-Voce examination only after three months. If he fails to get a satisfactory report at the second Viva-Voce examination, the candidate has to re-register for the project and complete the project within the stipulated time after taking the approval from the University.

7.0 Cumulative Grade Point Average (CGPA)

Marks Range Theory/ Laboratory (Max – 100)	Marks Range Mini Project/ Project Work or Dissertation (Max – 100)	Letter Grade	Level	Grade Point
≥ 90	≥ 90	O	Outstanding	10
≥80 to <90	≥80 to <90	S	Excellent	9
≥70 to <80	≥70 to <80	A	Very Good	8
≥60 to <70	≥60 to <70	B	Good	7
≥50 to <60	≥50 to <60	C	Fair	6
≥40 to <50	≥40 to <50	D	Satisfactory	5
<40	<40	F	Fail	0

			Absent	0
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Computation of SGPA

- The following procedure is to be adopted to compute the Semester Grade Point Average(SGPA) and Cumulative Grade Point Average(CGPA):
- The **SGPA** is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e
- **SGPA (Si) = $\sum (C_i \times G_i) / \sum C_i$**
- Where C_i is the number of credits of the i^{th} course and G_i is the grade point scored by the student in the i^{th} course.

Computation of CGPA

- The **CGPA** is also calculated in the same manner taking into account all the courses undergone by a student over all the semester of a Programme, i.e.
- **CGPA = $\sum (C_i \times S_i) / \sum C_i$**
- Where S_i is the SGPA of the i^{th} semester and C_i is the total number of credits in that semester.
- The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.
- Equivalent Percentage = $(CGPA - 0.75) \times 10$

8.0 AWARD OF DEGREE AND CLASS

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of M. Tech. Degree he shall be placed in one of the following four classes:

Class Awarded	CGPA to be secured	
First Class with Distinction	≥ 7.75	From the CGPA secured from 68 Credits.
First Class	≥ 6.75	
Second Class	≥ 5.75 to < 6.75	
Pass Class	≥ 4.75 to < 5.75	

The Grades secured, Grade points and Credits obtained will be shown separately in the memorandum of marks.

9.0 WITHHOLDING OF RESULTS

If the student is involved in indiscipline/malpractices/court cases, the result of the student will be withheld.

10.0 TRANSITORY REGULATIONS (for R19)

- 10.1 Discontinued or detained candidates are eligible for re-admission into same or equivalent subjects at a time as and when offered.
- 10.2 The candidate who fails in any subject will be given two chances to pass the same subject; otherwise, he has to identify an equivalent subject as per R16 academic regulations.

11.0 GENERAL

- 11.1 Wherever the words “he”, “him”, “his”, occur in the regulations, they include “she”, “her”, “hers”.
- 11.2 The academic regulation should be read as a whole for the purpose of any interpretation.
- 11.3 In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.
- 11.4 The University may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the University.

MALPRACTICES RULES

DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/Improper conduct	Punishment
	<i>If the candidate:</i>	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the University.

3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.

6.	<p>Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.</p>	<p>In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.</p>
7.	<p>Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.</p>	<p>Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with</p>

		forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	<p>Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.</p> <p>Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.</p>
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that

		semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action to award suitable punishment.	

Malpractices identified by squad or special invigilators

1. Punishments to the candidates as per the above guidelines.
2. Punishment for institutions : (if the squad reports that the college is also involved in encouraging malpractices)
 - (i) A show cause notice shall be issued to the college.
 - (ii) Impose a suitable fine on the college.
 - (iii) Shifting the examination centre from the college to another college for a specific period of not less than one year.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India

DEPARTMENT OF MECHANICAL ENGINEERING

COURSE STRUCTURE & SYLLABUS M.Tech ME for
CAD/ CAM Programme

(Applicable for batches admitted from 2019-2020)



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India

I SEMESTER

S.No	Course Code	Course Name	L	T	P	Credits
1	CA 101	Geometric Modeling	3	0	0	3
2	CA 102	Computer Aided Manufacturing	3	0	0	3
3	CA 103	Program Elective – 1	3	0	0	3
	CA 1031	Computational Methods in Engineering				
	CA 1032	Materials Technology				
	CA 1033	Mechanical Vibrations				
4	CA 104	Program Elective – 2	3	0	0	3
	CA 1041	Mechatronics				
	CA 1042	Industrial Robotics				
	CA 1043	Simulation of Manufacturing Systems				
5	CA 105	Advanced CAD Lab	0	0	4	2
6	CA 106	Advanced Manufacturing Lab	0	0	4	2
7	CA 107	Research Methodology and IPR	2	0	0	2
8	CA 108	Writing Skills for Scientific Communication	2	0	0	0
Total						18

II SEMESTER

S.No	Course Code	Course Name	L	T	P	Credits
1	CA 201	Theory of Elasticity and Plasticity	3	0	0	3
2	CA 202	Advanced Manufacturing Processes	3	0	0	3
3	CA 203	Program Elective – 3	3	0	0	3
	CA 2031	Advanced Finite Element Methods				
	CA 2032	Fracture mechanics				
	CA 2033	Product Design and Development				
4	CA 204	Program Elective – 4	3	0	0	3
	CA 2041	Materials Characterization Techniques				
	CA 2042	Optimization & Reliability				
	CA 2043	Additive Manufacturing				
5	CA 205	Material Characterization Lab	0	0	4	2
6	CA 206	Simulation of Manufacturing Systems Lab	0	0	4	2
7	CA 207	Mini Project With Seminar	2	0	0	2
8	CA 208	Personality development through life enlightenment skills	2	0	0	0
Total						18



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India

III SEMESTER

S.No	Course Code	Course Name	T	P	Credits
1	CA 301	Program Elective - 5	3	0	3
	CA 3011	Non destructive Evaluation			
	CA 3012	Quality engineering in manufacturing			
	CA 3013	Green Manufacturing			
	CA 3014	MOOCS/ NPTEL *			
2	CA 302	Open Elective	3	0	3
	CA 3021	Nano Technology			
	CA 3022	Optimization Techniques			
	CA 3023	Product Design and Manufacturing			
3		Project /Dissertation Phase-I	0	20	10
Total					16

*MOOCS/NPTEL certification courses as per the approved list of internal BoS at the time of registration.

IV SEMESTER

S.No	Course Code	Course Name	L	T	P	Credits
1		Project /Dissertation Phase-II	0	0	32	16
Total						16



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India

I Year I Semester	GEOMETRIC MODELING	L	P	C
		3	0	3

Unit - I

Cubic splines –I Definition, Explicit and implicit equations, parametric equations, Algebraic and geometric form of cubic spline, Hermite cubic spline, tangent vectors, parametric space of a curve, blending functions.

Unit - II

Cubic Splines-II:

four point form, reparametrization, truncating and subdividing of curves. Graphic construction and interpretation, composite pc curves.

Bezier Curves: Bernstein basis, equations of Bezier curves, properties, derivatives.

Unit - III

B-Spline Curves: B-Spline basis, equations, knot vectors, properties, and derivatives.

Unit – IV

Surfaces: Bicubic surfaces, Coon’s surfaces, Bezier surfaces, B-Spline surfaces, surfaces of revolutions, Sweep surfaces, ruled surfaces, tabulated cylinder, bilinear surfaces, Gaussian curvature.

Unit – V

Solids: Tricubic solid, Algebraic and geometric form.

Solid modeling concepts: Wire frames, Boundary representation, Half space modeling, spatial cell, cell decomposition, classification problem.

TEXT BOOKS:

1. Elements of Computer Graphics by Roger & Adams Tata McGraw Hill.
2. Geometric Modeling by Micheal E. Mortenson, McGraw Hill Publishers

REFERENCES:

1. Computer Aided Design and Manufacturing, K.Lalit Narayan, K.Mallikarjuna Rao, MMM Sarcar, PHI Publishers



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KAKINADA - 533 003, Andhra Pradesh, India

I Year I Semester	COMPUTER AIDED MANUFACTURING	L	P	C
		3	0	3

UNIT - I

COMPUTER AIDED PROGRAMMING: General information, APT programming, Examples Apt programming problems (2D machining only). NC programming on CAD/CAM systems, the design and implementation of post processors .Introduction to CAD/CAM software, Automatic Tool Path generation.

UNIT - II

TOOLING FOR CNC MACHINES: Interchangeable tooling system, preset and qualified toois, coolant fed tooling system, modular fixturing, quick change tooling system, automatic head changers. DNC Systems and Adaptive Control: Introduction, type of DNC systems, advantages arid disadvantages of DNC, adaptive control with optimization, Adaptive control with constrains, Adaptive control of machining processes like turning, grinding.

UNIT - III

POST PROCESSORS FOR CNC: Introduction to Post Processors: The necessity of a Post Processor, the general structure of a Post Processor, the functions of a Post Processor, DAPP — based- Post Processor: Communication channels and major variables in the DAPP — based Post Processor, th creation of a DAPP — Based Post Processor.

UNIT - IV

MICRO CONTROLLERS: Introduction, Hardware components, I/O pins, ports, external memory:, counters, timers and serial data I/O interrupts. Selection of Micro Controllers Embedded Controllers, Applications and Programming of Micro Controllers. Programmable Logic Controllers (PLC' s): Introduction, Hardware components of PLC, System, basic structure, principle of operations, Programming mnemonics timers, Internal relays and counters, Applications of PLC's in CNC Machines.

UNIT - V

COMPUTER AIDED PROCESS PLANNING: Hybrid CAAP System, Computer Aided Inspection and quality control, Coordinate Measuring Machine, Limitations of CMM, Computer Aided Testing, Optical Inspection Methods, Artificial Intelligence and expert system: Artificial Neural Networks, Artificial Intelligence in CAD, Experts systems and its structures.

TEXT BOOKS:

1. Computer Control of Manufacturing Systems / Yoram Koren / Mc Graw Hill. 1983.
2. CAD/CAM Principles and Applications, P.N.Rao, TMH

REFERENCES:

1. Computer Aided Design Manufacturing – K. Lalit Narayan, K. Mallikarjuna Rao and M.M.M. Sarcar, PHI, 2008.
2. CAD / CAM Theory and Practice, / Ibrahim Zeid, TMH
3. CAD / CAM / CIM, Radhakrishnan and Subramanian, New Age
4. Principles of Computer Aided Design and Manufacturing, Farid Amirouche, Pearson
5. Computer Numerical Control Concepts and programming, Warren S Seames, Thomson.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India

I Year I Semester	COMPUTATIONAL METHODS IN ENGINEERING (ELECTIVE I)	L	P	C
		3	0	3

Unit – I

Introduction to numerical methods applied to engineering problems: Examples, solving sets of equations – Matrix notation – Determinants and inversion – Iterative methods – Relaxation methods – System of non-linear equations. Least square approximation fitting of non-linear curves by least squares – regression analysis- multiple linear regression, non linear regression - computer programs.

Unit – II

Boundry value problems and charecteristic value problems: Shooting method – Solution through a set of equations – Derivative boundary conditions – Rayleigh – Ritz method – Characteristic value problems.

Unit – III

Transformation Techniques: Continuous fourier series, frequency and time domains, laplace transform, fourier integral and transform, discrete fourier transform (DFT), Fast fourier transform (FFT).

Unit – IV

Numerical solutions of partial differential equations: Laplace's equations – Representations as a difference equation – Iterative methods for Laplace's equations – poisson equation – Examples – Derivative boundary conditions – Irregular and non – rectangular grids – Matrix patterns, sparseness – ADI method – Finite element method.

Unit – V

Partial differential equations: Explicit method – Crank-Nickelson method – Derivative boundary condition – Stability and convergence criteria. Solving wave equation by finite differences-stability of numerical method –method of characteristics-wave equation in two space dimensions-computer programs.

TEXT BOOKS:

1. Steven C.Chapra, Raymond P.Canale “Numerical Methods for Engineers” Tata Mc-Graw Hill
- 2.Curtis F.Gerald, Partick.O.Wheatly,”Applied numerical analysis”Addison-Wesley,1989
- 3.Douglas J.Faires,Riched Burden”Numerical methods”, Brooks/Cole publishing company,1998.Second edition.

REFERENCES:

1. Ward Cheney and David Kincaid “Numerical mathematics and computing” Brooks/Cole publishing company1999, Fourth edition.
2. Riley K.F., M.P.Hobson and Bence S.J,”Mathematical methods for physics and engineering”, Cambridge University press,1999.
3. Kreysis, Advanced Mathematics



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India

I Year II Semester	MATERIALS TECHNOLOGY (ELECTIVE IV)	L	P	C
		3	0	3

UNIT I:

Elasticity in metals, mechanism of plastic deformation, slip and twinning, role of dislocations, yield stress, shear strength of perfect and real crystals, strengthening mechanism, work hardening, solid solution, grain boundary strengthening. Poly phase mixture, precipitation, particle, fiber and dispersion strengthening, effect of temperature, strain and strain rate on plastic behavior, super plasticity, Yield criteria: Von-mises and Tresca criteria.

UNIT II:

Griffith's Theory, stress intensity factor and fracture Toughness, Toughening Mechanisms, Ductile and Brittle transition in steel, High Temperature Fracture, Creep, Larson – Miller parameter, Deformation and Fracture mechanism maps.

UNIT III:

Fatigue, fatigue limit, features of fatigue fracture, Low and High cycle fatigue test, Crack Initiation and Propagation mechanism and Paris Law, Effect of surface and metallurgical parameters on Fatigue, Fracture of non-metallic materials, fatigue analysis, Sources of failure, procedure of failure analysis. Motivation for selection, cost basis and service requirements, Selection for Mechanical Properties, Strength, Toughness, Fatigue and Creep.

UNIT IV:

MODERN METALLIC MATERIALS: Dual Steels, Micro alloyed, High Strength Low alloy (HSLA) Steel, Transformation induced plasticity (TRIP) Steel, Maraging Steel, Inter metallics, Ni and Ti Aluminides. Processing and applications of Smart Materials, Shape Memory alloys, Metallic Glass Quasi Crystal and Nano Crystalline Materials.

UNIT V:

NONMETALLIC MATERIALS: Polymeric materials and their molecular structures, Production Techniques for Fibers, Foams, Adhesives and Coatings, structure, Properties and Applications of Engineering Polymers, Advanced Structural Ceramics WC, TiC, TaC, Al₂O₃, SiC, Si₃N₄, CBN and Diamond – properties, Processing and applications.

TEXT BOOKS:

1. Mechanical Behavior of Materials/Thomas H. Courtney/ McGraw Hill/2 nd Edition/2000
2. Mechanical Metallurgy/George E. Dieter/McGraw Hill, 1998.

REFERENCES:

- 1 Selection and use of Engineering Materials 3e/Charles J.A/Butterworth Heiremann.
- 2 Engineering Materials Technology/James A Jacob Thomas F Kilduff/Pearson
- 3 Material Science and Engineering/William D Callister/John Wiley and Sons
- 4 Plasticity and plastic deformation by Aritzur.
- 5 Introduction to Ceramics, 2nd Edition by W. David Kingery, H. K. Bowen, Donald R. Uhlmann



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India

I Year I Semester	MECHANICAL VIBRATIONS (ELECTIVE I)	L	P	C
		3	0	3

Unit I

Single degree of Freedom systems: Undamped and damped free vibrations; forced vibrations ; coulomb damping; Response to harmonic excitation; rotating unbalance and support excitation, Vibration isolation and transmissibility, Vibrometers, velocity meters & accelerometers.

Unit II

Response to Non Periodic Excitations: unit Impulse, unit step and unit Ramp functions; response to arbitrary excitations, The Convolution Integral; shock spectrum; System response by the Laplace Transformation method.

Unit III

Multi degree freedom systems: Principal modes – undamped and damped free and forced vibrations ; undamped vibration absorbers, Matrix formulation, stiffness and flexibility influence coefficients; Eigen value problem; normal modes and their properties; Free and forced vibration by Modal analysis; Method of matrix inversion; Torsional vibrations of multi – rotor systems and geared systems; Discrete-Time systems.

Unit IV

Numerical Methods: Rayleigh's, Stodola's, Matrix iteration, Rayleigh-Ritz Method and Holzer's methods

Unit V

Application of concepts: Free vibration of strings – longitudinal oscillations of bars-transverse vibrations of beams- Torsional vibrations of shafts. Critical speeds without and with damping, secondary critical speed.

Text books:

1. Elements of Vibration Analysis by Meirovitch.
2. Mechanical Vibrations by G.K. Groover.

References:

1. Vibrations by W.T. Thomson
2. Mechanical Vibrations – Schaum series.
3. Vibration problems in Engineering by S.P. Timoshenko.
4. Mechanical Vibrations – V.Ram Murthy.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India

I Year I Semester	MECHATRONICS (ELECTIVE II)	L	P	C
		3	0	3

UNIT-I

Mechatronics systems, elements, levels of mechatronics system, Mechatronics design process, system, measurement systems, control systems, microprocessor-based controllers, advantages and disadvantages of mechatronics systems. Sensors and transducers, types, displacement, position, proximity, velocity, motion , force, acceleration, torque, fluid pressure, liquid flow, liquid level, temperature and light sensors.

UNIT-II

Solid state electronic devices, PN junction diode, BJT, FET, DIA and TRIAC. Analog signal conditioning, amplifiers, filtering. Introduction to MEMS & typical applications.

UNIT-III

Hydraulic and pneumatic actuating systems, Fluid systems, Hydraulic and pneumatic systems, components, control valves, electro-pneumatic, hydro-pneumatic, electro-hydraulic servo systems:

Mechanical actuating systems and electrical actuating systems.

UNIT-IV

Digital electronics and systems, digital logic control, micro processors and micro controllers, programming, process controllers, programmable logic controllers, PLCs versus computers, application of PLCs for control.

UNIT-V

System and interfacing and data acquisition, DAQS , SCADA, A to D and D to A conversions; Dynamic models and analogies, System response. Design of mechatronics systems & future trends.

TEXT BOOKS:

1. MECHATRONICS Integrated Mechanical Electronics Systems/KP Ramachandran & GK Vijaya Raghavan/WILEY India Edition/2008
2. Mechatronics Electronics Control Systems in Mechanical and Electrical Engineering by W Bolton, Pearson Education Press, 3rd edition, 2005.

REFERENCES:

- 1 Mechatronics Source Book by Newton C Braga, Thomson Publications, Chennai.
- 2 Mechatronics – N. Shanmugam / Anuradha Agencies Publishers.
- 3 Mechatronics System Design / Devdas shetty/Richard/Thomson.
- 4 Mechatronics/M.D.Singh/J.G.Joshi/PHI.
- 5 Mechatronics – Electronic Control Systems in Mechanical and Electrical Engg. 4th Edition, Pearson, 2012 W. Bolton
- 6 Mechatronics – Principles and Application Godfrey C. Onwubolu, Wlsevier, 2006 Indian print



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India**

I Year I Semester	INDUSTRIAL ROBOTICS	L	P	C
		3	0	3

UNIT - I

INTRODUCTION: Automation and Robotics, Robot anatomy, robot configuration, motions joint notation scheme, work volume, robot drive systems, control systems and dynamic performance, precision of movement.

CONTROL SYSTEM AND COMPONENTS: basic concepts and motion controllers, control system analysis, robot actuation and feedback components, Positions sensors, velocity sensors, actuators, power transmission systems, robot joint control design.

UNIT - II

MOTION ANALYSIS AND CONTROL: Manipulator kinematics, position representation, forward and inverse transformations, homogeneous transformations, manipulator path control, robot arm dynamics, configuration of a robot controller.

UNIT - III

END EFFECTORS: Grippers-types, operation, mechanism, force analysis, tools as end effectors consideration in gripper selection and design. **SENSORS:** Desirable features, tactile, proximity and range sensors, uses sensors in robotics.

MACHINE VISION: Functions, Sensing and Digitizing-imaging devices, Lighting techniques, Analog to digital single conversion, image storage: Image processing and Analysis-image data reduction, Segmentation, feature extraction, Object recognition. Training the vision system, Robotic application.

UNIT - IV

ROBOT PROGRAMMING: Lead through programming, Robot program as a path in space, Motion interpolation, WAIT, SIGNAL AND DELAY commands, Branching, capabilities and Limitations of lead through methods.

ROBOT LANGUAGES: Textual robot Languages, Generations of robot programming languages, Robot language structures, Elements and function.

UNIT - V

ROBOT CELL DESIGN AND CONTROL: Robot cell layouts-Robot centered cell, In-line robot cell, Considerations in work design, Work and control, Inter locks, Error detection, Work cell controller.

ROBOT APPLICATION: Material transfer, Machine loading/unloading, Processing operation, Assembly and Inspection, Future Application.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India

TEXT BOOKS:

1. Industrial Robotics / Groover M P / Pearson Edu.
2. Introduction to Robotic Mechanics and Control by JJ Craig, Pearson, 3rd edition.

REFERENCES:

- 1 Robotics / Fu K S/ McGraw Hill.
- 2 Robotic Engineering / Richard D. Klafter, Prentice Hall
- 3 Robot Analysis and Intelligence / Asada and Slotine / Wiley Inter-Science.
- 4 Robot Dynamics & Control – Mark W. Spong and M. Vidyasagar / John Wiley
- 5 Introduction to Robotics by SK Saha, The McGrah Hill Company, 6th, 2012
- 6 Robotics and Control / Mittal R K & Nagrath I J / TMH



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India

I Year II Semester	MODELING AND SIMULATION OF MANUFACTURING SYSTEMS	L	P	C
		3	0	3

Unit-I

Introduction to System and simulation: Concept of system and elements of system, Discrete and continuous system, Models of system and Principles of modeling and simulation, Monte carlo simulation, Types of simulation, Steps in simulation model, Advantages, limitations and applications of simulation, Applications of simulation in manufacturing system

Unit-II

Review of statistics and probability: Types of discrete and continuous probability distributions such as Geometric, Poisson, Uniform, Geometric distribution with examples, Normal, Exponential distribution with examples.

Unit-III

Random numbers: Need for RNs, Technique for Random number generation such as Mid product method, Mid square method, and Linear congruential method with examples
Test for Random numbers: Uniformity - Chi square test or Kolmogorov Smirnov test, Independency- Auto correlation test
Random Variate generation: Technique for Random variate generation such as Inverse transforms technique or Rejection method

Unit-IV

Analysis of simulation data: Input data analysis, Verification and validation of simulation models, Output data analysis
Simulation languages: History of simulation languages, Comparison and selection of simulation languages
Design and evaluation of simulation experiments: Development and analysis of simulation models using simulation language with different manufacturing systems

Unit-V

Queueing models: An introduction, M/M/1 and M/M/m Models with examples, Open Queueing and Closed queueing network with examples

Markov chain models and others: Discrete time markov chain with examples, Continues time markov chain with examples, stochastic process in manufacturing, Game theory

TEXT BOOKS:

1. J.Banks, J.S. Carson, B. L. Nelson and D.M. Nicol, "Discrete Event System Simulation", PHI, New Delhi, 2009.
2. A.M. Law and W.D.Kelton, "Simulation Modeling and Analysis", Tata McGraw Hill Ltd, New Delhi, 2008.
3. N. Viswanadham and Y. Narahari, "Performance Modeling of Automated Manufacturing Systems", PHI, New Delhi, 2007



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India**

I Year I Semester	ADVANCED CAD LAB	L	P	C
		0	4	2

Students shall carry out the modeling and FE analysis of the following to predict deflection and stress distributions :

1. Trussess – 2D and 3D
2. Beams
3. Plate with Plane stress condition
4. Plate with Plane strain condition
5. Cylinders – Axi-symmetric condition
6. Natural frequencies of Beam



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I Year I Semester	ADVANCED MANUFACTURING LAB	L	P	C
		0	4	2

1. Casting processes - Study of Solidification, temperatures, metallurgical phases.
2. Forging processes - Study of hot working processes and extrusion
3. Forming Processes – Study of blanking, bending and deep drawing
4. Welding Processes – Study of arc, and spot welding processes
5. Powder metallurgy- Study of Green Density and sintering density
6. Additive Manufacturing – Study of simple parts in 3D printing
7. Machining- Estimation of chip reduction coefficient and shear angle in orthogonal turning, Measurement of cutting forces and average cutting temperature, and Estimation of tool life of a single point turning tool.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India

I Year I Semester	RESEARCH METHODOLOGY AND IPR	L	P	C
		2	0	2

Unit 1: Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

Unit 2: Effective literature studies approaches, analysis Plagiarism, Research ethics, Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

Unit 3: Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

Unit 4: Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

Unit 5: New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

References:

- (1) Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students"
- (2) Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"
- (3) Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners"
- (4) Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.
- (5) Mayall, "Industrial Design", McGraw Hill, 1992.
- (6) Niebel, "Product Design", McGraw Hill, 1974.
- (7) Asimov, "Introduction to Design", Prentice Hall, 1962.
- (8) (8) Robert P. Merges, Peter S. Menell, Mark A. Lemley, " Intellectual Property in New Technological Age", 2016.
- (9) T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008



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COURSE OUTCOMES: At the end of this course, students will be able to

CO1: Understand research problem formulation.

CO2: Analyze research related information

CO3: Follow research ethics

CO4: Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.

CO5: Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasize the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.

CO6: Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India

I Year I Semester	WRITING SKILLS FOR SCIENTIFIC COMMUNICATION	L	P	C
		2	0	0

Unit-1:

Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness, Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising.

Unit-2: Paraphrasing and Plagiarism, Sections of a Paper, Abstracts, Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

Unit-3:

Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature.

Unit-4:

Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions.

Unit-5:

Useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

Suggested Studies:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman'sbook .
4. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

COURSE OUTCOMES: The Students will be able to

CO1. Understand that how to improve your writing skills and level of readability

CO2. Learn about what to write in each section

CO3. Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India**

I Year II Semester	THEORY OF ELASTICITY AND PLASTICITY	L	P	C
		3	0	3

UNIT-I

INTRODUCTION: Elasticity –Notation for forces and stresses-Components of stresses –components of strain –Hooke’s law.

PLANE STRESS AND PLANE STRAIN ANALYSIS: Plane stress-plane strain-Differential equations of equilibrium- Boundary conditions- Compatibility equations-stress function-Boundary conditions.

UNIT-II

TWO DIMENSIONAL PROBLEMS IN RECTANGULAR COORDINATES: Solution by polynomials-Saint Venant’s principle-Determination of displacements-bending of simple beams-application of Fourier series for two dimensional problems - gravity loading.

TWO DIMENSIONAL PROBLEMS IN POLAR COORDINATES :General Equation in polar coordinates - stress distribution symmetrical about an axis –Pure bending of curved bars- strain components in polar coordinates-Displacements for symmetrical stress distributions-simple symmetric and asymmetric problems-General solution of two dimensional problem in polar coordinates-Application of the general solution of two dimensional problem in polar coordinates-Application of the general solution in polar coordinates.

UNIT-III

ANALYSIS OF STRESS AND STRAIN IN THREE DIMENSIONS: Principle stress - ellipsoid and stress-director surface-Determination of principle stresses- Maximum shear stresses-Homogeneous deformation-principle axis of strain rotation.

GENERAL THEOREMS: Balance laws - Differential equations of equilibrium- conditions of compatibility - Determination of displacement-Equations of equilibrium in terms of displacements-principle of superposition-Uniqueness of solution –the Reciprocal theorem.

UNIT-IV

TORSION OF PRISMATIC BARS: General solution of problems by displacement (St. Venant’s warping function) & force (Prandtl’s stress function) approaches - Membrane analogy - Torsion of circular and non-circular (elliptic and rectangular) sections - Torsion of thin rectangular section and hollow thin walled section - Single and multi-celled sections.

UNIT-V

THEORY OF PLASTICITY: Stress-strain curve - Theories of strength and failure –Yield Criteria - Yield Surface – Plastic Flow – Plastic Work – Plastic Potential – Strain hardening

Text Books:

1. Timoshenko, S., Theory of Elasticity and Plasticity, MC Graw Hill Book company.
2. Sadhu Singh, Theory of Elasticity and Plasticity, Khanna Publishers.

Reference Books:

1. Papov, Advanced Strength of materials, MC Graw Hill Book Company.
2. Chen, W.F. and Han, D.J, Plasticity for structural Engineers, Springer-Verlag, New York.
3. Lubliner, J., Plasticity Theory, Mac Millan Publishing Co., New York.
4. Y.C.Fung., Foundations of Solid Mechanics, Prentice Hall India



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India

I Year II Semester	ADVANCED MANUFACTURING PROCESSES	L	P	C
		3	0	3

UNIT-I

SURFACE TREATMENT: Scope, Cleaners, Methods of cleaning, Surface coating types, and ceramic and organic methods of coating, economics of coating. Electro forming, Chemical vapor deposition, thermal spraying, Ion implantation, diffusion coating, Diamond coating and cladding.

UNIT- II

PROCESSING OF CERAMICS: Applications, characteristics, classification .Processing of particulate ceramics, Powder preparations, consolidation, Drying, sintering, Hot compaction, Area of application, finishing of ceramics. Processing of Composites: Composite Layers, Particulate and fiber reinforced composites, Elastomers, Reinforced plastics, MMC, CMC, Polymer matrix composites.

UNIT- III

FABRICATION OF MICROELECTRONIC DEVICES:

Crystal growth and wafer preparation, Film Deposition oxidation, lithography, bonding and packaging, reliability and yield, Printed Circuit boards, computer aided design in micro electronics, surface mount technology, Integrated circuit economics.

UNIT - IV

ADVANCED MACHINING PROCESSES: EDM, WireEDM, ECM, LBM, EBM, AJM, WJM – Principle, working, limitations and applications.

UNIT -V

RAPID PROTOTYPING: Working Principles, Methods, Stereo Lithography, Laser Sintering, Fused Deposition Method, Applications and Limitations, Rapid tooling, Techniques of rapid manufacturing

TEXT BOOKS:

1. Manufacturing Engineering and Technology / Kalpakijian / Adisson Wesley, 1995.
2. Process and Materials of Manufacturing / R. A. Lindburg / 1th edition, PHI 1990.

REFERENCES:

- 1 Microelectronic packaging handbook / Rao. R. Thummala and Eugene, J. Rymaszewski / Van Nostrand Renihold,
- 2 MEMS & Micro Systems Design and manufacture / Tai — Run Hsu / TMGH
- 3 Advanced Machining Processes / V.K.Jain / Allied Publications.

Introduction to Manufacturing Processes / John A Schey / Mc Graw Hill



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India

I Year II Semester	FINITE ELEMENT METHOD	L	P	C
		3	0	3

UNIT - I

Formulation Techniques: Methodology, Engineering problems and governing differential equations, finite elements., Variational methods-potential energy method, Raleigh Ritz method, strong and weak forms, Galerkin and weighted residual methods, calculus of variations, Essential and natural boundary conditions.

UNIT – II

One-dimensional elements: Bar, trusses, beams and frames, displacements, stresses and temperature effects.

UNIT – III

Two dimensional problems: CST, LST, four noded and eight noded rectangular elements, Lagrange basis for triangles and rectangles, serendipity interpolation functions. Axisymmetric Problems: Axisymmetric formulations, Element matrices, boundary conditions. Heat Transfer problems: Conduction and convection, examples: - two-dimensional fin.

UNIT – IV

Isoparametric formulation: Concepts, sub parametric, super parametric elements, numerical integration, Requirements for convergence, h-refinement and p-refinement, complete and incomplete interpolation functions, Pascal's triangle, Patch test.

UNIT – V

Finite elements in Structural Analysis: Static and dynamic analysis, eigen value problems, and their solution methods, case studies using commercial finite element packages.

TEXT BOOK :

1. Finite element methods by Chandrupatla & Belagundu.

REFERENCES:

1. J.N. Reddy, Finite element method in Heat transfer and fluid dynamics, CRC press,1994
2. Zienkiwicz O.C. & R. L. Taylor, Finite Element Method, McGraw-Hill,1983.
3. K. J. Bathe, Finite element procedures, Prentice-Hall, 1996



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India

I Year II Semester	FRACTURE MECHANICS (ELECTIVE III)	L	P	C
		3	0	3

UNIT-I

Introduction: Prediction of mechanical failure. Macroscopic failure modes; brittle and ductile behaviour. Fracture in brittle and ductile materials – characteristics of fracture surfaces; inter-granular and intra-granular failure, cleavage and micro-ductility, growth of fatigue cracks, The ductile/brittle fracture transition temperature for notched and unnotched components. Fracture at elevated temperature.

UNIT-II

Griffiths analysis: Concept of energy release rate, G , and fracture energy, R . Modification for ductile materials, loading conditions. Concept of R curves.

Linear Elastic Fracture Mechanics, (LEFM). Three loading modes and the state of stress ahead of the crack tip, stress concentration factor, stress intensity factor and the material parameter the critical stress intensity factor, crack tip plasticity, effect of thickness on fracture toughness.

UNIT-III

Elastic-Plastic Fracture Mechanics; (EPFM). The definition of alternative failure prediction parameters, Crack Tip Opening Displacement, and the J integral. Measurement of parameters and examples of use.

UNIT-IV

Fatigue: definition of terms used to describe fatigue cycles, High Cycle Fatigue, Low Cycle Fatigue, mean stress R ratio, strain and load control. $S-N$ curves. Goodmans rule and Miners rule. Micromechanisms of fatigue damage, fatigue limits and initiation and propagation control, leading to a consideration of factors enhancing fatigue resistance. Total life and damage tolerant approaches to life prediction.

UNIT-V

Creep deformation: the evolution of creep damage, primary, secondary and tertiary creep. Micro-mechanisms of creep in materials and the role of diffusion. Ashby creep deformation maps. Stress dependence of creep – power law dependence. Comparison of creep performance under different conditions – extrapolation and the use of Larson-Miller parameters. Creep-fatigue interactions. Examples.



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KAKINADA - 533 003, Andhra Pradesh, India**

TEXT BOOKS:

1. T.L. Anderson, Fracture Mechanics Fundamentals and Applications, 2nd Ed. CRC press, (1995)
2. J.F. Knott, Fundamentals of Fracture Mechanics, Butterworths (1973)
3. G. E. Dieter, Mechanical Metallurgy, McGraw Hill, (1988)
4. S. Suresh, Fatigue of Materials, Cambridge University Press, (1998)

REFERENCES:

1. B. Lawn, Fracture of Brittle Solids, Cambridge Solid State Science Series 2nd ed 1993.
2. J.F. Knott, P Withey, Worked examples in Fracture Mechanics, Institute of Materials.
3. H.L. Ewald and R.J.H. Wanhill Fracture Mechanics, Edward Arnold, (1984).
4. L.B. Freund and S. Suresh, Thin Film Materials Cambridge University Press, (2003).
9. D.C. Stouffer and L.T. Dame, Inelastic Deformation of Metals, Wiley (1996)



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India

I Year II Semester	PRODUCT DESIGN AND DEVELOPMENT	L	P	C
		3	0	3

UNIT I

Introduction: Classification/Specifications of Products, Product life cycle. Product mix, Introduction to product design, Modern product development process, Innovative thinking.

UNIT II

Morphology of design. Conceptual Design: Generation, selection & embodiment of concept. Product architecture, Industrial design: process, need, Robust Design: Taguchi Designs & DOE, Design Optimization.

UNIT III

Design for Mfg& Assembly: Methods of designing for Manufacturing and assembly, Designs for Maintainability, Designs for Environment, Product costing, Legal factors and social issues, Engineering ethics and issues of society related to design of products. Value Engineering / Value Analysis. : Definition. Methodology, Case studies.

UNIT IV

Economic analysis: Qualitative & Quantitative. Ergonomics / Aesthetics: Gross human autonomy, Anthropometry, Man-Machine interaction, Concepts of size and texture, colour .Comfort criteria, Psychological & Physiological considerations.

UNIT V

Creativity Techniques: Creative thinking, conceptualization, brain storming, primary design, drawing, simulation, detail design. Concurrent Engineering, Rapid prototyping, Tools for product design – Drafting / Modeling software, CAM Interface, Patents & IP Acts. Overview, Disclosure preparation.

Text Books:

1. Karl T Ulrich, Steven D Eppinger , “ Product Design & Development.” Tata McGrawhill New Delhi 2003.
2. David G Ullman, “The Mechanical Design Process.” McGrawhill Inc Singapore 1992 N J M Roozenberg , J Ekels , N F M Roozenberg “ Product Design Fundamentals and Methods .” John Willey & Sons 1995.
3. Kevin Otto & Kristin Wood Product Design: “Techniques in Reverse Engineering and New Product Development.” 1 / e 2004 , Pearson Education New Delhi. References:
4. L D Miles “Value Engineering.”
5. Hollins B & Pugh S “Successful Product Design.” Butter worths London.
6. Baldwin E N & Neibel B W “Designing for Production.” Edwin Homewood Illinois
7. Jones J C “Design Methods.” Seeds of Human Futures. John Willey New York.
8. Bralla J G “Handbook of Product Design for Manufacture, McGrawhill New York



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India

I Year II Semester	MATERIALS CHARACTERIZATION TECHNIQUES	L	P	C
		3	0	3

UNIT I

Introduction to materials and Techniques, Structure analysis tools: X-ray diffraction: phase identification, indexing and lattice parameter determination, Analytical line profile fitting using various models, Neutron diffraction, Reflection High Energy Electron Diffraction, and Low Energy Electron Diffraction.

UNIT II

Microscopy techniques: Optical microscopy, transmission electron microscopy (TEM), energy dispersive X-ray microanalysis (EDS), scanning electron microscopy (SEM), Rutherford backscattering spectrometry (RBS), atomic force microscopy (AFM) and scanning probe microscopy (SPM).

UNIT III

Thermal analysis technique: Differential thermal analysis (DTA), Differential Scanning Calorimetry (DSC), Thermogravimetric analysis (TGA); Electrical characterization techniques: Electrical resistivity, Hall effect, Magnetoresistance.

UNIT IV

Magnetic characterization techniques: Introduction to Magnetism, Measurement Methods, Measuring Magnetization by Force, Measuring Magnetization by Induction method, Types of measurements using magnetometers: M-H loop, temperature dependent magnetization, time dependent magnetization, Measurements using AC susceptibility, Magneto-optical Kerr effect, Nuclear Magnetic Resonance, Electron Spin Resonance.

UNIT V

Optical and electronic characterization techniques: UV-VIS spectroscopy, Fourier transform infrared spectroscopy, Raman spectroscopy, X-ray photoelectron spectroscopy.

TEXT BOOKS:

1. Characterization of Materials (Materials Science and Technology: A Comprehensive Treatment, Vol 2A & 2B, VCH (1992).
2. Semiconductor Material and Device Characterization, 3rd Edition, D. K. Schroder, Wiley-IEEE Press (2006).
3. Materials Characterization Techniques, S Zhang, L. Li and Shok Kumar, CRC Press (2008).

REFERENCES:

1. Physical methods for Materials Characterization, P. E. J. Flewitt and R. K. Wild, IOP Publishing (2003).
2. Characterization of Nanophase materials, Ed. Z. L. Wang, Wiley-VCH (2000).



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India

I Year II Semester	OPTIMIZATION AND RELIABILITY	L	P	C
		3	0	3

UNIT - I

CLASSICAL OPTIMIZATION TECHNIQUES: Single variable optimization with and without constraints, multi – variable optimization without constraints, multi – variable optimization with constraints – method of Lagrange multipliers, Kuhn-Tucker conditions, merits and demerits of classical optimization techniques.

UNIT - II

NUMERICAL METHODS FOR OPTIMIZATION: Nelder Mead’s Simplex search method, Gradient of a function, Steepest descent method, Newton’s method, Pattern search methods, conjugate method, types of penalty methods for handling constraints, advantages of numerical methods.

UNIT - III

GENETIC ALGORITHM (GA) : Differences and similarities between conventional and evolutionary algorithms, working principle, reproduction, crossover, mutation, termination criteria, different reproduction and crossover operators, GA for constrained optimization, draw backs of GA,

GENETIC PROGRAMMING (GP): Principles of genetic programming, terminal sets, functional sets, differences between GA & GP, random population generation, solving differential equations using GP.

MULTI-OBJECTIVE GA: Pareto’s analysis, Non-dominated front, multi – objective GA, Non-dominated sorted GA, convergence criterion, applications of multi-objective problems .

UNIT – IV

APPLICATIONS OF OPTIMIZATION IN DESIGN AND MANUFACTURING SYSTEMS: Some typical applications like optimization of path synthesis of a four-bar mechanism, minimization of weight of a cantilever beam, optimization of springs and gears, general optimization model of a machining process, optimization of arc welding parameters, and general procedure in optimizing machining operations sequence.

UNIT V

RELIABILITY: Concepts of Engineering Statistics, risk and reliability, probabilistic approach to design, reliability theory, design for reliability, numerical problems, hazard analysis.

TEXT BOOKS:

1. Optimization for Engineering Design – Kalyanmoy Deb, PHI Publishers
2. Engineering Optimization – S.S.Rao, New Age Publishers
3. Reliability Engineering by L.S.Srinath
4. Multi objective genetic algorithm by Kalyanmoy Deb, PHI Publishers.

REFERENCES:

1. Genetic algorithms in Search, Optimization, and Machine learning – D.E.Goldberg, Addison-Wesley Publishers
2. Multi objective Genetic algorithms - Kalyanmoy Deb, PHI Publishers
3. Optimal design – Jasbir Arora, Mc Graw Hill (International) Publishers
4. An Introduction to Reliability and Maintainability Engineering by CE Ebeling, Waveland Printers Inc., 2009
5. Reliability Theory and Practice by I Bazovsky, Dover Publications, 2013



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India

I Year II Semester	ADDITIVE MANUFACTURING	L	P	C
		3	0	3

UNIT I

Additive Manufacturing Process: Basic Principles of the Additive Manufacturing Process, Generation of Layer Information, Physical Principles for Layer Generation. Elements for Generating the Physical Layer, Classification of Additive Manufacturing Processes, Evaluation of the Theoretical Potentials of Rapid Prototyping Processes.

UNIT II

Machines for Rapid Prototyping: Overview of Polymerization: Stereolithography (SL), Sintering/Selective Sintering: Melting in the Powder Bed, Layer Laminate Manufacturing (LLM) and Three-Dimensional Printing (3DP).

UNIT III

Rapid Prototyping: Classification and Definition, Strategic Aspects for the Use of Prototypes, Applications of Rapid Prototyping in Industrial Product Development. Rapid Tooling: Classification and Definition of Terms, Properties of Additive Manufactured Tools, Indirect Rapid

UNIT IV

Tooling Processes: Molding Processes and Follow-up Processes, Indirect Methods for the Manufacture of Tools for Plastic Components, Indirect Methods for the Manufacture of Metal Components.

UNIT V

Direct Rapid Tooling Processes: Prototype Tooling: Tools Based on Plastic Rapid Prototyping Models and Methods, Metal Tools Based on Multilevel AM Processes, Direct Tooling: Tools Based on Metal Rapid Prototype Processes.

Text Books:

1. Andreas Gebhardt Jan-Steffen Hötter, Additive Manufacturing: 3D Printing for Prototyping and Manufacturing, Hanser Publications, 6915 Valley Avenue, Cincinnati, Ohio.
2. Ian Gibson, David Rosen, Brent Stucker, Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing, Second Edition, Springer New York Heidelberg Dordrecht London.

References:

1. Liou L.W. and Liou F.W., "Rapid Prototyping and Engineering applications : A tool box for prototype development", CRC Press, 2007.
2. Kamrani A.K. and Nasr E.A., "Rapid Prototyping: Theory and practice", Springer, 2006.
3. Hilton P.D. and Jacobs P.F., "Rapid Tooling: Technologies and Industrial Applications", CRC press, 2000.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India

I Year II Semester	MATERIAL CHARACTERIZATION LAB	L	P	C
		0	4	2

COURSE OUTCOMES:

- (1) Microscopy: Different microscopy techniques, Resolution, Magnification, Depth of field Imaging – theory and concepts.
- (2) Optical Microscopy: Grain size estimation, Phase Percentage Estimation
- (3) Micro hardness evaluation of Ferrous and Non ferrous metals.
- (4) Testing of Tensile Properties of mild steel material
- (5) Testing of Compression Properties
- (6) Testing of Flexural Strength on Ferrous metals.
- (7) Evaluation of Tribological properties of Ferrous and Non ferrous metals through Pin on Disc Tester.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India

I Year II Semester	SIMULATION OF MANUFACTURING SYSTEMS LAB	L	P	C
		0	4	2

1. Casting processes - Simulation of Solidification, temperatures, Residual stresses, metallurgical phases etc.
2. Bulk Forming processes - Simulation of cold working and hot working processes for extrusion, drawing, rolling, etc.
3. Sheet Metal Forming Processes – Simulation of blanking, bending, deep drawing, etc.
4. Welding Processes – Simulation of arc, spot, laser welding, etc
5. Machining Processes- Simulation of Turning, Milling and Shaping operations.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India

I Year II Semester	MINI PROJECT WITH SEMINAR	L	P	C
		2	0	2



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India

I Year II Semester	PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS	L	P	C
		2	0	0

UNIT I

Introduction to Personality Development The concept of personality - Dimensions of personality – Theories of Freud & Erickson-Significance of personality development. The concept of success and failure: What is success? - Hurdles in achieving success - Overcoming hurdles - Factors responsible for success – What is failure - Causes of failure. SWOT analysis.

UNIT II

Attitude & Motivation Attitude - Concept - Significance - Factors affecting attitudes - Positive attitude – Advantages –Negative attitude- Disadvantages - Ways to develop positive attitude - Differences between personalities having positive and negative attitude. Concept of motivation - Significance – Internal and external motives - Importance of self- motivation- Factors leading to de-motivation

UNIT III

Self-esteem Term self-esteem - Symptoms - Advantages - Do's and Don'ts to develop positive self-esteem – Low self-esteem - Symptoms - Personality having low self esteem - Positive and negative self esteem. Interpersonal Relationships – Defining the difference between aggressive, submissive and assertive behaviours - Lateral thinking.

UNIT IV

Other Aspects of Personality Development Body language - Problem-solving - Conflict and Stress Management - Decision-making skills - Leadership and qualities of a successful leader – Character building -Team-work – Time management - Work ethics –Good manners and etiquette.

UNIT V

Employability Quotient Resume building- The art of participating in Group Discussion – Facing the Personal (HR & Technical) Interview -Frequently Asked Questions - Psychometric Analysis - Mock Interview Sessions.

Text Books:

1. Hurlock, E.B (2006). Personality Development, 28th Reprint. New Delhi: Tata McGraw Hill.
2. Stephen P. Robbins and Timothy A. Judge(2014), Organizational Behavior 16th Edition: Prentice Hall.

Reference Books:

1. Andrews, Sudhir. How to Succeed at Interviews. 21st (rep.) New Delhi.Tata McGraw-Hill 1988.
2. Heller, Robert.Effective leadership. Essential Manager series. Dk Publishing, 2002
3. Hindle, Tim. Reducing Stress. Essential Manager series. Dk Publishing, 2003
4. Lucas, Stephen. Art of Public Speaking. New Delhi. Tata - Mc-Graw Hill. 2001
5. Mile, D.J Power of positive thinking. Delhi. Rohan Book Company, (2004).
6. Pravesh Kumar. All about Self- Motivation. New Delhi. Goodwill Publishing House. 2005.
7. Smith, B . Body Language. Delhi: Rohan Book Company. 2004



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India

II Year I Semester	NON DESTRUCTIVE EVALUATION	L	P	C
		3	0	3

UNIT – I

General Methods: Flaw Detection Using Dye Penetrants. Magnetic Particle Inspection introduction to electrical impedance, Principles of Eddy Current testing, Flaw detection using eddy currents.

UNIT – II

X-Ray Radiography: The Radiographic process, X-Ray and Gamma-ray sources, Geometric Principles, Factors Governing Exposure, Radio graphic screens, Scattered radiation, Arithmetic of exposure, Radiographic image quality and detail visibility, Industrial X-Ray films, Fundamentals of processing techniques, Process control, The processing Room, Special Processing techniques, Paper Radiography, Sensitometric characteristics of x-ray films, Film graininess signal to noise ratio in radiographs, The photographic latent image, Radiation Protection,

UNIT – III

Generation of ultrasonic waves, Horizontal and shear waves, Near field and far field acoustic wave description, Ultrasonic probes- straight beam, direct contact type, Angle beam, Transmission/reflection type, and delay line transducers, acoustic coupling and media, Transmission and pulse echo methods, A-scan, B-scan, C-scan, F-scan and P-scan modes, Flaw sizing in ultrasonic inspection: AVG, Amplitude, Transmission, TOFD, Satellite pulse, Multi-modal transducer, Zonal method using focused beam. Flow location methods, Signal processing in Ultrasonic NDT; Mimics, spurious echos and noise. Ultrasonic flaw evaluation.

UNIT – IV

Holography: Principles and practices of Optical holography, acoustical, microwave, x-ray and electron beam holography techniques.

UNIT – V

Applications: NDT in flaw analysis of Pressure vessels, piping, NDT in Castings, Welded constructions, etc., Case studies.

TEXT BOOKS:

1. Ultrasonic testing by Krautkramer and Krautkramer
2. Ultrasonic inspection 2 Training for NDT : E. A. Gingel, Prometheus Press,
3. ASTM Standards, Vol 3.01, Metals and alloys



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India

II Year I Semester	QUALITY ENGINEERING IN MANUFACTURING (ELECTIVE III)	L	P	C
		3	0	3

UNIT - I

QUALITY VALUE AND ENGINEERING: An overall quality system, quality engineering in production design, quality engineering in design of production processes. Loss Function and Quality Level: Derivation and use of quadratle loss function, economic consequences of tightening tolerances as a means to improve quality, evaluations and types tolerances.(N-type,S-type and L-type)

UNIT II:

TOLERANCE DESIGN AND TOLERANCING: Functional limits, tolerance design for N-type. L-type and S-type characteristics, tolerance allocation fbr multiple components. Parameter and Tolerance Design: Introduction to parameter design, signal to noise ratios, Parameter design strategy, some of the case studies on parameter and tolerance designs.

UNIT – III

ANALYSIS OF VARIANCE (ANOVA): Introduction to ANOVA, Need for ANOVA, NO-way ANOVA, One-way ANOVA, Two-way ANOVA, Critique of F-test, ANOVA for four level factors, multiple level factors.

UNIT - IV

ORTHOGONAL ARRAYS: Typical test strategies, better test strategies, efficient test strategies, steps in designing, conducting and analyzing an experiment. Interpolation of Experimental Results: Interpretation methods, percent contributor, estimating the mean.

UNIT - V

SIX SIGMA AND THE TECHNICAL SYSTEM: Six sigma DMAIC methodology, tools for process improvement, six sigma in services and small organizations, statistical foundations, statistical methodology.

TEXT BOOK:

1. Taguchi Techniques for Quality Engineering / Phillip J. Ross / McGraw Hill/ Intl. II Edition, 1995.

REFERENCES:

1. Quality Engineering in Production systems by G. Taguchi, A. Elsayed et al, McGraw Hill Intl. Pub 1989.
2. Taguchi Methods explained: Practical steps to Robust Design / Papan P. Bagchi / Prentice Hall Pvt.Ltd. New Delhi



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India

II Year I Semester	GREEN MANUFACTURING	L	P	C
		3	0	3



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KAKINADA - 533 003, Andhra Pradesh, India

II Year I Semester	MOOCS/ NPTEL	L	P	C
		3	0	3



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India

II Year I Semester	NANO TECHNOLOGY (ELECTIVE I)	L	P	C
		3	0	3

UNIT-I Introduction, Size and shape dependence of material properties at the nanoscale, scaling relations, can nanorobots walk and nanoplanes fly, Nano scale elements in conventional technologies, Mechanics at nanoscale Enhancement of mechanical properties with decreasing size, Nanoelectromechanical systems, nano machines, Nano fluidics, filtration, sorting, Molecular motors, Application of Nano Technology.

UNIT-II

Nano material Synthesis Techniques: Top-down and bottom-up nanofabrication, Synthesis of nano composites, The Intel-IBM approach to nanotechnology: lithography, etching, ion implantation, thin film deposition, nano coatings and nano indentation, Electron beam lithography, Soft lithography: nanoimprinting and micro-contact printing, Solution/plasma-phase nanofabrication, sol-gel methods, template techniques.

UNIT-III

Imaging/characterization of nanostructures General considerations for imaging, Scanning probe techniques: XRD, SEM, TEM, AFM and NSOM.

UNIT-IV

Metal and semiconductor nanoparticles Synthesis, stability, control of size, Optical and electronic properties, Ultra-sensitive imaging and detection with nano particles, bioengineering applications, Catalysis. Semiconductor and metal nanowires Vapor/liquid/solid growth and other synthesis techniques, Nanowire transistors and sensors.

UNIT-V

Carbon nanotubes

Structure and synthesis, Electronic, vibrational, and mechanical properties, How can C nanotubes enable faster computers, brighter TV screens, and stronger mechanical reinforcement?

TEXT BOOKS:

1. Nanoscale Science and Technology by Kelsall, Hamley, and Geoghegan, Wiley (2005)
2. Introduction to Nanoscale Science and Technology by Di Ventra, Evoy, and Heflin, Kluwer Academic Publishers (2004).

REFERENCES:

1. Introduction to Nanotechnology by Poole and Owens, Wiley (2003)
2. Nanochemistry: A Chemical Approach to Nanomaterials, Ozin and Arsenault, RSC Publishing (2006).



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
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II Year I Semester	OPTIMIZATION TECHNIQUES	L	P	C
		3	0	3



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KAKINADA - 533 003, Andhra Pradesh, India

II Year I Semester	PRODUCT DESIGN AND MANUFACTURING	L	P	C
		3	0	3



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KAKINADA - 533 003, Andhra Pradesh, India

II Year I Semester	PROJECT /DISSERTATION PHASE-I	L	P	C
		0	20	10



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KAKINADA - 533 003, Andhra Pradesh, India

II Year II Semester	PROJECT /DISSERTATION PHASE-II	L	P	C
		0	32	16



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

**COURSE STRUCTURE & SYLLABUS for
M.Tech EEE Common for**

- I. Power Electronics (PE)
- II. Power and Industrial Drives (P&ID)
- III. Power Electronics and Electrical Drives (PE &ED)
- IV. Power Electronics and Drives (PE&D)
- V. Power Electronics and systems (PE&S)
- VI. Electrical Machines and Drives (EM&D)

Programme

(Applicable for batches admitted from 2019-2020)



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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

COURSE STRUCTURE

I Semester

S.No	Course No	Category	Course Name	P.Os	L	T	P	C	Marks
1		PC	Electrical Machine Modeling and Analysis		3	0	0	3	100
2		PC	Analysis of Power Electronic Converters		3	0	0	3	100
3		PE	Elective – I i. Modern Control Theory ii. Power Quality and Custom Power Devices iii. Programmable Logic Controllers & Applications		3	0	0	3	100
4		PE	Elective – II i. Artificial Intelligence Techniques ii. Renewable Energy Technologies iii. HVDC Transmission and Flexible AC Transmission Systems		3	0	0	3	100
5			Research Methodology and IPR		2	0	0	2	100
6			Power Electronics Simulation Laboratory		0	0	4	2	100
7			Power Converters Laboratory		0	0	4	2	100
8			Audit Course – 1		2	0	0	0	100
					16	0	8	18	800

II Semester

S.No	Course No	Category	Course Name	P.Os	L	T	P	C	Marks
1		PC	Switched Mode Power Conversion		3	0	0	3	100
2		PC	Power Electronic Control of Electrical Drives		3	0	0	3	100
3		PE	Elective – III i. Control & Integration of Renewable Energy Systems ii. Hybrid Electric Vehicles iii. Digital Control Systems		3	0	0	3	100
4		PE	Elective – IV i. Advanced Digital Signal Processing ii. Applications of Power Converters iii. Microcontrollers		3	0	0	3	100
5			Electric Drives Simulation Laboratory		0	0	4	2	100
6			Electric Drives Laboratory		0	0	4	2	100
7			Mini Project with Seminar		0	0	4	2	100
8			Audit Course – 2		2	0	0	0	100
					14	0	12	18	800



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III Semester

S.No	Course No	Category	Course Name	P.Os	L	T	P	C	Marks
1		PE	Program Elective – V i. Digital Signal Processing Controlled Drives ii. Smart Grid Technologies iii. Modeling & Simulation of Power Electronic Systems		3	0	0	3	100
2		OE	Open Elective i. Industrial Safety ii. Energy Audit, Conservation & Management iii. Composite Materials		3	0	0	3	100
3			Dissertation Phase - I (to be continued and evaluated next semester)		0	0	20	10	---
					6	0	20	16	200

IV Semester

S.No	Course No	Category	Course Name	T	P	C	Marks
1			Dissertation Phase-II (continued from III semester)	0	32	16	100
				0	32	16	100

Audit course 1 & 2

1. English for Research Paper Writing
2. Disaster Management
3. Sanskrit for Technical Knowledge
4. Value Education
5. Constitution of India
6. Pedagogy Studies
7. Stress Management by Yoga
8. Personality Development through Life Enlightenment Skills.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

I- Semester	Electrical Machines Modeling and Analysis	Category	L-T-P	Credits
			3-0-0	3

Pre-requisite: Electrical machines & Special machines.

Course Educational Objectives:

- To know the concepts of generalized theory of electrical machines.
- To represent the DC and AC machines as Basic Two Pole machine.
- To model the electrical machines with voltage, current, torque and speed equations.
- To investigate the steady state and transient behavior of the electrical machines.
- To understand the dynamic behavior of the AC machines.

UNIT– 1

Basic concepts of Modeling

Basic two-pole machine representation of Commutator machines, representations of 3-phase synchronous machine with and without damper bars and 3-phase induction machine, Kron's primitive Machine voltage, current and torque equations.

UNIT– 2

DC Machine Modeling

Mathematical model of separately excited D.C motor – Steady state analysis-transient State analysis-sudden application of inertia load-transfer function of separately excited D.C motor- Mathematical model of D.C Series motor, Shunt motor-Linearization techniques for small perturbations

UNIT– 3

Reference frame theory & Modeling of single phase Induction Machines

Linear transformation-Phase transformation - three phase to two phase transformation ($\alpha \beta 0$) and vice-versa, transformation to rotating reference frame, ($\alpha \beta 0$ to dqo) and vice versa -Power equivalence-Mathematical modeling of single phase induction machines.

UNIT– 4

Modeling of three phase Induction Machine

Generalized model in arbitrary reference frame-Derivation of commonly used induction machine models-Synchronously rotating reference frame model, Stator reference frame model-Rotor reference frame model--power equation, electromagnetic torque equation, state space model in induction motor with flux linkages as variables

UNIT– 5

Modeling of Synchronous Machine

Synchronous machine inductances –derivation of voltage equations in the rotor's dq0 reference frame electromagnetic torque-current in terms of flux linkages-three phase synchronous motor. State space models with flux linkages as variables.

Course Outcomes: At the end of the course, student will be able to

- Analyze the characteristics of different types of DC motors to design suitable controllers for different applications.
- Apply the knowledge of reference frame theory for AC machines to model the induction and Synchronous machines.
- Evaluate the steady state and transient behavior of induction and synchronous machines to propose the suitability of drives for different industrial applications
- Analyze the behavior of induction machines using voltage and torque equations.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

Text Books

1. Analysis of Electric Machinery and Drive Systems, 3rd Edition-Wiley-IEEE Press- Paul Krause, Oleg Wasynczuk, Scott D. Sudhoff, Steven Pekarek, Junr 2013.
2. Electric Motor Drives - Modeling, Analysis& control -R.Krishnan- Pearson Publications.

Reference Books:

1. Generalized theory of Electrical Machines -Fifth edition, Khanna Publishers P. S. Bimbhra, 1985.
2. Dynamic simulation of Electric machinery using MATLAB / Simulink –CheeMunOng- Prentice Hall, 2003.
3. Magneto electric devices transducers, transformers and machines-G. R. Slemon- Wiley in New York, London, 1966.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

I-Semester	Analysis of Power Electronic Converters	Category	L-T-P 3-0-0	Credits 3
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Pre-Requisite: Power Electronics.

Course Educational Objectives:

- To understand the control principle of ac to ac conversion with suitable power semi-conductor devices.
- To have the knowledge of ac to dc conversion and different ac to dc converter topologies.
- To understand the effect of operation of controlled rectifiers on p.f. and improvement of p.f. with PFC converters
- To acquire the knowledge on dc-ac converters and to know the different control techniques of dc-ac converters.
- To know multilevel inverter configuration to improve the quality of the inverter output voltage.

UNIT– 1

Overview of Switching Devices:

Power MOSFET, IGBT, GTO, GaN devices-static and dynamic characteristics, gate drive circuits for switching devices.

UNIT– 2

AC-DC converters: Single phase fully controlled converters with RL load– Evaluation of input power factor and harmonic factor- Continuous and Discontinuous load current, Power factor improvements, Extinction angle control, symmetrical angle control, PWM control. Three Phase AC-DC Converters, fully controlled converters feeding RL load with continuous and discontinuous load current, Evaluation of input power factor and harmonic factor-three phase dual converters.

UNIT– 3

Power Factor Correction Converters: Single-phase single stage boost power factor corrected rectifier, power circuit principle of operation, and steady state- analysis, three phase boost PFC converter

UNIT– 4

PWM Inverters: Principle of operation-Voltage control of single phase inverters - sinusoidal PWM – modified PWM – phase displacement Control – Trapezoidal, staircase, stepped, harmonic injection and delta modulation. Voltage Control of Three-Phase Inverters- Sinusoidal PWM- 60°PWM- Third Harmonic PWM- Space Vector Modulation- Comparison of PWM Techniques- Three phase current source inverters- Variable dc link inverter.

UNIT– 5

Multi level inverters: Introduction, Multilevel Concept, Types of Multilevel Inverters- Diode-Clamped Multilevel Inverter, Principle of Operation, Features of Diode-Clamped Inverter, Improved Diode-Clamped Inverter- Flying-Capacitors Multilevel Inverter- Principle of Operation, Features of Flying-Capacitors Inverter- Cascaded Multilevel Inverter- Principle of Operation- Features of Cascaded Inverter-Switching Device Currents-DC-Link Capacitor Voltage Balancing- Features of Multilevel Inverters- Comparisons of Multilevel Converters.

Course Outcomes: At the end of the course, student will be able to

- Describe and analyze the operation of AC-DC converters.
- Analyze the operation of power factor correction converters.
- Analyze the operation of three phase inverters with PWM control.
- Study the principles of operation of multi-level inverters and their applications.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

Text Books

1. Power Electronics: Converters, Applications, and Design- Ned Mohan, Tore M. Undeland, William P. Robbins, John Wiley & Sons, 2nd Edition, 2003.
2. Power Electronics-Md.H.Rashid –Pearson Education Third Edition- First Indian Reprint-2008.

Reference Books:

1. Power Electronics Daniel W. Hart - McGraw-Hill, 2011.
2. Elements of Power Electronics – Philip T. Krein, Oxford University press, 2014.
3. Power Converter Circuits – William Shepherd & Li Zhang-Yes Dee CRC Press, 2004.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

I-Semester	Modern Control Theory (Elective-I)	Category	L-T-P 3-0-0	Credits 3
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Pre-requisite:Control Systems, differential equations.

Course Educational Objectives:

- To facilitate the evolution of state variable approach for the analysis of control systems.
- To examine the importance of controllability and observability in modern control engineering.
- To enable students to analyze various types of nonlinearities & construction of trajectories using describing functions and phase plane analysis.
- To study the analysis of stability and instability of continuous time invariant system.

UNIT– 1

State Variable Analysis

The concept of state – State Equations for Dynamic systems– Solution of Linear Time Invariant Continuous-Time State Equations, State transition matrix and its properties. Controllability and Observability of state model in Jordan Canonical form - Controllability and Observability Canonical forms of State model

UNIT– 2

Design using state variable technique

Design of state feedback controller through pole placement technique-Necessary and sufficient condition-Ackermann's formula. Concept of observer-Design of full order state observer-reduced order observer.

UNIT– 3

Non Linear Systems

Classification of Nonlinearities- common physical nonlinearities– Characteristics of nonlinear systems - Singular Points –Linearization of nonlinear systems– Describing function – describing function analysis of nonlinear systems- Stability analysis of Nonlinear systems through describing functions.

UNIT– 4

Stability Analysis

Stability in the sense of Lyapunov, Lyapunov's stability and Lyapunov's instability theorems – Stability Analysis of Linear Continuous time invariant systems by Lyapunov method – Generation of Lyapunov functions – Variable gradient method – Krasoviski's method.

UNIT– 5

Introduction to Optimal Control

Minimization of functional of single function – Constrained minimization – Minimum principle – Control variable inequality constraints – Control and state variable inequality constraints – Euler Lagrangine equation.

Typical optimal control performance measures-optimal control based on Quadratic performance measures- Quadratic optimal regulator systems- State regulator problems –Output regulator problems, tracking problems; Riccati equation-Infinite time regulator problem-Reduce matrix Riccati equation-determination of optimal feedback gain matrix.

Course Outcomes: At the end of the course, student will be able to

- Formulate and solve the state equations of dynamic systems, analyze controllability and observability.
- Design a state feedback controller; design an observer.
- Linearize a nonlinear system model; analyze non-linear systems through describing functions.
- Determine the stability of a given system; generate a Lyapunov function.
- Minimize a given functional, design an optimal feedback gain matrix.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

Text Books:

1. Modern Control Engineering – by K. Ogata, Prentice Hall of India, 3rd edition, 1998.
2. Automatic Control Systems by B.C. Kuo, Prentice Hall Publication.

Reference Books:

1. Modern Control System Theory – by M. Gopal, New Age International Publishers, 2nd edition, 1996
2. Control Systems Engineering by I.J. Nagarath and M.Gopal, New Age International (P) Ltd.
3. Digital Control and State Variable Methods – by M. Gopal, Tata McGraw–Hill Companies, 1997.
4. Systems and Control by Stainslaw H. Zak , Oxford Press, 2003.
5. Optimal control theory: an Introduction by Donald E.Kirk by Dover publications.
6. Modern control systems, Richard C. Dorf and Robert H. Bishop, 11th Edition, Pearson Edu, India, 2009



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

I-Semester	Power Quality and Custom Power Devices (Elective-I)	Category	L-T-P 3-0-0	Credits 3
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Pre requisite: Knowledge on electric circuit analysis, power systems and power electronics and concept of reactive power compensation techniques.

Course Educational Objectives:

- To understand significance of power quality and power quality parameters.
- To know types of transient over voltages and protection of transient voltages.
- To understand harmonics, their effects, harmonic indices and harmonic minimization techniques.
- To understand the importance of power devices and their applications.
- To understand different compensation techniques to minimize power quality disturbances.

UNIT– 1

Introduction to power quality: Overview of Power Quality, Concern about the Power Quality, General Classes of Power Quality Problems, Voltage Unbalance, Waveform Distortion, Voltage fluctuation, Power Frequency Variations, Power Quality Terms, Voltage Sags, swells, flicker and Interruptions - Sources of voltage and current interruptions, Nonlinear loads.

UNIT– 2

Transient and Long Duration Voltage Variations: Source of Transient Over Voltages - Principles of Over Voltage Protection, Devices for Over Voltage Protection, Utility Capacitor Switching Transients, Utility Lightning Protection, Load Switching Transient Problems.

Principles of Regulating the Voltage, Device for Voltage Regulation, Utility Voltage Regulator Application, Capacitor for Voltage Regulation, End-user Capacitor Application, Regulating Utility Voltage with Distributed generation

UNIT– 3

Harmonic Distortion and solutions: Voltage vs. Current Distortion, Harmonics vs. Transients - Power System Quantities under Non-sinusoidal Conditions, Harmonic Indices, Sources of harmonics, Locating Sources of Harmonics, System Response Characteristics, Effects of Harmonic Distortion, Inter harmonics, Harmonic Solutions Harmonic Distortion Evaluation, Devices for Controlling Harmonic Distortion, Harmonic Filter Design, Standards on Harmonics

UNIT– 4

Custom Power Devices: Custom power and custom power devices, voltage source inverters, reactive power and harmonic compensation devices, compensation of voltage interruptions and current interruptions, static series and shunt compensators, compensation in distribution systems, interaction with distribution equipment, installation considerations.

UNIT– 5

Application of custom power devices in power systems: Static and hybrid Source Transfer Switches, Solid state current limiter - Solid state breaker. P-Q theory – Control of P and Q, Dynamic Voltage Restorer (DVR): Operation and control – Interline Power Flow Controller (IPFC): Operation and control of Unified Power Quality Conditioner (UPQC); Generalized power quality conditioner

Course Outcomes: At the end of the course, student will be able to

- Identify the issues related to power quality in power systems.
- Address the problems of transient and long duration voltage variations in power systems.
- Analyze the effects of harmonics and study of different mitigation techniques.
- Identify the importance of custom power devices and their applications.
- Acquire knowledge on different compensation techniques to minimize power quality disturbances.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

Text Books:

1. Electrical Power Systems Quality, Dugan R C, McGranaghan M F, Santoso S, and Beaty H W, Second Edition, McGraw-Hill, 2002.
2. Understanding Power Quality Problems: Voltage Sags and Interruptions, Bollen M H J, First Edition, IEEE Press; 2000.
3. Guidebook on Custom Power Devices, Technical Report, Published by EPRI, Nov 2000
4. Power Quality Enhancement Using Custom Power Devices – Power Electronics and Power Systems, Gerard Ledwich, Arindam Ghosh, Kluwer Academic Publishers, 2002.

Reference Books:

1. Power Quality Primer, Kennedy B W, First Edition, McGraw-Hill, 2000.
2. Power System Harmonics, Arrillaga J and Watson N R, Second Edition, John Wiley & Sons, 2003.
3. Electric Power Quality control Techniques, W. E. Kazibwe and M. H. Sendaula, Van Nostrand Reinhold, New York.
4. Power Quality c.shankaran, CRC Press, 2001
5. Harmonics and Power Systems –Franciso C.DE LA Rosa-CRC Press (Taylor & Francis).
6. Power Quality in Power systems and Electrical Machines-EwaldF.fuchs, Mohammad A.S. Masoum-Elsevier
7. Power Quality, C. Shankaran, CRC Press, 2001
8. Instantaneous Power Theory and Application to Power Conditioning, H. Akagiet.al., IEEE Press, 2007.
9. Custom Power Devices - An Introduction, Arindam Ghosh and Gerard Ledwich, Springer, 2002
10. A Review of Compensating Type Custom Power Devices for Power Quality Improvement, Yash Pal et.al., Joint International Conference on Power System Technology and IEEE Power India Conference, 2008. POWERCON 2008.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

I-Semester	Programmable Logic Controllers & Applications (Elective-I)	Category	L-T-P 3-0-0	Credits 3
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Pre-requisite: Knowledge on relay logic and digital electronics.

Course Educational Objectives:

- To have knowledge on PLC.
- To acquire the knowledge on programming of PLC.
- To understand different PLC registers and their description.
- To have knowledge on data handling functions of PLC.
- To know how to handle analog signal and converting of A/D in PLC.

UNIT– 1

PLC Basics:

PLC system, I/O modules and interfacing, CPU processor, programming equipment, programming formats, construction of PLC ladder diagrams, devices connected to I/O modules.

UNIT– 2

PLC Programming:

Input instructions, outputs, operational procedures, programming examples using contacts and coils. Drill press operation. Digital logic gates, programming in the Boolean algebra system, conversion examples. Ladder diagrams for process control: Ladder diagrams and sequence listings, ladder diagram construction and flow chart for spray process system.

UNIT– 3

PLC Registers:

Characteristics of Registers, module addressing, holding registers, input registers, output registers. PLC Functions: Timer functions and Industrial applications, counters, counter function industrial applications, Arithmetic functions, Number comparison functions, number conversion functions.

UNIT– 4

Data Handling functions:

SKIP, Master control Relay, Jump, Move, FIFO, FAL, ONS, CLR and Sweep functions and their applications. Bit Pattern and changing a bit shift register, sequence functions and applications, controlling of two axis and three axis Robots with PLC, Matrix functions.

UNIT– 5

Analog PLC operation:

Analog modules and systems, Analog signal processing, multi bit data processing, analog output application examples, PID principles, position indicator with PID control, PID modules, PID tuning, PID functions.

Course Outcomes: At the end of the course, student will be able to

- Understand the PLCs and their I/O modules.
- Develop control algorithms to PLC using ladder logic etc.
- Manage PLC registers for effective utilization in different applications.
- Handle data functions and control of two axis and their axis robots with PLC.
- Design PID controller with PLC.



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KAKINADA – 533 003, Andhra Pradesh, India

Text Books:

1. Programmable Logic Controllers – Principle and Applications by John W. Webb and Ronald A. Reiss, Fifth Edition, PHI
2. Programmable Logic Controllers – Programming Method and Applications by JR. Hackworth and F.D Hackworth Jr. – Pearson, 2004.

Reference Books:

1. Introduction to Programmable Logic Controllers- Gary Dunning-Cengage Learning.
Programmable Logic Controllers –W.Bolton-Elsevier publisher.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

I-Semester	Artificial Intelligence Techniques (Elective-II)	Category	L-T-P 3-0-0	Credits 3
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Pre –requisite: Fundamentals of Neural networks and Fuzzy Logic

Course Educational Objectives:

- To have knowledge on concept of neural network.
- To know different types of neural networks and training algorithms.
- To understand the concept of genetic algorithm and its application in optimization.
- To have the knowledge on fuzzy logic and design of fuzzy logic controllers.
- To know the applications of AI Techniques in electrical engineering.

UNIT– 1

Introduction

Artificial Neural Networks (ANN) – definition and fundamental concepts – Biological neural networks – Artificial neuron – activation functions – setting of weights – typical architectures – biases and thresholds – learning/training laws and algorithms. Perceptron – architectures, ADALINE and MADLINE – linear separability- XOR function.

UNIT– 2

ANN Paradigms

ADALINE – feed forward networks – Back Propagation algorithm- number of hidden layers – gradient decent algorithm – Radial Basis Function (RBF) network. Kohonen's self organizing map (SOM), Learning Vector Quantization (LVQ) and its types – Functional Link Networks (FLN) – Bidirectional Associative Memory (BAM) – Hopfield Neural Network.

UNIT– 3

Classical and Fuzzy Sets

Introduction to classical sets- properties, Operations and relations; Fuzzy sets, Membership, Operations, Properties, Fuzzy relations, Cardinalities, Membership functions.

UNIT– 4

FUZZY LOGIC CONTROLLER (FLC)

Fuzzy logic system components: Fuzzification, Inference engine (development of rule base and decision making system), Defuzzification to crisp sets- Defuzzification methods.

UNIT– 5

Application of AI Techniques

Speed control of DC motors using fuzzy logic –load flow studies using back propagation algorithm, single area and two area load frequency control using fuzzy logic.

Course Outcomes: At the end of the course, student will be able to

- Differentiate between Algorithmic based methods and knowledge based methods.
- Use appropriate AI framework for solving power system problems.
- To design fuzzy logic controllers for power engineering applications.

Text Books:

1. Introduction to Artificial Neural Systems - Jacek M. Zurada, Jaico Publishing House, 1997.
2. Fuzzy logic with Fuzzy Applications – T.J Ross – McGraw Hill Inc, 1997.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

Reference Books:

1. Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by S.Rajasekaran and G.A.VijayalakshmiPai – PHI Publication.
2. Modern power Electronics and AC Drives – B.K.Bose -Prentice Hall, 2002
3. Genetic Algorithms- David E Goldberg. Pearson publications.
5. Introduction to Neural Networks using MATLAB 6.0 by S N Sivanandam, S Sumathi, S N Deepa TMGH
6. Introduction to Fuzzy Logic using MATLAB by S N Sivanandam, S Sumathi, S N Deepa Springer, 2007.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

I-Semester	Renewable Energy Technologies (Elective-II)	Category	L-T-P 3-0-0	Credits 3
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Pre requisite: UG power Electronics.

Course Educational Objectives:

- To learn technical challenges in renewable energy.
- To learn basics of wind energy conversion & PV power generation.
- To analyze the of fuel cell system.

UNIT– 1

Introduction: Renewable Sources of Energy; Distributed Generation; Renewable Energy Economics - Calculation of Electricity Generation Costs; Demand-Side Management Options; Supply-Side Management Options; Control of renewable energy based power Systems

UNIT– 2

Induction Generators: Principles of Operation; Representation of Steady-State Operation; Power and Losses Generated - Self-Excited Induction Generator; Magnetizing Curves and Self-Excitation - Mathematical Description of the Self-Excitation Process; Interconnected and Stand-alone operation - Speed and Voltage Control.

UNIT– 3

Wind Power Plants: Site Selection; Evaluation of Wind Intensity; Topography; Purpose of the Energy Generation- General Classification of Wind Turbines; Rotor Turbines; Multiple-Blade Turbines; Drag Turbines; Lifting Turbines - Generators and Speed Control Used in Wind Power Energy; Analysis of Small wind energy conversion system.

UNIT– 4

Photovoltaic Power Plants: Solar Energy; Generation of Electricity by Photovoltaic Effect; Dependence of a PV Cell on Temperature and irradiance input-output Characteristics - Equivalent Models and Parameters for Photovoltaic Panels; MPPT schemes: P&O,INC, effect of partial shaded condition. Applications of Photovoltaic Solar Energy-Economical Analysis of Solar Energy

UNIT– 5

Fuel Cells: The Fuel Cell; Low- and High-Temperature Fuel Cells; Commercial and Manufacturing Issues - Constructional Features of Proton Exchange-Membrane Fuel Cells; Reformers; Electrolyzer Systems; Advantages and Disadvantages of Fuel Cells - Fuel Cell Equivalent Circuit; Practical Determination of the Equivalent Model Parameters; Aspects of Hydrogen for storage

Course Outcomes: At the end of the course, student will be able to

- Understand various general aspects of renewable energy systems.
- Analyze and design induction generator for power generation from wind.
- Design MPPT controller for solar power utilization.
- Utilize fuel cell systems for power generation.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

Text Books:

1. Felix A. Farret, M. Godoy Simões, Integration of Alternative Sources of Energy, John Wiley & Sons, 2006.
2. Remus Teodorescu, Marco Liserre, Pedro Rodríguez, Grid Converters for Photovoltaic and Wind Power Systems, John Wiley & Sons, 2011.

Reference Books:

1. Gilbert M. Masters, Renewable and Efficient Electric Power Systems, John Wiley & Sons, 2004



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

I-Semester	HVDC Transmission and Flexible AC Transmission Systems (Elective-II)	Category	L-T-P 3-0-0	Credits 3
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Pre-requisite: Knowledge on Power Electronics, Power Systems and High Voltage Engineering

Course Educational Objectives:

- To learn various schemes of HVDC transmission.
- To learn the operation and analysis of different HVDC converter circuits.
- To learn the control of HVDC systems.
- To learn the basic types of FACTS controllers.
- To learn the series and shunt compensators.

UNIT– 1

HVDC Transmission: DC Power Transmission: Need for power system interconnections, Evolution of AC and DC transmission systems, Comparison of HVDC and HVAC Transmission systems, Types of DC links, relative merits, Components of a HVDC system, Modern trends in DC Transmission systems

UNIT– 2

Analysis of HVDC Converters: Pulse number, choice of converter configurations, Analysis of Graetz circuit with and without overlap, voltage waveforms, Analysis of two and three valve conduction mode, Converter Bridge characteristics, Inverter mode of operation, voltage waveforms

UNIT– 3

HVDC Control: Principles of DC link control, Converter Control characteristics, Control hierarchy Constant current Control, CEA Control, firing angle control of valves, starting and stopping of a dc link, Power control

Harmonics and Filters: effects of Harmonics, sources of harmonic generation, Types of filters –Design examples

UNIT– 4

Power Flow Analysis in AC/DC Systems: Modelling of DC links, solutions of AC-DC Power flow

Flexible AC Transmission Systems (FACTS): FACTS concepts and general system conditions: Power flow in AC systems, Relative importance of controllable parameters, Basic types of FACTS controllers, shunt and series controllers, Current source and Voltage source converters

UNIT– 5

Static Shunt Compensators: Objectives of shunt compensation, Methods of controllable VAR generation, Static Var Compensator, its characteristics, TCR, TSC, STATCOM, basic operating principle, control approaches and characteristics

Static Series Compensators: Objectives of series compensator, variable impedance type of series compensators, TCSC, TSSC-operating principles and control schemes, SSSC, Power Angle characteristics, Control range and VAR rating, Capability to provide reactive power compensation, external control

Introduction to Unified Power Flow Controller, Basic operating principles, Conventional control capabilities, Independent control of real and reactive power.

Course Outcomes: At the end of the course, student will be able to

- Compare HVDC and EHVAC transmission systems
- Analyze converter configurations used in HVDC and evaluate the performance metrics.
- Understand controllers for controlling the power flow through a dc link and compute filter Parameters.
- Apply impedance, phase angle and voltage control for real and reactive power flow in ac transmission systems with FACTS controller.
- Analyze and select a suitable FACTS controller for a given power flow condition.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

Text Books:

1. NarainG.Honorani, Laszlo Gyugyi: Understanding FACTS –Concepts and Technology of Flexible AC Transmission Systems, Wiley-IEEE Press, 2000.
2. K.R.Padiyar: HVDC Power Transmission Systems –Technology and System Interactions, New Age International Publishers, 2011.

Reference Books:

1. Kimbark: Direct Current Transmission, 1971.
2. Jos Arrillaga: High Voltage Direct Current Transmission, The Institution of electrical Engineers, 1998.
3. Yong Hua Song, Allan T Johns: Flexible AC Transmission Systems, The Institution of electrical Engineers, 1999.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

I-Semester	Research Methodology and IPR	Category	L-T-P 2-0-0	Credits 2
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UNIT-I

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

UNIT-II

Effective literature studies approaches, analysis Plagiarism, Research ethics, Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

UNIT-III

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

UNIT-IV

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

UNIT-V

New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

REFERENCES:

1. Stuart Melville and Wayne Goddard, “Research methodology: an introduction for science & engineering students”
2. Wayne Goddard and Stuart Melville, “Research Methodology: An Introduction”
3. Ranjit Kumar, 2nd Edition, “Research Methodology: A Step by Step Guide for beginners”
4. Halbert, “Resisting Intellectual Property”, Taylor & Francis Ltd,2007.
5. Mayall, “Industrial Design”, McGraw Hill, 1992.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

I-Semester	POWER ELECTRONICS SIMULATION LABORATORY	CATEGORY	L-T-P 0 -0-4	CREDITS 2
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Course Educational Objectives:

To analyze the operation of DC-DC converters, AC-DC converters and DC-AC converters by simulation.

Any 10 of the following experiments are to be conducted.

List of Experiments:

1. Simulation of Buck converter using small signal model.
2. Simulation of Boost converter using small signal model.
3. Simulation of single phase half bridge inverter.
4. Simulation of single-phase full bridge inverter using Uni-polar & Bi-polar PWM techniques.
5. Simulation of three phase inverter using sine-triangle PWM.
6. Simulation of three phase inverter using space vector PWM.
7. Simulation of three level three phase NPC inverter.
8. Study of neutral point voltage floating in NPC three level inverter
9. Simulation of 3-level flying capacitor inverter & evaluation of capacitor voltage balanced methods.
10. Simulation of single phase AC voltage regulator.
11. Simulation of three phase AC voltage regulator.
12. Comparison of harmonic profile of two level & three level inverter (FFT analysis).
13. Simulation of 5-level inverter using carrier based PWM methods.
14. Simulation of three phase full converter with RL & RLE loads.
15. Simulation of three-phase dual converter.

Course Outcome: To understand the operation of DC-DC converters, AC-DC converters, AC voltage regulators and DC-AC converters by simulation.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

I-Semester	POWER CONVERTERS LABORATORY	CATEGORY	L-T-P	CREDITS
			0-0-4	2

Course Educational Objectives:

To study and understand the different converters and inverters for single and three phase loads.

Any 10 of the following experiments are to be conducted.

List of experiments

1. Study of DC-DC non-isolated converters such as Buck & Boost converter.
2. Study of DC-DC Buck-Boost and Cuk converters.
3. Study of 1- ϕ dual converter.
4. Determination of input p.f. and harmonic factor for 1- ϕ semi-converter and 1- ϕ full-converter (Inductive load)
5. Study of p.f. improvement in 1- ϕ full-converter with symmetric and extinction angle control.
6. Study of 1- ϕ square wave and sinusoidal PWM inverter.
7. Study of 3- ϕ inverter with 120° and 180° mode of operation.
8. Study of 3- ϕ sinusoidal PWM inverter.
9. Study of 3-level NPC inverter.
10. Study of 5-level cascaded H-bridge inverter.
11. Determination of input p.f. and harmonic factor for 3- ϕ full converter (Inductive load).
12. Determination of input p.f. and harmonic factor for 3- ϕ semi converter (Inductive load).
13. Study the characteristics of IGBT, MOSFET & GTO's.
14. Design of gate drive circuits for IGBT & MOSFET's.

Course Outcomes: Students are able to implement the converter and inverters in real time applications.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

I-Semester	Audit Course-1	PC	L-T-P 2-0-0	Credits 0
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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

II-Semester	Switched Mode Power Conversion	Category	L-T-P 3-0-0	Credits 3
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Pre-requisite: Concepts of electrical circuit analysis and power electronics.

Course Educational Objectives:

- To understand the control operation of non-sinusoidal DC-DC converters.
- To understand the basic operation of resonant converters.
- To understand the control operation of isolated DC-DC converters.
- To understand the control schemes of DC-DC converters and designing of magnetic components.
- To understand the modeling and control design of switch mode conversion based on linearization.
- To understand how to analyze the switch mode converters using small-signal analysis.

UNIT– 1

Non-isolated switch mode converters:

Control of DC-DC converters: Buck converters, Boost converters, Buck-Boost converter, CUK Converter, continuous and discontinuous operation, Converter realization with non-ideal components.

UNIT– 2

Isolated switched mode converters:

Forwarded converter, flyback converter, push-pull converter, half-bridge converter, full bridge converter.

UNIT– 3

Resonant converters:

Basic resonant circuit concepts, series resonant circuits, parallel resonant circuits, zero current switching quasi-resonant buck converter, zero current switching quasi-resonant boost converter, zero voltage switching quasi-resonant buck converter, zero voltage switching quasi-resonant boost converter.

UNIT– 4

Control schemes of switching converters:

Voltage control, Current mode control, control scheme for resonant converters.

Magnetic design consideration: Transformer design, inductor and capacitor design.

UNIT– 5

Modeling and Controller design based on linearization:

Formulation of averaged models for buck and boost converters: state space analysis, average circuit models, linearization and small – signal analysis, small-signal models.

Control design based on linearization: Transfer function of converters, control design, large signal issues in voltage-mode and current-mode control.

Course Outcomes: At the end of the course, student will be able to

- Analyze operation and control of non-isolated and isolated switch mode converters.
- Design of non-isolated and isolated switch mode converters.
- Analyze operation and control of resonant converters.
- Feedback design of switch mode converters based on linearized models.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

Text Books:

1. Fundamentals of Power Electronics-Erickson, Robert W., Maksimovic, Dragan, Springer, 2011.
2. Power switching converters-Simon Ang, Alejandro Oliva, CRC Press, 2010.
3. Elements of Power Electronics – Philip T. Krein, Oxford University press, 2014.
4. Design of Magnetic Components for Switched Mode Power Converters- Umanand, S.P. Bhat, John Wiley & Sons Australia, 1992.

Reference Books:

1. Power Electronics: Essentials and applications- L. Umanand, Wiley publications
2. Switching Power Supply Design-Abraham I. Pressman, McGraw-Hill Ryerson, Limited, 1991.
3. Power Electronics – IssaBatareseh, Jhon Wiley publications, 2004.
4. Power Electronics: converters Applications & Design – Mohan, Undeland, Robbins-Wiley publications.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

II-Semester	Power Electronic Control of Electrical Drives	Category	L-T-P 3-0-0	Credits 3
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Pre-requisite: Knowledge of Power Electronics and Electrical Machines.

Course Educational Objectives:

- To familiarize with advanced control schemes for induction motor drives and control techniques for PMSM, BLDC and SRM drives.

UNIT– 1

Vector Control of Induction Motor Drive:

Principle of scalar and vector control, direct vector control, indirect vector control, rotor flux oriented control, stator flux oriented control, air gap flux oriented control, decoupling circuits.

UNIT– 2

Sensor less Control of induction Motor Drive:

Advantages of speed sensor less control, voltage current based speed sensor less control, MRAS-model reference adaptive systems, Extended Kalman filter observers.

UNIT– 3

Direct Torque Control of Induction Motor Drive:

Principle of Direct torque control (DTC), concept of space vectors, DTC control strategy of induction motor, comparison between vector control and DTC, applications, space vector modulation based DTC of induction motors.

UNIT– 4

Control of Permanent Magnet Synchronous Machines (PMSM) and Brushless DC (BLDC) Motor Drives:

Advantages and limitations of Permanent magnet machines, operating principle of PMSM, modeling of PMSM, operating principle of BLDC, modeling of BLDC, similarities and difference between PMSM and BLDC, need for position sensing in BLDC motors, control strategies for PMSM and BLDC, methods of reducing torque ripples of BLDC motor.

UNIT– 5

Control of Switched Reluctance Motor (SRM) Drive:

SRM structure, Merits and limitations, stator excitation, converter topologies, SRM waveforms, Torque control schemes, speed control of SRM, torque ripple minimization, instantaneous -torque control using current controllers and flux controllers.

Course Outcomes: After the completion of the course, student will be able to

- Understand the concepts of scalar and vector control methods for drive systems.
- Analyze and design controllers and converters for induction motor, PMSM and BLDC drives.
- Select and implement proper control techniques for induction motor and PMSM for specific applications.
- Analyze and design control techniques and converters for SRM drives.

Text Books:

1. Bose B. K., "Power Electronics and Variable Frequency Drives', IEEE Press, Standard Publisher Distributors. 2001.
2. Krishnan R., "Electric Motor Drives – Modeling, Analysis and Control", Prentice Hall of India Private Limited.

Reference Books:

1. Switched Reluctance Motors and Their Control-T. J. E. Miller, Magna Physics, 1993.
2. Power electronic converters applications and design-Mohan, Undeland, Robbins-Wiley publications



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

II-Semester	Control & Integration of Renewable Energy Systems (Elective -III)	Category	L-T-P 3-0-0	Credits 3
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Pre-requisite:Power Electronics

Course Educational Objectives:

- To understand different conventional & non-conventional dynamic energy conversion technologies.
- To learn the principles of static energy conversion technologies.
- To understand the basics of real & reactive power control with renewable generators.
- To learn the principles of standalone and grid connected systems.

UNIT-1

Introduction: Electric grid introduction, Supply guarantee and power quality, Stability, Effects of renewable energy penetration into the grid, Boundaries of the actual grid configuration, Consumption models and patterns, static and dynamic energy conversion technologies, interfacing requirements .

UNIT-2

Dynamic Energy Conversion Technologies: Introduction to different conventional and nonconventional dynamic generation technologies, principle of operation and analysis of reciprocating engines, gas and micro turbines, hydro and wind based generation technologies, control and integrated operation of different dynamic energy conversion devices.

UNIT-3

Static Energy Conversion Technologies: Introduction to different conventional and nonconventional static generation technologies, principle of operation and analysis of fuel cell, photovoltaic based generators, and wind based generation technologies, different storage technologies such as batteries, fly wheels and ultra-capacitors, plug-in-hybrid vehicles, control and integrated operation of different static energy conversion devices.

UNIT-4

Real and reactive power control: Control issues and challenges in Diesel, PV, wind and fuel cell based generators, PLL, Modulation Techniques, Dimensioning of filters, Linear and nonlinear controllers, predictive controllers and adaptive controllers, Fault-ride through Capabilities, Load frequency and Voltage Control .

UNIT-5

Integration of different Energy Conversion Technologies:Resources evaluation and needs, Dimensioning integration systems, Optimized integrated systems, Interfacing requirements, integrated Control of different resources, Distributed versus Centralized Control, Synchro Converters, Grid connected and Islanding Operations, stability and protection issues, load sharing, Cases studies

Course Outcomes: After the completion of the course, student will be able to

- Gain knowledge on different renewable energy sources and storage devices
- Recognize, model and simulate different renewable energy sources
- Analyze, model and simulate basic control strategies required for grid connection
- Implement a complete system for standalone/grid connected system



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Text books:

1. Ali Keyhani Mohammad Marwali and Min Dai, “Integration and Control of Renewable Energy in Electric Power System” John Wiley publishing company
2. S. Chowdhury, S. P. Chowdhury, P. Crossley, “Microgrids and Active Distribution Networks”, IET Power Electronics Series, 2012
3. G. Masters, “Renewable and Efficient Electric Power Systems”, IEEE-Wiley Publishers, 2013

References:

1. Quing-Chang Zhong, “Control of Power Inverters in Renewable Energy and Smart Grid Integration”, Wiley, IEEE Press
2. Bin Wu, Yongqiang Lang, NavidZargari, “Power Conversion and Control of Wind Energy Systems”, Wiley 2011.



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II-Semester	Hybrid Electric Vehicles (Elective-III)	Category	L-T-P 3-0-0	Credits 3
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Pre-requisite: Knowledge of Power Electronics and Electric Drives

Course Educational Objectives:

- To learn the concept of hybrid vehicles, types of electric drives used in hybrid vehicles and their control.

UNIT– 1

Introduction:

History of hybrid vehicles, architectures of HEVs, series and parallel HEVs, complex HEVs.

UNIT– 2

Hybridization of Automobile:

Fundamentals of vehicle, components of conventional vehicle and propulsion load; Drive cycles and drive terrain; Concept of electric vehicle and hybrid electric vehicle; Plug-in hybrid vehicle, constituents of PHEV, comparison of HEV and PHEV; Fuel Cell vehicles and its constituents.

UNIT– 3

Plug-in Hybrid Electric Vehicle:

PHEVs and EREVs blended PHEVs, PHEV Architectures, equivalent electric range of blended PHEVs; Fuel economy of PHEVs, power management of PHEVs, end-of-life battery for electric power grid support, vehicle to grid technology, PHEV battery charging.

UNIT– 4

Power Electronics in HEVs:

Rectifiers used in HEVs, voltage ripples; Buck converter used in HEVs, non-isolated bidirectional DC-DC converter, regenerative braking, voltage source inverter, current source inverter, isolated bidirectional DC-DC converter, PWM rectifier in HEVs, EV and PHEV battery chargers.

UNIT– 5

Battery and Storage Systems

Energy Storage Parameters; Lead–Acid Batteries; Ultra capacitors; Flywheels - Superconducting Magnetic Storage System; Pumped Hydroelectric Energy Storage; Compressed Air Energy Storage - Storage Heat; Energy Storage as an Economic Resource

Course Outcomes: At the end of the course, student will be able to

- Know the concept of electric vehicles and hybrid electric vehicles.
- Familiar with different motors used for hybrid electric vehicles.
- Understand the power converters used in hybrid electric vehicles
- Know different batteries and other energy storage systems.

Text Books

1. Ali Emadi, Advanced Electric Drive Vehicles, CRC Press, 2014.
2. Iqbal Hussein, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2003.



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Reference Books:

1. MehrdadEhsani, YimiGao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press, 2004.
2. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2003.
3. H. Partab: Modern Electric Traction – Dhanpat Rai & Co, 2007.

Research Books:

1. Pistoaa G., “Power Sources , Models, Sustainability, Infrastructure and the market”, Elsevier 2008
2. Mi Chris, Masrur A., and Gao D.W., “ Hybrid Electric Vehicle: Principles and Applications with Practical Perspectives” 1995.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
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II-SEMESTER	DIGITAL CONTROL SYSTEMS (ELECTIVE-III)	CATEGORY	L-T-P 3-0-0	CREDITS 3
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Pre-Requisite: Control Systems, digital control systems.

Course Educational objectives:

- To understand fundamentals of digital circuits and devices using Z-transforms and Inverse Z-Transforms
- To understand the controllability and observability in digital domain
- To understand the stability and controller design in digital domain
- To understand the design an observer
- To understand the solving of a given optimal control problem

UNIT– 1

Introduction

Introduction to analog and digital control systems – Advantages of digital systems – Typical examples– Sample and hold devices – Sampling theorem and data reconstruction-Transfer functions and frequency domain characteristics of zero order hold and first order hold. Review of Z–transforms and Inverse Z–transforms- solving differential equations. Mapping between the S–Plane and the Z–Plane – Primary strips and Complementary Strips

UNIT– 2

State space analysis and the concepts of Controllability and observability

State Space Representation of discrete time systems – State transition matrix properties and evaluation – Solution of state equations- Discretization of continuous-time state equations –controllability and observability – concepts, conditions and tests, Principle of duality.

UNIT– 3

Stability Analysis and Controller Design

Stability criterion – Modified Routh’s stability criterion and Jury’s stability test, Lyapunov’s stability analysis.

Design of state feedback controller through pole placement techniques, Necessary and sufficient conditions, Ackermann’s formula, controller for deadbeat response, control system with reference input, Design of full order observer-reduced order observer.

UNIT– 4

State Observer

Necessary and sufficient condition for state observation-Full order state observer- error dynamics – design of prediction observers- Ackermann’s formula-effect of the addition of observer on closed loop system-Current observer- minimum order observer observed – state feedback control system with minimum order observer -control system with reference input.

UNIT– 5

Quadratic Optimal Control Systems

Quadratic optimal control problems-Solution by minimization method using Lagrange multipliers-Evolution of the minimum performance index – discretize quadratic optimal control –Steady state Riccati equations-Lyapunov approaches to the solution of the Steady state quadratic optimal regulator problem and optimal control problem - Quadratic optimal control of a servo system.



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Course Outcomes: At the end of the course, student will be able to

- Analyze digital control systems using Z-transforms and Inverse Z-Transforms.
- Evaluate the state transition matrix and solve state equation for discrete model for continuous time systems, investigate the controllability and observability.
- Determine the stability; design state feedback controller.
- Design an observer.
- Solve a given optimal control problem.

Text Book:

1. Discrete–Time Control systems – K. Ogata, Pearson Education/PHI, 2nd Edition.
2. B. C. Kuo, “Digital control systems”- Holt Saunder’s International Edition, 1991.

Reference Books:

1. M. Gopal: Digital control engineering, New Age Int. Ltd., India, 1998.
2. K. Ogata, “Modern control engineering”- PHI, 1991.



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II-semester	Advanced Digital Signal Processing (Elective-IV)	Category	L-T-P 3-0-0	Credits 3
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Pre-requisite: Signals & Systems

Course Educational Objectives:

- To understand the various digital filter structures
- To design the FIR and IIR Filters
- To know the importance of FFT algorithm for computation of Discrete Fourier Transform
- To analyze the finite word length effects on various filters
- To learn the concepts of power spectrum estimation of periodic and non-periodic signals

UNIT– 1

Digital Filter Structure: Block diagram representation-Equivalent Structures-FIR and IIR digital filter Structures All pass Filters-tunable IIR Digital Filters-IIR tapped cascaded Lattice Structures-FIR cascaded Lattice structures-Parallel-Digital Sine-cosine generator-Computational complexity of digital filter structures.

UNIT– 2

Digital filter design: Preliminary considerations-Bilinear transformation method of IIR filter design-design of lowpass, high pass-band pass, and band stop- IIR digital filters-Spectral transformations of IIR filters, FIR filter design-based on windowed Fourier series- design of FIR digital filters with least –mean-square-error-constrained least-square design of FIR digital filters

UNIT– 3

DSP algorithm implementation: Computation of the discrete Fourier transform- number representation-arithmetic operations handling of overflow-tunable digital filters-function approximation.

UNIT– 4

Analysis of finite Word length effects: The quantization process and errors- quantization of fixed -point and floating -point Numbers-Analysis of coefficient quantization effects, Analysis of arithmetic round-off errors, dynamic range scaling-signal- to- noise ratio in low -order IIR filters-low-sensitivity digital filters-Reduction of Product round-off errors using error feedback-Limit cycles in IIR digital filters, Round-off errors in FFT Algorithms.

UNIT– 5

Power Spectrum Estimation: Estimation of spectra from finite duration observations signals – Non-parametric methods for power spectrum estimation – parametric method for power spectrum estimation, estimation of spectral form-finite duration observation of signals-non-parametric methods for power spectrum estimation-Walsh methods-Blackman & torchy method.

Course Outcomes: At the end of the course, student will be able to

- Describe structure of digital filters.
- Design digital filters with different techniques.
- Understand the implementation aspects of signal processing algorithms.
- Know the effect of finite word length in signal processing.
- Analyze different power spectrum estimation techniques.



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Text Books:

1. Digital signal processing-Sanjit K. Mitra-TMH second edition, 2002.
2. Discrete Time Signal Processing – Alan V.Oppenheim, Ronald W.Shafer - PHI-1996 1st edition-9th reprint

Reference Books:

1. Digital Signal Processing and principles, algorithms and Applications – John G.Proakis -PHI –3rd edition-2002.
2. Digital Signal Processing – S.Salivahanan, A.Vallavaraj, C. Gnanapriya – TMH - 2nd reprint-2001
3. Theory and Applications of Digital Signal Processing-LourensR. Rebinar&Bernold.
4. Digital Filter Analysis and Design-Auntonian-TMH.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
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II-Semester	Applications of Power Converters (Elective-IV)	Category	L-T-P 3-0-0	Credits 3
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Pre-requisites: Analysis of Power Electronic Converters

Course Educational Objectives:

- To understand the inverters for induction heating applications
- To understand the power converters for different industrial applications
- To understand modeling of high voltage power supplies using the power converters for radar and space applications
- To understand modeling of low voltage and high current power supplies using the power converters for microprocessors and computer loads
- To understand the applications of DC-DC converters

UNIT-1

Inverters for Induction Heating: For induction cooking, induction hardening, melting, and welding applications.

UNIT-2

Power Converters for Lighting, pumping and refrigeration Systems: Electronic ballast, LED power drivers for indoor and outdoor applications. PFC based grid fed LED drivers, PV / battery fed LED drivers. PV fed power supplies for pumping/refrigeration applications.

UNIT-3

High Voltage Power Supplies - Power supplies for X-ray applications - power supplies for radar applications - power supplies for space applications.

UNIT-4

Low voltage high current power supplies: Power converters for modern microprocessor and computer loads

UNIT-5

Bi-directional DC-DC (BDC) converters: Electric traction, automotive Electronics and charge/discharge applications, Line Conditioners and Solar Charge Controllers

Course Outcomes: At the end of the course, the student will be able to

- Analyze power electronic application requirements.
- Identify suitable power converter from the available configurations.
- Develop improved power converters for any stringent application requirements.
- Improve the existing control techniques to suit the application. Design of Bi-directional converters for charge/discharge applications

Text books:

1. Ali Emadi, A. Nasiri, and S. B. Bekiarov: Uninterruptible Power Supplies and Active Filters, CRC Press, 2005.
2. M. Ehsani, Y. Gao, E. G. Sebastien and A. Emadi: Modern Electric, Hybrid Electric and Fuel Cell Vehicles, 1st Edition, CRC Press, 2004.

References:

1. William Ribbens: Understanding Automotive Electronics, Newnes, 2003.
2. Current literature



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II-Semester	Microcontrollers (Elective-IV)	Category	L-T-P 3-0-0	Credits 3
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Pre-requisite: Basic micro-processors & micro controllers.

Course Educational Objectives:

- To learn about microcontrollers architecture.
- To learn about DSP architecture and assembly programming for DSP processors.
- To learn about basics of FPGA controllers.

UNIT– 1

PIC Microcontrollers

PIC Microcontrollers: Overview and Features, PIC 16C6X/7X, FSR(File Selection Register) [Indirect Data Memory Address Pointer], PIC Reset Actions, PIC Oscillator Connections, PIC Memory Organizations, PIC PIC 16C6X/7X Instructions, Addressing Modes, I/O Ports, Interrupts in PIC 16C61/71, PIC 16C61/71 Timers, PIC 16C71 Analog-to-Digital Converter (ADC)

UNIT– 2

Introduction to DSP

Introduction to the C2xx DSP core and code generation, The components of the C2xx DSP core, Mapping external devices to the C2xx core , peripherals and Peripheral Interface , System configuration registers , Memory , Types of Physical Memory , memory Addressing Modes , Assembly Programming using C2xx DSP, Instruction Set, Software Tools.

UNIT– 3

I/O & Control Registers

Pin Multiplexing (MUX) and General Purpose I/O Overview, Multiplexing and General Purpose I/O Control Registers .Introduction to Interrupts, Interrupt Hierarchy, Interrupt Control Registers, Initializing and Servicing Interrupts in Software.

UNIT– 4

ADC & Event Manager

ADC Overview , Operation of the ADC in the DSP , Overview of the Event manager (EV), Event Manager Interrupts , General Purpose (GP) Timers , Compare UNITs, Capture UNITs And Quadrature Enclosed Pulse (QEP) Circuitry , General Event Manager Information

UNIT– 5

Introduction to Field Programmable Gate Arrays – CPLD Vs FPGA – Types of FPGA , Xilinx C3000 series , Configurable logic Blocks (CLB), Input/Output Block (IOB) – Programmable Interconnect Point (PIP) – Xilinx 4000 series – HDL programming – overview of Spartan 3E and Virtex II pro FPGA boards- case study.

Course Outcomes: At the end of the course, student will be able to

- Design the interfacing circuits for input and output to PIC micro controllers and DSP processors.
- Write ALP for DSP processors.
- Design PWM controller for power electronic circuits using FPGA.



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Text Books:

1. Microcontrollers-Theory and Applications - Ajay V Deshmukh, McGraw Hills, 2005.
2. DSP Based Electro Mechanical Motion Control -Hamid.A.Toliat and Steven G.Campbell, CRC Press New York, 2004.

Reference Books:

1. The 8051 Microcontroller-Kennith J ayala, Thomson publishers,2005.
2. Microprocessor and Microcontrollers by Prof C.R.Sarma.
3. XC 3000 series datasheets (version 3.1). Xilinx,Inc.,USA, 1998.
4. Wayne Wolf,” FPGA based system design “, Prentice hall, 2004



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II-Semester	Electric Drives Simulation Laboratory	Category	L-T-P 0-0-4	Credits 2
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Pre-requisite: Power electronics & Drives

Course Educational Objectives:

The student should be able to understand the simulate different electrical machines and drives

Any 10 of the following experiments are to be conducted.

List of Experiments:

1. Simulation of DC shunt machine as motor & generator.
2. Simulate the speed control of DC motor using chopper converter.
3. Simulation of induction motor modes using d-q model.
4. Simulate the speed control of induction motor by using V/f control.
5. Simulate the BLDC motor and observe the speed transients.
6. Simulate speed control of induction motor by using vector control.
7. Compare the transient performance of induction motor controlled by v/f control & vector control methods.
8. Simulate PMSM motor by using d-q model.
9. Simulate the multi-level inverter fed induction motor drive.
10. Simulate the re-generative braking of inverter fed induction motor.
11. Study of PWM controlled inverter fed PMSM drive.
12. Evaluation of switching frequency effect on electric drive

Course Objectives:

The student should analyze the performance of different electrical machines and drives



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II-Semester	Electric Drives Laboratory	Category	L-T-P 0-0-4	Credits 2
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Course Educational Objectives:

To study the speed control methods of DC & AC drives.

Any 10 of the following experiments are to be conducted.

List of experiments:

1. Study of armature controlled separately excited DC drive with 1- ϕ full converter.
2. Study of chopper controlled separately excited DC drive.
3. Study of armature controlled separately excited DC drive with 3- ϕ full converter
4. Study of dynamic braking of DC drives.
5. Study of regenerative braking of DC drive.
6. Study of performance characteristics of a 3- ϕ induction motor using V/f control.
7. Vector control based speed control of induction motor.
8. Study of direct torque control of induction motor.
9. Speed control of PMSM drive with 3- ϕ inverter.
10. Speed control of BLDC drive with 3- ϕ inverter.
11. Speed control of switched reluctance motor drive.

Course Outcome:The student should Understand the performance of DC & AC drives.



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II-Semester	Mini Project with Seminar	Category	L-T-P 0-0-4	Credits 2
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Note:

It is recommended that a Supervisor/advisor should be allotted to each student at the end of the semester-I or allot at the start of the semester-II

Syllabus content:

A Student has to select one paper published in any of the IEEE Transactions and simulate the same. The student has to present the progress of the work at the middle of the semester. At the end of the semester, the student has to present the results by explaining the idea of the topic, methodology, finding of the simulations. A Student should also submit a report of the entire work carried out under this course. The end semester presentation must be video recorded and preserved.



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II-Semester	Audit Course-II	Category	L-T-P 2-0-0	Credits 3
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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
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III-Semester	Digital Signal Processor Controlled Drives (Program Elective - V)	Category	L-T-P 3-0-0	Credits 3
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Pre-requisite: Applications of Digital Signal Processors, Power Electronic control of Electrical Drives.

Course Educational Objectives:

- To study DSP controllers.
- To learn coding in DSP's to control the electric drive speed.
- To learn speed control methods for induction motor, PMSM, BLDC motors.

UNIT-1

Overview of TMS320LF2407 DSP controller: Review of Instruction Set, Interrupts, normalization and number formatting.

UNIT-2

Clarke's and Park's transformations: Review of Clarke's and Park's transformations, Implementation of Clarke's and Park's transformation using TMS320LF2407 DSP

UNIT-3

Implementation of PWM Techniques for 3-Ph VSI: Implementation of Sine-triangle and SVPWM with TMS320LF2407 DSP using the concept of imaginary switching time

UNIT-4

Control of BLDC Motor: Principle of operation with Drive control system, implementation of control system using TMS320LF2407 DSP

UNIT-5

Control of PMSM: Principle of operation with drive control system, implementation of vector control using TMS320 LF2407 DSP

UNIT-6

Control of Induction Motor: Implementation of field oriented control for the speed control of Induction Motor using TMS320LF2407 DSP.

Course Outcomes: At the end of the course, student will be able to

- Interface the DSP platform with sensors such as hall-effect voltage sensors,
- Use hall-effect current sensors, shaft encoder for data acquisition for motor drive applications
- Scale and normalize the data to suit the requirements of the drive system
- Exploit the architectural features of the DSP platform to design and implement
- Use algorithms for the realization of controllers, Pulse Width Modulators and observers

Text Books:

1. Hamid A. Toliyat: DSP Based Electromechanical Motion Control, 1st Edition, CRC Press, 2004
2. Ned Mohan, T.M. Undeland and William P. Robbins: Power Electronics: Converters, Applications, 3rd Edition, John Wiley & Sons, 2009

Reference:

1. Application Notes from the website of Texas Instruments .



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
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III-Semester	Smart Grid Technologies (Program Elective–V)	Category	L-T-P 3 -0-0	Credits 3
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Pre-requisite: Basic knowledge on smart concept communication protocols, renewable energy systems and electronic circuits.

Course Educational Objectives:

- To understand concept of smart grid and developments on smart grid.
- To understand smart grid technologies and application of smart grid concept in hybrid electric vehicles etc.
- To have knowledge on smart substations, feeder automation and application for

UNIT – 1

Introduction to Smart Grid: Evolution of Electric Grid, Concept of Smart Grid, Definitions, Need of Smart Grid, Functions of Smart Grid, Opportunities & Barriers of Smart Grid, Difference between conventional & smart grid, Concept of Resilient & Self-Healing Grid, Present development & International policies on Smart Grid. Case study of Smart Grid.

UNIT – 2

Smart Grid Technologies: Part 1: Introduction to Smart Meters, Real Time Pricing, Smart Appliances, Automatic Meter Reading(AMR), Outage Management System(OMS), Plug in Hybrid Electric Vehicles(PHEV), Vehicle to Grid, Smart Sensors, Home & Building Automation, Phase Shifting Transformers.

UNIT – 3

Smart Grid Technologies: Part 2: Smart Substations, Substation Automation, Feeder Automation. Geographic Information System(GIS), Intelligent Electronic Devices(IED) & their application for monitoring & protection, Smart storage like Battery, SMES, Pumped Hydro, Compressed Air Energy Storage, Wide Area Measurement System(WAMS), Phase Measurement Unit(PMU).

UNIT – 4

Micro grids and Distributed Energy Resources: Concept of micro grid, need & applications of microgrid, formation of microgrid, Issues of interconnection, protection & control of microgrid. Plastic & Organic solar cells, Thin film solar cells, Variable speed wind generators, fuel cells, microturbines, Captive power plants, Integration of renewable energy sources.

UNIT – 5

Power Quality Management in Smart Grid: Power Quality & EMC in Smart Grid, Power Quality issues of Grid connected Renewable Energy Sources, Power Quality Conditioners for Smart Grid, Web based Power Quality monitoring, Power Quality Audit.

Information and Communication Technology for Smart Grid: Advanced Metering Infrastructure (AMI), Home Area Network (HAN), Neighborhood Area Network (NAN), Wide Area Network (WAN).

monitoring and protection.



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Course Outcomes:

At the end of this course, the student will be able to:

- Understand smart grids and analyze the smart grid policies and developments in smart grids.
- Develop concepts of smart grid technologies in hybrid electrical vehicles etc.
- Understand smart substations, feeder automation, GIS etc.
- Analyze micro grids and distributed generation systems.
- Analyze the effect of power quality in smart grid and to understand latest developments in ICT for smart grid.

Text Books:

1. Ali Keyhani, Mohammad N. Marwali, Min Dai “Integration of Green and Renewable Energy in Electric Power Systems”, Wiley
2. Clark W. Gellings, “The Smart Grid: Enabling Energy Efficiency and Demand Response”, CRC Press

Reference Books:

1. JanakaEkanayake, Nick Jenkins, KithsiriLiyanage, Jianzhong Wu, Akihiko Yokoyama, “Smart Grid: Technology and Applications”, Wiley
2. Jean Claude Sabonnadière, NouredineHadjsaïd, “Smart Grids”, Wiley Blackwell 19
3. Peter S. Fox Penner, “Smart Power: Climate Changes, the Smart Grid, and the Future of Electric Utilities”, Island Press; 1 edition 8 Jun 2010
4. S. Chowdhury, S. P. Chowdhury, P. Crossley, “Microgrids and Active Distribution Networks.” Institution of Engineering and Technology, 30 Jun 2009
5. Stuart Borlase, “Smart Grids (Power Engineering)”, CRC Press
6. Andres Carvallo, John Cooper, “The Advanced Smart Grid: Edge Power Driving Sustainability: 1”, Artech House Publishers July 2011



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II-Semester	Modeling and Simulation of Power Electronic Systems (Program Elective–V)	Category	L-T-P 3 -0-0	Credits 3
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Pre-requisites: Analysis of Power Electronic Converters

Course Educational Objectives:

- To learn the simulation techniques in Power Electronic Converters.
- To learn the modeling the Power Electronic Converters.
- To simulate control methods for Power Electronic Converters.

UNIT-1

Introduction: Challenges in computer simulation - Simulation process - mechanics of simulation, Solution techniques for time domain analysis - Equation solvers, circuit-oriented simulators.

UNIT-2

Simulation of power electronic converters: MNA and ST Approaches- Nodal Analysis, Modified Nodal Analysis, The Spare Tableau Approach, Nonlinear Circuits - The Newton-Raphson Method, Computation Time, Convergence Issues, Nonlinear Circuit Equations, Introduction to Transient Simulation - Introduction, Discretization of Time, Transient Analysis, Accuracy and Stability, Explicit and Implicit Schemes, Methods for Transient Simulation - FE, BE and TRZ, Transient Analysis in Circuit Simulation, Equivalent Circuit Approach: RC Circuit, Buck Converter; Some Practical Aspects: Undamped Oscillations, Ringing, Global Error in Switching Circuits, Round-off Error, Assessment of Accuracy, Singular Matrix Problem, Trapezoidal integration, M & N method for simulating power electronic converters (with buck converter as a representative example).

UNIT-3

Switching function: Introduction, Application of the switching function technique, Properties of the switching function, Voltage-Current relations in switched circuits - Single Switch, Parallel Switch, Pulse Width Modulation- Unipolar, PWM Signal of a composite function, bipolar square wave modulation, Mathematical Modeling of Buck Converter, Modeling using switching function-buck converter, Rectifier, 3-phase VSI inverter, matrix converter, m-phase rectifier. PWM rectifier topologies, Modeling of power electronic converters - PWM rectifier in different frames- abc, alpha-beta and d-q.

UNIT-4

Modeling, simulation of switching converters with state space averaging, hybrid model: State space approach, averaging method, State Space Averaging Technique – Modeling AND linearization of converter transfer functions- Hybrid Modeling for DC-DC converter.

Course Outcomes: After the completion of the course, student will be able to

- Understand the back ground activities i.e. numerical solution used in the simulation software.
- Can judge or properly choose the required numerical solver to be used for analysis.
- Can understand and debug the convergence problems occurring during simulation.

Text book:

1. M. B. Patil, V. Ramnarayanan, V. T. Ranganathan: *Simulation of Power Electronic Converters*, 1st ed., Narosa Publishers, 2010

Reference book:

1. Ned Mohan, Undeland and Robbins, “Power Electronics: Converters, Design and control”- 2nd ed., John Wiley.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

II-Semester	Industrial Safety (Open Elective)	Category	L-T-P 3 -0-0	Credits 3
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Pre-requisite: Engineering Fundamentals

Course Educational Objectives:

- To learn safety aspects of any industrial area
- To learn fundamentals and types of maintenance engineering
- To learn causes and effects of wear and Corrosion and their prevention
- To learn identification of faults and their repair
- To learn preventive maintenance- periodic an preventive-maintenance of industrial systems

Unit-I: Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.

Unit-II: Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

Unit-III: Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

Unit-IV: Fault tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

Unit-V: Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: i. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance



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Course Outcomes: At the end of the course, the student should be able to

- Understand the general industrial requirements like lighting, cleanliness prevention from hazards and accidents.
- Analyze maintenance requirements of the industry and cost associated.
- Analyze wear and corrosion aspects of the industry and their prevention.
- Identify the faults prone areas and their repair and periodic maintenance.

Reference Books:

1. Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.
2. Maintenance Engineering, H. P. Garg, S. Chand and Company.
3. Pump-hydraulic Compressors, Audels, Mcgrew Hill Publication.
4. Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

III-Semester	Energy Audit Conservation & Management (Open Elective)	Category	L-T-P 3 -0-0	Credits 3
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Pre-requisite: Concepts of utilization of electrical energy, electrical machines and electrical measurements.

Course educational objectives:

- To learn principle of energy audit as well as management for industries and utilities and buildings.
- To study the energy efficient motors and lighting.
- To learn power factor improvement methods and operation of different energy instruments.
- To compute depreciation methods of equipment for energy saving.

UNIT– 1

Basic Principles of Energy Audit

Energy audit- definitions, concept , types of audit, energy index, cost index ,pie charts, Sankey diagrams and load profiles, Energy conservation schemes- Energy audit of industries- energy saving potential, energy audit of process industry, thermal power station, building energy audit.

UNIT– 2

Energy Management

Principles of energy management, organizing energy management program, initiating, planning, controlling, promoting, monitoring, reporting. Energy manager, qualities and functions, language, Questionnaire – check list for top management

UNIT– 3

Energy Efficient Motors and Lighting

Energy efficient motors, factors affecting efficiency, loss distribution, constructional details, characteristics – variable speed , variable duty cycle systems, RMS - voltage variation-voltage unbalance-over motoring-motor energy audit. lighting system design and practice, lighting control, lighting energy audit

UNIT– 4

Power Factor Improvement and energy instruments

Power factor – methods of improvement, location of capacitors, Power factor with non-linear loads, effect of harmonics on p.f, p.f motor controllers – Energy Instruments- watt meter, data loggers, thermocouples, pyrometers, lux meters, tongue testers,application of PLC's

UNIT– 5

Economic Aspects and their computation

Economics Analysis depreciation Methods, time value of money, rate of return, present worth method, replacement analysis, lifecycle costing analysis – Energy efficient motors. Calculation of simple payback method, net present value method- Power factor correction, lighting – Applications of life cycle costing analysis, return on investment.

Course Outcomes: At the end of the course, student will be able to

- Understand the principle of energy audit and their economic aspects.
- Recommend energy efficient motors and design good lighting system.
- Understand advantages to improve the power factor.
- Evaluate the depreciation of equipment.



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Text Books:

1. Energy management by W.R.Murphy&G.Mckay Butter worth, Heinemann publications, 1982.
2. Energy management hand book by W.CTurner, John Wiley and sons, 1982.

Reference Books:

1. Energy efficient electric motors by John.C.Andreas, Marcel Dekker Inc Ltd-2nd edition,1995
2. Energy management by Paul o' Callaghan, Mc-graw Hill Book company-1st edition, 1998
3. Energy management and good lighting practice : fuel efficiency- booklet12-EEO.



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III-Semester	Composite Materials (Open Elective)	Category	L-T-P 3 -0-0	Credits 3
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Pre-requisite: Engineering Physics

Course Educational Objectives:

- To learn characteristics of composite materials and know effects of reinforcement
- To learn application of different fibers, understand rules of mixtures
- To learn manufacturing of ceramic matrix, carbon matrix and applications
- To learn preparation of moulding compounds, properties and applications
- To learn strength and failure criteria

UNIT-1: INTRODUCTION: Definition – Classification and characteristics of Composite materials. Advantages and application of composites. Functional requirements of reinforcement and matrix. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.

UNIT – 2: REINFORCEMENTS: Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures. Isostrain and Isostress conditions.

UNIT – 3: Manufacturing of Metal Matrix Composites: Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing, Properties and applications. Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon composites: Knitting, Braiding, Weaving. Properties and applications.

UNIT-4: Manufacturing of Polymer Matrix Composites: Preparation of Moulding compounds and prepregs – hand layup method – Autoclave method – Filament winding method – Compression moulding – Reaction injection moulding. Properties and applications.

UNIT – 5: Strength: Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hydrothermal failure. Laminate first ply failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.

Course Outcomes: At the end of the course, students should be able to

- Understand characteristics and advantages of composite materials
- Acquire knowledge of reinforcement, glass fiber, etc.
- Identify the usage of metal matrix composites
- Understand manufacturing of polymer matrix composites
- Understand manufacturing of polymer matrix composites
- Identify different types of failures.



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Text Books:

1. Material Science and Technology – Vol 13 – Composites by R.W.Cahn – VCH, West Germany.
2. Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R.Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007.

Reference Books:

1. Hand Book of Composite Materials-ed-Lubin.
2. Composite Materials – K.K.Chawla.
3. Composite Materials Science and Applications – Deborah D.L. Chung.
4. Composite Materials Design and Applications – Danial Gay, Suong V. Hoa, and Stephen W. Tasi.



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III SEMESTER	DISSERTATION PHASE-I	CATEGORY	L-T-P 0-0-20	CREDIT 10
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IV SEMESTER	DISSERTATION PHASE-II	CATEGORY	L-T-P	CREDIT
			0-0-32	16



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

AUDIT 1 and 2: ENGLISH FOR RESEARCH PAPER WRITING

Course objectives: Students will be able to: Understand that how to improve your writing skills and level of readability Learn about what to write in each section Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission		
Syllabus		
Units	CONTENTS	Hours
1	Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness	4
2	Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction	4
3	Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.	4
4	key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature,	4
5	skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions	4
6	useful phrases, how to ensure paper is as good as it could possibly be the first- time submission	4

Suggested Studies:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman'sbook .
4. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

AUDIT 1 and 2: DISASTER MANAGEMENT

Course Objectives: -Students will be able to:
learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in

Syllabus

Units	CONTENTS	Hours
1	Introduction Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.	4
2	Repercussions Of Disasters And Hazards: Economic Damage, Loss Of Human And Animal Life, Destruction Of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man- made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.	4
3	Disaster Prone Areas In India Study Of Seismic Zones; Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics	4
4	Disaster Preparedness And Management Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.	4
5	Risk Assessment Disaster Risk: Concept And Elements, Disaster Risk Reduction, Global And National Disaster Risk Situation. Techniques Of Risk Assessment, Global Co-Operation In Risk Assessment And Warning, People's Participation In Risk Assessment. Strategies for Survival.	4
6	Disaster Mitigation Meaning, Concept And Strategies Of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation And Non-Structural Mitigation, Programs Of Disaster Mitigation In India.	4



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Suggested Readings:

1. R. Nishith, Singh AK, “Disaster Management in India: Perspectives, issues and strategies “New Royal book Company.
2. Sahni, PardeepEt.Al. (Eds.),” Disaster Mitigation Experiences And Reflections”, Prentice Hall Of India, New Delhi.
3. Goel S. L. , Disaster Administration And Management Text And Case Studies” ,Deep &Deep Publication Pvt. Ltd., New Delhi.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

AUDIT 1 and 2: SANSKRIT FOR TECHNICAL KNOWLEDGE

Course Objectives

1. To get a working knowledge in illustrious Sanskrit, the scientific language in the world
2. Learning of Sanskrit to improve brain functioning
3. Learning of Sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power
4. The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature

Syllabus

Unit	Content	Hours
1	<ul style="list-style-type: none">• Alphabets in Sanskrit,• Past/Present/Future Tense,• Simple Sentences	8
2	<ul style="list-style-type: none">• Order• Introduction of roots• Technical information about Sanskrit Literature	8
3	<ul style="list-style-type: none">• Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics	8

Suggested reading

1. “Abhyaspustakam” – Dr.Vishwas, Samskrita-Bharti Publication, New Delhi
2. “Teach Yourself Sanskrit” Prathama Deeksha-Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
3. “India’s Glorious Scientific Tradition” Suresh Soni, Ocean books (P) Ltd., New Delhi.

Course Output

Students will be able to

1. Understanding basic Sanskrit language
2. Ancient Sanskrit literature about science & technology can be understood

Being a logical language will help to develop logic in



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AUDIT 1 and 2: SANSKRIT FOR TECHNICAL KNOWLEDGE

Course Objectives

5. To get a working knowledge in illustrious Sanskrit, the scientific language in the world
6. Learning of Sanskrit to improve brain functioning
7. Learning of Sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power
8. The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature

Syllabus

Unit	Content	Hours
1	<ul style="list-style-type: none">• Alphabets in Sanskrit,• Past/Present/Future Tense,• Simple Sentences	8
2	<ul style="list-style-type: none">• Order• Introduction of roots• Technical information about Sanskrit Literature	8
3	<ul style="list-style-type: none">• Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics	8

Suggested reading

4. “Abhyaspustakam” – Dr.Vishwas, Samskrita-Bharti Publication, New Delhi
5. “Teach Yourself Sanskrit” Prathama Deeksha-Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
6. “India’s Glorious Scientific Tradition” Suresh Soni, Ocean books (P) Ltd., New Delhi.

Course Output

Students will be able to

1. Understanding basic Sanskrit language
2. Ancient Sanskrit literature about science & technology can be understood
3. Being a logical language will help to develop logic in students



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AUDIT 1 and 2: VALUE EDUCATION

Course Objectives

Students will be able to

1. Understand value of education and self- development
2. Imbibe good values in students
3. Let the should know about the importance of character

Syllabus

Unit	Content	Hours
1	<ul style="list-style-type: none">• Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism.• Moral and non- moral valuation. Standards and principles.• Value judgements	4
2	<ul style="list-style-type: none">• Importance of cultivation of values.• Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness.• Honesty, Humanity. Power of faith, National Unity.• Patriotism. Love for nature ,Discipline	6
3	<ul style="list-style-type: none">• Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline.• Punctuality, Love and Kindness.• Avoid fault Thinking.• Free from anger, Dignity of labour.• Universal brotherhood and religious tolerance.• True friendship.• Happiness Vs suffering, love for truth.• Aware of self-destructive habits.• Association and Cooperation.• Doing best for saving nature	6
4	<ul style="list-style-type: none">• Character and Competence –Holy books vs Blind faith.• Self-management and Good health.• Science of reincarnation.• Equality, Nonviolence ,Humility, Role of Women.• All religions and same message.• Mind your Mind, Self-control.• Honesty, Studying effectively	6

Suggested reading

1 Chakroborty, S.K. “Values and Ethics for organizations Theory and practice”, Oxford University Press, New Delhi

Course outcomes

- Students will be able to
1. Knowledge of self-development
 2. Learn the importance of Human values
 3. Developing the overall personality



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KAKINADA – 533 003, Andhra Pradesh, India

AUDIT 1 and 2: CONSTITUTION OF INDIA

Course Objectives:

Students will be able to:

1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

Syllabus

Units	Content	Hours
1	•History of Making of the Indian Constitution: History Drafting Committee, (Composition & Working)	4
2	•Philosophy of the Indian Constitution: Preamble Salient Features	4
3	<input type="checkbox"/> Contours of Constitutional Rights & Duties: <input type="checkbox"/> Fundamental Rights <input type="checkbox"/> Right to Equality <input type="checkbox"/> Right to Freedom <input type="checkbox"/> Right against Exploitation <input type="checkbox"/> Right to Freedom of Religion <input type="checkbox"/> Cultural and Educational Rights <input type="checkbox"/> Right to Constitutional Remedies <input type="checkbox"/> Directive Principles of State Policy <input type="checkbox"/> Fundamental Duties.	4



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4	<ul style="list-style-type: none"><input type="checkbox"/> Organs of Governance:<input type="checkbox"/> Parliament<input type="checkbox"/> Composition<input type="checkbox"/> Qualifications and Disqualifications<input type="checkbox"/> Powers and Functions<ul style="list-style-type: none">• Executive<input type="checkbox"/> President<input type="checkbox"/> Governor<input type="checkbox"/> Council of Ministers<input type="checkbox"/> Judiciary, Appointment and Transfer of Judges, Qualifications<input type="checkbox"/> Powers and Functions	4
5	<ul style="list-style-type: none"><input type="checkbox"/> Local Administration:<input type="checkbox"/> District's Administration head: Role and Importance,<input type="checkbox"/> Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation.<input type="checkbox"/> Pachayati raj: Introduction, PRI: ZilaPachayat.<input type="checkbox"/> Elected officials and their roles, CEO ZilaPachayat: Position and role.<input type="checkbox"/> Block level: Organizational Hierarchy (Different departments),<input type="checkbox"/> Village level: Role of Elected and Appointed officials,<input type="checkbox"/> Importance of grass root democracy	4
6	<ul style="list-style-type: none"><input type="checkbox"/> Election Commission:<input type="checkbox"/> Election Commission: Role and Functioning.<input type="checkbox"/> Chief Election Commissioner and Election Commissioners.<input type="checkbox"/> State Election Commission: Role and Functioning.<input type="checkbox"/> Institute and Bodies for the welfare of SC/ST/OBC and women.	4

Suggested reading

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

Course Outcomes:

Students will be able to:

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
4. Discuss the passage of the Hindu Code Bill of 1956.



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AUDIT 1 and 2: PEDAGOGY STUDIES

Course Objectives:

Students will be able to:

4. Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
5. Identify critical evidence gaps to guide the development.

Syllabus

Units	Content	Hours
1	<input type="checkbox"/> Introduction and Methodology: <input type="checkbox"/> Aims and rationale, Policy background, Conceptual framework and terminology <input type="checkbox"/> Theories of learning, Curriculum, Teacher education. <input type="checkbox"/> Conceptual framework, Research questions. <input type="checkbox"/> Overview of methodology and Searching.	4
2	<ul style="list-style-type: none"> • Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. • Curriculum, Teacher education. 	2
3	<ul style="list-style-type: none"> • Evidence on the effectiveness of pedagogical practices • Methodology for the in depth stage: quality assessment of included studies. • How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? • Theory of change. • Strength and nature of the body of evidence for effective pedagogical practices. • Pedagogic theory and pedagogical approaches. • Teachers' attitudes and beliefs and Pedagogic strategies. 	4
4	<ul style="list-style-type: none"> • Professional development: alignment with classroom practices and follow-up support • Peer support • Support from the head teacher and the community. • Curriculum and assessment • Barriers to learning: limited resources and large class sizes 	4
5	<input type="checkbox"/> Research gaps and future directions <input type="checkbox"/> Research design <input type="checkbox"/> Contexts <input type="checkbox"/> Pedagogy <input type="checkbox"/> Teacher education <input type="checkbox"/> Curriculum and assessment <input type="checkbox"/> Dissemination and research impact.	2



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Suggested reading

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, *Compare*, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, *Journal of Curriculum Studies*, 36 (3): 361-379.
3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? *International Journal Educational Development*, 33 (3): 272–282.
5. Alexander RJ (2001) *Culture and pedagogy: International comparisons in primary education*. Oxford and Boston: Blackwell.
6. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.
7. www.pratham.org/images/resource%20working%20paper%202.pdf.

Course Outcomes:

Students will be able to understand:

1. What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?
2. What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
3. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?



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AUDIT 1 and 2: STRESS MANAGEMENT BY YOGA

Course Objectives

1. To achieve overall health of body and mind
2. To overcome stress

Syllabus

Unit	Content	Hours
1	<ul style="list-style-type: none">• Definitions of Eight parts of yog. (Ashtanga)	8
2	Yam and Niyam. Do`s and Don`t`s in life. i) Ahinsa, satya, astheya, bramhacharya and aparigraha ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan	8
3	<ul style="list-style-type: none">• Asan and Pranayam <ol style="list-style-type: none">1. Various yog poses and their benefits for mind & body2. Regularization of breathing techniques and its effects-Types of pranayam	8

Suggested reading

1. ‘Yogic Asanas for Group Training-Part-I’ : Janardan Swami YogabhyasiMandal, Nagpur
2. “Rajayoga or conquering the Internal Nature” by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata

Course Outcomes:

Students will be able to:

1. Develop healthy mind in a healthy body thus improving social health also
2. Improve efficiency



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
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AUDIT 1 and 2: PERSONALITY DEVELOPMENT THROUGH LIFE
ENLIGHTENMENT SKILLS

Course Objectives

1. To learn to achieve the highest goal happily
2. To become a person with stable mind, pleasing personality and determination
3. To awaken wisdom in students

Syllabus

Unit	Content	Hours
1	Neetisatakam-Holistic development of personality <ul style="list-style-type: none">• Verses- 19,20,21,22 (wisdom)• Verses- 29,31,32 (pride & heroism)• Verses- 26,28,63,65 (virtue)• Verses- 52,53,59 (dont's)• Verses- 71,73,75,78 (do's)	8
2	<ul style="list-style-type: none">• Approach to day to day work and duties.• Shrimad Bhagwad Geeta : Chapter 2-Verses 41, 47,48,• Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35,• Chapter 18-Verses 45, 46, 48.	8
3	<ul style="list-style-type: none">• Statements of basic knowledge.• Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68• Chapter 12 -Verses 13, 14, 15, 16,17, 18• Personality of Role model. Shrimad Bhagwad Geeta: Chapter2-Verses 17, Chapter 3-Verses 36,37,42,• Chapter 4-Verses 18, 38,39• Chapter18 – Verses 37,38,63	8

Suggested reading

1. "Srimad Bhagavad Gita" by Swami Swarupananda Advaita Ashram (Publication Department), Kolkata
2. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.

Course Outcomes

Students will be able to

1. Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
 2. The person who has studied Geeta will lead the nation and mankind to peace and prosperity
- Study of Neetishatakam will help in developing versatile personality of students



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE STRUCTURE & SYLLABUS for
M.Tech EEE for

- I. POWER SYSTEMS (PS)**
- II. POWER SYSTEM CONTROL AND AUTOMATION (PSC&A)**
- III. POWER SYSTEM ENGINEERING (PSE)**
- IV. POWER SYSTEM CONTROL (PSC)**
- V. ADVANCED POWER SYSTEMS (APS)**
- VI. ELECTRICAL POWER ENGINEERING (EPE)**
- VII. POWER ENGINEERING & ENERGY SYSTEMS (PE&ES)**

Programme

(Applicable for batches admitted from 2019-2020)



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COURSE STRUCTURE

I Semester

S.No	Course No	Category	Course Name	P.Os	L	T	P	C	Marks
1		PC	Power System Operation & Control		3	0	0	3	100
2		PC	Analysis of Power Electronic Converters		3	0	0	3	100
3		PE	Program Elective – I i. Electrical Distribution Automation ii. Renewable Energy Technologies iii. Power System Deregulation		3	0	0	3	100
4		PE	Program Elective – II i. HVDC Transmission ii. Advanced Power Systems Protection iii. Power System Reliability		3	0	0	3	100
5			Research Methodology and IPR		2	0	0	2	100
6			Power System Simulation Laboratory – I		0	0	4	2	100
7			Power Systems Laboratory		0	0	4	2	100
8			Audit Course – I		2	0	0	0	100
					16	0	8	18	800

II Semester

S.No	Course No	Category	Course Name	P.Os	L	T	P	C	Marks
1		PC	Power System Dynamics and Stability		3	0	0	3	100
2		PC	Real Time Control of Power Systems		3	0	0	3	100
3		PE	Program Elective – III i. EHVAC Transmission ii. Flexible AC Transmission Systems iii. Hybrid Electric Vehicles		3	0	0	3	100
4		PE	Program Elective – IV i. Generation & Measurement of High Voltages ii. Evolutionary Algorithms and Applications iii. Programmable Logic Controllers & Applications		3	0	0	3	100
5			Power System Simulation Laboratory – II		0	0	4	2	100
6			Power Converters Laboratory		0	0	4	2	100
7			Mini Project with Seminar		0	0	4	2	100
8			Audit Course – II		2	0	0	0	100
					14	0	12	18	800



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III Semester

S.No	Course No	Category	Course Name	P.Os	L	T	P	C	Marks
1		PE	Program Elective – V i. Energy Audit Conservation & Management ii. Smart Grid Technologies iii. Power Quality and Custom Power Devices		3	0	0	3	100
2		OE	Open Elective i. Industrial Safety ii. Artificial Intelligent Techniques iii. Operations Research		3	0	0	3	100
3			Dissertation Phase - I (to be continued and evaluated next semester)		0	0	20	10	---
					6	0	20	16	200

IV Semester

S.No	Course No	Category	Course Name	T	P	C	Marks
1			Dissertation Phase-II (continued from III semester)	0	32	16	100
				0	32	16	100

Audit course 1 & 2

1. English for Research Paper Writing
2. Disaster Management
3. Sanskrit for Technical Knowledge
4. Value Education
5. Constitution of India
6. Pedagogy Studies
7. Stress Management by Yoga
8. Personality Development through Life Enlightenment Skills.



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I-Semester	POWER SYSTEM OPERATION & CONTROL	CATEGORY	L-T-P 3-0-0	CREDITS 3
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Pre-requisite: Knowledge on Power Generation Engineering, Power Transmission Engineering.

Course Educational Objectives:

- To study the unit commitment problem for economic load dispatch.
- To study the load frequency control of single area and two area systems with and without control.
- To study the effect of generation with limited energy supply.
- To study the effectiveness of interchange evaluation in interconnected power systems.

UNIT – 1

Unit commitment problem and optimal power flow solution: Unit commitment: Constraints in UCP, UC solution methods. Priority list method, introduction to Dynamic programming Approach.

Optimal power flow: OPF without inequality constraints, inequality constraints on control variables and dependent variables.

UNIT – 2

Single area Load Frequency Control: Necessity of keeping frequency constant. Definition of control area, single area control, Block diagram representation of an isolated Power System, Steady State analysis, Dynamic response-Uncontrolled case. Proportional plus Integral control of single area and its block diagram representation, steady state response.

UNIT – 3

Two area Load Frequency Control: Load frequency control of two-area system, uncontrolled case and controlled case, tie-line bias control, steady state representation. Optimal two-area LF control- performance Index and optimal parameter adjustment. Load frequency control and Economic dispatch control.

UNIT – 4

Generation with limited Energy supply : Take-or-pay fuel supply contract, composite generation production cost function. Solution by gradient search techniques, Hard limits and slack variables, Fuel scheduling by linear programming.

UNIT – 5

Interchange Evaluation and Power Pools Economy Interchange: Economy interchange Evaluation, Interchange Evaluation with unit commitment, Multiple Interchange transactions, Other types of Interchange, power pools, transmission effects and issues.



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Course Outcomes: At the end of the course, student will be able to

- Determine the unit commitment problem for economic load dispatch.
- Get the knowledge of load frequency control of single area system with and without control.
- Get the knowledge of load frequency control of two area system with and without control.
- Know the effect of generation with limited energy supply.
- Determine the interchange evaluation in interconnected power systems.

Text Books:

1. Power Generation, Operation and Control - by A.J.WoodandF.Wollenberg,Johnwiley& sons Inc. 1984.
2. Modern Power System Analysis - by I.J.Nagrath&D.P.Kothari, Tata McGraw-Hill Publishing Company ltd, 2nd edition.

Reference Books:

- 1 Power system operation and control PSR Murthy B.S publication.
- 2 Electrical Energy Systems Theory - by O.I.Elgerd, Tata McGraw-Hill Publishing Company Ltd, 2nd edition.
- 3 Reactive Power Control in Electric Systems - by TJE Miller, John Wiley & sons.



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I-Semester	ANALYSIS OF POWER ELECTRONIC CONVERTERS	CATEGORY	L-T-P 3-0-0	CREDITS 3
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Pre-Requisite: Power Electronics.

Course Educational Objectives:

- To understand the control principle of ac to ac conversion with suitable power semi-conductor devices.
- To have the knowledge of ac to dc conversion and different ac to dc converter topologies.
- To understand the effect of operation of controlled rectifiers on p.f. and improvement of p.f. with PFC converters
- To acquire the knowledge on dc-ac converters and to know the different control techniques of dc-ac converters.
- To know multilevel inverter configuration to improve the quality of the inverter output voltage.

UNIT– 1

Overview of Switching Devices:

Power MOSFET, IGBT, GTO, GaN devices-static and dynamic characteristics, gate drive circuits for switching devices.

UNIT– 2

AC-DC converters: Single phase fully controlled converters with RL load– Evaluation of input power factor and harmonic factor-Continuous and Discontinuous load current, Power factor improvements, Extinction angle control, symmetrical angle control, PWM control. Three Phase AC-DC Converters, fully controlled converters feeding RL load with continuous and discontinuous load current, Evaluation of input power factor and harmonic factor-three phase dual converters.

UNIT– 3

Power Factor Correction Converters: Single-phase single stage boost power factor corrected rectifier, power circuit principle of operation, and steady state- analysis, three phase boost PFC converter

UNIT– 4

PWM Inverters: Principle of operation-Voltage control of single phase inverters - sinusoidal PWM – modified PWM – phase displacement Control – Trapezoidal, staircase, stepped, harmonic injection and delta modulation. Voltage Control of Three-Phase Inverters- Sinusoidal PWM- 60°PWM- Third Harmonic PWM- Space Vector Modulation- Comparison of PWM Techniques- Three phase current source inverters-Variable dc link inverter.

UNIT– 5

Multi level inverters: Introduction, Multilevel Concept, Types of Multilevel Inverters- Diode-Clamped Multilevel Inverter, Principle of Operation, Features of Diode-Clamped Inverter, Improved Diode-Clamped Inverter- Flying-Capacitors Multilevel Inverter- Principle of Operation, Features of Flying-Capacitors Inverter- Cascaded Multilevel Inverter- Principle of Operation- Features of Cascaded Inverter-Switching Device Currents-DC-Link Capacitor Voltage Balancing- Features of Multilevel Inverters- Comparisons of Multilevel Converters.



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Course Outcomes: At the end of the course, student will be able to

- Describe and analyze the operation of AC-DC converters.
- Analyze the operation of power factor correction converters.
- Analyze the operation of three phase inverters with PWM control.
- Study the principles of operation of multi- level inverters and their applications.

Text Books

1. Power Electronics: Converters, Applications, and Design- Ned Mohan, Tore M. Undeland, William P. Robbins, John Wiley& Sons, 2nd Edition, 2003.
2. Daniel W. Hart - McGraw-Hill,2011.

Reference Books:

1. Elements of Power Electronics – Philip T. Krein, Oxford University press, 2014.
2. Power Electronics: Converters, Applications, and Design- Ned Mohan, Tore M. Undeland, William P. Robbins, John Wiley& Sons, 2nd Edition, 2003.
3. Power Converter Circuits – William Shepherd & Li Zhang-Yes Dee CRC Press, 2004.



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I-Semester	ELECTRICAL DISTRIBUTION AUTOMATION (ELECTIVE-I)	CATEGORY	L-T-P 3 -0-0	CREDITS 3
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Pre-requisite: Knowledge on basics of distribution systems, Compensation in electrical distribution systems, Circuit Analysis, concept of load modelling.

Course Educational Objectives:

- To learn the importance of economic distribution of electrical energy.
- To analyse the distribution networks for V-drops, P_{Loss} calculations and reactive power.
- To understand the co-ordination of protection devices.
- To impart knowledge of capacitive compensation/voltage control.
- To understand the principles of voltage control.

UNIT – 1

General : Introduction to Distribution systems, an overview of the role of computers in distribution system planning-Load modelling and characteristics - definition of basic terms like demand factor, utilization factor, load factor, plant factor, diversity factor, coincidence factor, contribution factor and loss factor-Relationship between the load factor and loss factor - Classification of loads (Residential, Commercial, Agricultural and Industrial) and their characteristics.

UNIT – 2

Distribution Feeders and Substations: Design consideration of Distribution feeders: Radial and loop types of primary feeders, voltage levels, and feeder-loading. Design practice of the secondary distribution system. Location of Substations: Rating of a Distribution Substation, service area with 'n' primary feeders. Benefits derived through optimal location of substations.

UNIT – 3

Protective devices and coordination: Objectives of distribution system protection, types of common faults and procedure for fault calculation. Protective Devices: Principle of operation of fuses, circuit reclosers, line sectionalizer and circuit breakers. Coordination of protective devices: General coordination procedure; types of coordination.

UNIT – 4

Capacitive compensation for power factor control: Different types of power capacitors, shunt and series capacitors, effect of shunt capacitors (Fixed and switched), power factor correction, capacitor location. Economic justification. Procedure to determine the best capacitor location. Voltage control: Equipment for voltage control, effect of series capacitors, effect of AVB/AVR, line drop compensation.

UNIT – 5

Distribution automation functions: Electrical system automation, EMS functional scope, DMS functional scope functionality of DMS- Steady state and dynamic performance improvement; Geographic information systems- AM/FM functions and Database management; communication options, supervisory control and data acquisition: SCADA functions and system architecture; Synchrophasors and its application in power systems.



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Course Outcomes: At the end of the course, student will be able to

- Analyse a distribution system.
- Design equipment for distribution system and sub-stations.
- Design protective systems and co-ordinate the devices.
- Understand of capacitive compensation.
- Understand of distribution automation.

Text Books:

1. “Electric Power Distribution System Engineering “ by Turan Gonen, McGraw-Hill Book Company,1986.
2. Distribution System Analysis and Automation, by Juan M. Gers, The Institution of Engineering and Technology, UK 2014.

Reference Books:

1. Electric Power Distribution-by A.S.Pabla, Tata McGraw-Hill Publishing Company, 4thedition, 1997.
2. Electrical Distribution V.Kamaraju-McGraw Hill
3. Handbook of Electrical Power Distribution – Gorti Ramamurthy-Universities press



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I-Semester	RENEWABLE ENERGY TECHNOLOGIES (ELECTIVE-I)	CATEGORY	L-T-P 3 -0-0	CREDITS 3
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Pre requisite: UG power Electronics.

Course Educational Objectives:

- To learn the technical challenges in renewable energy.
- To learn the basics of wind energy conversion & PV power generation.
- To learn the analysis of fuel cell system.

UNIT– 1

Introduction: Renewable Sources of Energy; Distributed Generation; Renewable Energy Economics - Calculation of Electricity Generation Costs; Demand-Side Management Options; Supply-Side Management Options; Control of renewable energy based power Systems

UNIT– 2

Induction Generators: Principles of Operation; Representation of Steady-State Operation; Power and Losses Generated - Self-Excited Induction Generator; Magnetizing Curves and Self-Excitation - Mathematical Description of the Self-Excitation Process; Interconnected and Stand-alone operation - Speed and Voltage Control.

UNIT– 3

Wind Power Plants: Site Selection; Evaluation of Wind Intensity; Topography; Purpose of the Energy Generation- General Classification of Wind Turbines; Rotor Turbines; Multiple-Blade Turbines; Drag Turbines; Lifting Turbines - Generators and Speed Control Used in Wind Power Energy; Analysis of Small wind energy conversion system.

UNIT– 4

Photovoltaic Power Plants: Solar Energy; Generation of Electricity by Photovoltaic Effect; Dependence of a PV Cell on Temperature and irradiance input-output Characteristics - Equivalent Models and Parameters for Photovoltaic Panels; MPPT schemes: P&O,INC, effect of partial shaded condition. Applications of Photovoltaic Solar Energy-Economical Analysis of Solar Energy

UNIT– 5

Fuel Cells: The Fuel Cell; Low- and High-Temperature Fuel Cells; Commercial and Manufacturing Issues - Constructional Features of Proton Exchange-Membrane Fuel Cells; Reformers; Electrolyser Systems; Advantages and Disadvantages of Fuel Cells - Fuel Cell Equivalent Circuit; Practical Determination of the Equivalent Model Parameters; Aspects of Hydrogen for storage

Course Outcomes: At the end of the course, student will be able to

- Understand various general aspects of renewable energy systems.
- Analyze and design induction generator for power generation from wind.
- Design MPPT controller for solar power utilization.
- Utilize fuel cell systems for power generation.



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Text Books:

1. Felix A. Farret, M. Godoy Simo` es, Integration of Alternative Sources of Energy, John Wiley & Sons, 2006.
2. Remus Teodorescu, Marco Liserre, Pedro Rodríguez, Grid Converters for Photovoltaic and Wind Power Systems, John Wiley & Sons, 2011.

Reference Books:

1. Gilbert M. Masters, Renewable and Efficient Electric Power Systems, John Wiley & Sons, 2004.



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I-Semester	POWER SYSTEM DEREGULATION (ELECTIVE-I)	CATEGORY	L-T-P 3 -0-0	CREDITS 3
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Pre-requisite: Knowledge on power systems.

Course Educational Objectives:

- To provide in-depth understanding of operation of deregulated electricity market systems.
- To examine typical issues in electricity markets and how these are handled world –wide in various markets.
- To enable students to analyse various types of electricity market operational and control issues using new mathematical models.

UNIT – 1

Need and conditions for deregulation. Introduction of Market structure, Market Architecture, Spot market, forward markets and settlements. Review of Concepts:marginal cost of generation, least-cost operation, incremental cost of generation. Power System Operation.

UNIT – 2

Electricity sector structures and Ownership /management, the forms of Ownership and management. Different structure model like Monopoly model, Purchasing agency model, wholesale competition model, Retail competition model.

UNIT – 3

Framework and methods for the analysis of Bilateral and pool markets, LMP based markets, auction models and price formation, price based unit commitment, country practices

UNIT – 4

Transmission network and market power. Power wheeling transactions and marginal costing, transmission costing. Congestion management methods- market splitting, counter-trading; Effect of congestion on LMPs- country practices

UNIT – 5

Ancillary Services and System Security in Deregulation. Classifications and definitions, AS management in various markets- country practices. Technical, economic, & regulatory issues involved in the deregulation of the power industry.

Course Outcomes: At the end of the course, student will be able to

- Understand of operation of deregulated electricity market systems
- Typical issues in electricity markets
- Analyse various types of electricity market operational and control issues using new mathematical models.
- Understand LMP's wheeling transactions and congestion management.
- Analyse impact of ancillary services.



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Text Books:

1. Power System Economics: Designing markets for electricity - S. Stoft, Wiley.
2. Operation of restructured power systems - K. Bhattacharya, M.H.J. Bollen and J.E. Daalder, Springer.

Reference Books:

1. Power generation, operation and control, -J. Wood and B. F. Wollenberg, Wiley.
2. Market operations in electric power systems - M. Shahidehpour, H. Yaminand Z. Li, Wiley.
3. Fundamentals of power system economics - S. Kirschen and G. Strbac, Wiley.
4. Optimization principles: Practical Applications to the Operation and Markets of the Electric Power Industry - N. S. Rau, IEEE Press series on Power Engineering.
5. Competition and Choice in Electricity - Sally Hunt and Graham Shuttleworth



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I-Semester	HVDC TRANSMISSION (ELECTIVE-II)	CATEGORY	L-T-P	CREDITS
			3 -0-0	3

Pre-requisite: Knowledge on Power Electronics, Power Systems and High Voltage Engineering.

Course Educational Objectives:

- To learn various schemes of HVDC transmission.
- To learn about the basic HVDC transmission equipment.
- To learn the control of HVDC systems.
- To be exposed to the interaction between HVAC and HVDC system.
- To be exposed to the various protection schemes of HVDC engineering.

UNIT – 1

Limitation of EHV AC Transmission, Advantages of HVDC: Technical economical and reliability aspects. HVDC Transmission: General considerations, Power Handling Capabilities of HVDC Lines, Basic Conversion principles, static converter configuration. Types of HVDC links-Apparatus and its purpose

UNIT – 2

Static Power Converters: 6-pulse bridge circuit and 12-pulse converters, converter station and Terminal equipment, commutation process, Rectifier and inverter operation, equivalent circuit for converter – special features of converter transformers. Comparison of the performance of diametrical connection with 6-pulse bridge circuit

UNIT – 3

Control of HVDC Converters and systems: constant current, constant extinction angle and constant Ignition angle control. Individual phase control and equidistant firing angle control, DC power flow control. Factors responsible for generation of Harmonics voltage and current, harmonics effect of variation of α and μ . Filters, Harmonic elimination.

UNIT – 4

Interaction between HV AC and DC systems – Voltage interaction, Harmonic instability problems and DC power modulation. Development of DC circuit Breakers, Multi-terminal DC links and systems; series, parallel and series parallel systems, their operation and control.

UNIT – 5

Transient over voltages in HV DC systems: Over voltages due to disturbances on DC side, over voltages due to DC and AC side line faults. Converter faults and protection in HVDC Systems: Converter faults, over current protection - valve group, and DC line protection, circuit breakers. Over voltage protection of converters, surge arresters.

Course Outcomes: At the end of the course, student will be able to

- Understand the various schemes of HVDC transmission.
- Understand the basic HVDC transmission equipment.
- Understand the control of HVDC systems.
- Understand the interaction between HVAC and HVDC system.
- Understand the various protection schemes of HVDC engineering.
- Understand the various schemes of HVDC transmission.



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Text Books:

1. S Kamakshaih and V Kamaraju: HVDC Transmission- MG hill.
2. K.R.Padiyar : High Voltage Direct current Transmission, Wiley Eastern Ltd., New Delhi – 1992.

Reference Books:

1. E.W. Kimbark : Direct current Transmission, Wiley Inter Science – New York.
2. J.Arillaga : H.V.D.C.Transmission Peter Peregrinus ltd., London UK 1983
3. Vijay K Sood: HVDC and FACTS controllers:Applications of static converters in power systems by, Kluwer Academic Press.



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I-Semester	ADVANCED POWER SYSTEMS PROTECTION (ELECTIVE-II)	CATEGORY	L-T-P 3 -0-0	CREDITS 3
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Pre-requisite: Concepts of Power Electronics, Electronic circuits, STLD and basics of Relays and protection.

Course Educational Objectives:

- To learn about classification and operation of static relays.
- To understand the basic principles and application of comparators.
- To learn about static version of different types of relays.
- To understand about numerical protection techniques.

UNIT – 1

Static Relays classification and Tools : Comparison of Static with Electromagnetic Relays, Basic classification, Level detectors and Amplitude and phase Comparators – Duality – Basic Tools – Schmitt Trigger Circuit, Multivibrators, Square wave Generation – Polarity detector – Zero crossing detector – Thyristor and UJT Triggering Circuits. Phase sequence Filters – Speed and reliability of static relays.

UNIT – 2

Amplitude and Phase Comparators (2 Input) : Generalized equations for Amplitude and Phase comparison – Derivation of different characteristics of relays – Rectifier Bridge circulating and opposed voltage type amplitude comparators – Averaging & phase splitting type amplitude comparators – Principle of sampling comparators.

Phase Comparison : Block Spike and phase Splitting Techniques – Transistor Integrating type, phase comparison, Rectifier Bridge Type Comparison – Vector product devices.

UNIT – 3

Static over current (OC) relays – Instantaneous, Definite time, Inverse time OC Relays, static distance relays, static directional relays, static differential relays, measurement of sequence impedances in distance relays, multi input comparators, elliptic & hyperbolic characteristics, switched distance schemes, Impedance characteristics during Faults and Power Swings,

UNIT – 4

PILOT Relaying schemes: Wire pilot protection: circulating current scheme – balanced voltage scheme – translay scheme – half wave comparison scheme - carrier current protection: phase comparison type – carrier aided distance protection – operational comparison of transfer trip and blocking schemes – optical fibre channels.

UNIT – 5

Microprocessor based relays and Numerical Protection: Introduction – over current relays – impedance relay – directional relay – reactance relay.

Numerical Protection: Introduction - numerical relay - numerical relaying algorithms - mann-morrison technique - Differential equation technique and discrete fourier transform technique - numerical over current protection - numerical distance protection.



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Course Outcomes: At the end of the course, student will be able to

- Know the classifications and applications of static relays.
- Understand the application of comparators.
- Understand the static version of different types of relays.
- Understand the numerical protection techniques.

Text Books:

1. Power System Protection with Static Relays – by TSM Rao, TMH.
2. Power system protection & switchgear by Badri Ram & D N viswakarma, TMH.

Reference Books:

1. Protective Relaying Vol-II Warrington, Springer.
2. Art & Science of Protective Relaying - C R Mason, Willey.
3. Power System Stability Kimbark Vol-II, Willey.
4. Electrical Power System Protection –C.Christopoulos and A.Wright- Springer
5. Protection & Switchgear –BhaveshBhalaja, R.PMaheshwari, NileshG.Chothani-Oxford publisher



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I-Semester	POWER SYSTEM RELIABILITY (ELECTIVE-II)	CATEGORY	L-T-P 3 -0-0	CREDITS 3
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Pre-requisite: Probability theory, power systems.

Course Educational Objectives:

- To get the basic understanding of network modelling and reliability.
- To get the basic understanding of Markov chains.
- To get the basic understanding of Reliability analysis of generation systems.
- To get the basic understanding of Decomposition techniques

UNIT – 1

Basic probability theory – rules for combining probabilities of events – Bernoulli's trials – probability density and distribution functions – binomial- distributions – expected value and standard deviation of binomial distribution.

UNIT – 2

Network Modelling and Reliability Analysis of Series, Parallel, Series-Parallel networks – complex networks – decomposition method

Reliability functions $F(t)$, $R(t)$, $h(t)$ and their relationship – exponential distributions – Expected value and standard deviation of exponential distribution – Bath tub curve – reliability analysis of series parallel networks using exponential distribution – reliability measures MTTF, MTTR, MTBF

UNIT – 3

Markov chains – concept of stochastic transitional probability Matrix, Evaluation of limiting state Probabilities – Markov processes one component repairable system – time dependent probability evaluation using Laplace transform approach – evaluation of limiting state probabilities using STPM – two component repairable models – Frequency and duration concept – Evaluation of frequency of encountering state, mean cycle time, for one, two component repairable models – evaluation of cumulative probability and cumulative frequency of encountering merged states

UNIT – 4

Generation system reliability analysis – reliability model of a generation system – recursive relation for unit addition and removal – load modelling – merging of generation load model – evaluation of transition rates for merged state model – cumulative Probability, cumulative frequency of failure evaluation – LOLP, LOLE.

UNIT – 5

Composite system reliability analysis decomposition method – distribution system reliability analysis – radial networks – weather effects on transmission lines – Evaluation of load and energy indices.



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Course Outcomes: At the end of the course, student will be able to

- Understand reliability analysis applied to power systems.
- Understand Markov Chains and application to power systems.
- Perform stability analysis of generation systems.
- Understand decomposition techniques applied to power system.

Reference Books:

1. Reliability Evaluation of Engg. System – R.Billinton, R.N.Allan, Plenum Press, New York.
2. Reliability Modeling in Electric Power Systems - J. Endrenyi, John Wiley, 1978, Neewyork.
3. An Introduction to Realiability and Maintainability Engineering. Sharies E Ebeling, TATA McGraw Hill – Edition.



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KAKINADA – 533 003, Andhra Pradesh, India

I-Semester	RESEARCH METHODOLOGY AND IPR	CATEGORY	L-T-P	CREDITS
			2-0-0	2

UNIT-I

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

UNIT-II

Effective literature studies approaches, analysis Plagiarism, Research ethics, Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

UNIT-III

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

UNIT-IV

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

UNIT-V

New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

REFERENCES:

1. Stuart Melville and Wayne Goddard, “Research methodology: an introduction for science & engineering students”
2. Wayne Goddard and Stuart Melville, “Research Methodology: An Introduction”
3. Ranjit Kumar, 2nd Edition, “Research Methodology: A Step by Step Guide for beginners”
4. Halbert, “Resisting Intellectual Property”, Taylor & Francis Ltd,2007.
5. Mayall, “Industrial Design”, McGraw Hill, 1992.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

I-Semester	POWER SYSTEM SIMULATION LABORATORY – I	CATEGORY	L-T-P 0-0-4	CREDITS 2
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Pre-requisite: Electrical Power Systems

Course Educational Objectives:

- To understand the modelling of different transmission lines
- To understand the mathematical formulation of distribution system load flow
- To understand the configurations of transmission lines
- To understand the transients in transmission lines
- To understand the formation of Z- and Y-bus matrices

List of Experiments:

1. Performance analysis of short and medium transmission lines.
2. Performance analysis of long transmission lines.
3. Computation of sag of transmission lines for equal and unequal heights of towers.
4. Distribution load flow analysis.
5. Computation of B- co-efficient in economic load dispatch problem.
6. Computation of line parameters (R, L, C) for different configuration of 3- ϕ symmetrical transmission lines.
7. Computation of line parameters (R, L, C) for different configuration of 3- ϕ unsymmetrical transmission lines with and without transportation.
8. Computation reflection and refraction co-efficient of voltages and currents of transmission line form different conditions.
9. Formation of Y-bus by direct inspection method.
10. Formations of Z-bus by building algorithm.

Course Outcomes: The student shall be able to

1. Analyse the performance of the various transmission lines at different loading conditions
2. Perform the load flow study on distribution systems
3. Calculate the different line parameters of 3-phase symmetrical and unsymmetrical transmission lines
4. Compute the reflection and refraction coefficients of voltages and currents in the transmissions
5. Form the Z- and Y-bus matrices for the given power transmission system



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I-Semester	POWER SYSTEMS LABORATORY	CATEGORY	L-T-P 0 -0-4	CREDITS 2
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Course Educational Objectives:

To understand the experimental determination of various parameters used in power system area and to analyse the performance of transmission line with and without compensation.

List of Experiments:

1. Determination of Sequence Impedance of an Alternator by direct method.
2. Determination of Sequence impedance of an Alternator by fault Analysis.
3. Measurement of sequence impedance of a three phase transformer
 - (a). by application of sequence voltage.
 - (b). using fault analysis.
4. Power angle characteristics of a salient pole Synchronous Machine.
5. Poly-phase connection on three single phase transformers and measurement of phase displacement.
6. Determination of equivalent circuit of 3-winding Transformer.
7. Measurement of ABCD parameters on transmission line model.
8. Performance of long transmission line without compensation.
9. Study of Ferranti effect in long transmission line.
10. Performance of long transmission line with shunt compensation.

Course Outcomes:

After the Completion of lab they will understand procedure for determination of various parameters used in power system as well as performance of transmission line.



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II-Semester	POWER SYSTEM DYNAMICS AND STABILITY	CATEGORY	L-T-P	CREDITS
			3 -0-0	3

Pre-requisite: Knowledge of synchronous machine, Power System Analysis

Course Educational Objectives:

- To study the model of synchronous machines.
- To study the stability studies of synchronous machines.
- To study the solution method of transient stability.
- To study the effect of different excitation systems.

UNIT – 1

System Dynamics: Synchronous machine model in state space from computer representation for excitation and governor system –modelling of loads and induction machines.

UNIT – 2

Steady state stability – steady state stability limit – Dynamics Stability limit – Dynamic stability analysis – State space representation of synchronous machine connected to infinite bus-time response – Stability by eigen value approach.

UNIT – 3

Digital Simulation of Transient Stability: Swing equation machine equations – Representation of loads – Alternate cycle solution method – Direct method of solution – Solution Techniques: Modified Euler method – Runge Kutta method – Concept of multi machine stability.

UNIT – 4

Effect of governor action and excite on power system stability effect of saturation, saliency & automatic voltage regulators on stability.

UNIT – 5

Excitation Systems : Rotating Self-excited Exciter with direct acting Rheostatic type voltage regulator – Rotating main and Pilot Exciters with Indirect Acting Rheostatic Type Voltage Regulator – Rotating Main Exciter, Rotating Amplifier and Static Voltage Regulator – Static excitation scheme – Brushless excitation system.

Course Outcomes: At the end of the course, student will be able to

- Determine the model of synchronous machines.
- Know the stability studies of synchronous machines.
- Get the knowledge of solution methods of transient stability.
- Know the effect of different excitation systems in power systems.

Text Books:

1. Power System Stability by Kimbark Vol. I&II, III, Willey.
2. Power System control and stability by Anderson and Fund, IEEE Press.

Reference Books:

1. Power systems stability and control by PRABHA KUNDUR, TMH.
2. Computer Applications to Power Systems–Glenn.W.Stagg& Ahmed. H.El.Abiad, TMH.
3. Computer Applications to Power Systems – M.A.Pai, TMH.
4. Power Systems Analysis & Stability – S.S.VadheraKhanna Publishers



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II-Semester	REAL TIME CONTROL OF POWER SYSTEMS	CATEGORY	L-T-P	CREDITS
			3 -0-0	3

Pre-requisite: Power system operation and control.

Course Educational Objectives:

- To understand the importance of state estimation in power systems.
- To know the importance of security and contingency analysis.
- To understand SCADA, its objectives and its importance in power systems.
- To know the significance of voltage stability analysis.
- To know the applications of AI to power systems problems.

UNIT – 1:

State Estimation: Different types of State Estimations, Theory of WLS state estimation, sequential and non-sequential methods to process measurements. Bad data Observability, Bad data detection, identification and elimination.

UNIT – 2:

Security and Contingency Evaluation : Security concept, Security Analysis and monitoring, Contingency Analysis for Generator and line outages by iterative linear power flow method, Fast Decoupled model, and network sensitivity methods.

UNIT – 3:

Computer Control of Power Systems: Need for real time and computer control of power systems, operating states of a power system, SCADA - Supervisory control and Data Acquisition systems implementation considerations, energy control centres, software requirements for implementing the above functions.

UNIT – 4:

Voltage Stability, voltage collapse, and voltage security, relation of voltage stability to rotor angle stability. Voltage stability analysis Introduction to voltage stability analysis 'P-V' curves and 'Q-V' curves, voltage stability in mature power systems, long-term voltage stability, power flow analysis for voltage stability, voltage stability static indices.

UNIT – 5:

Synchrophasor Measurement units: Introduction, Phasor representation of sinusoids, a generic PMU, GPS, Phasor measurement systems, Communication options for PMUs, Functional requirements of PMUs and PDCs, Phasors for nominal frequency signals, types of frequency excursions in power systems, DFT estimation at off nominal frequency with a nominal frequency clock.

Course Outcomes: At the end of the course, student will be able to

- Understand state estimation, security and contingency evaluation.
- Understand about Supervisory control and data acquisition.
- Real time software application to state estimation.
- Understand application of AI in power system.



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Text Books:

1. John J.Grainger and William D.Stevenson, Jr. : Power System Analysis, McGraw-Hill, 1994, International Edition
2. Allen J.Wood and Bruce F.Wollenberg : Power Generation operation and control, John Wiley & Sons, 1984.
3. A.G.Phadka and J.S. Thorp, “Synchronized Phasor Measurements and Their Applications”, Springer, 2008

Reference Books:

1. R.N.Dhar : Computer Aided Power Systems Operation and Analysis, Tata McGraw Hill, 1982
2. L.P.Singh : Advanced Power System Analysis and Dynamics, WileyEastern Ltd. 1986
3. PrabhaKundur : Power System Stability and Control -, McGraw Hill, 1994
4. P.D.Wasserman : `Neural Computing : Theory and Practice' Van Nostrand -Feinhold, New York.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
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II-Semester	EHVAC TRANSMISSION (ELECTIVE-III)	CATEGORY	L-T-P 3 -0-0	CREDITS 3
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Pre-requisite: Transmission line parameters and properties, Corona etc.

Course Educational Objectives:

- To calculate the transmission line parameters.
- To calculate the field effects on EHV and UHV AC lines.
- To have knowledge of corona, RI and audible noise in EHV and UHV lines.
- To have knowledge of voltage control and compensation problems in EHV and UHV transmission systems.

UNIT – 1

E.H.V. A.C. Transmission, line trends and preliminary aspects, standard transmission voltages – power handling capacities and line losses – mechanical aspects. Calculation of line resistance and inductance: resistance of conductors, temperature rise of conductor and current carrying capacity. Properties of bundled conductors and geometric mean radius of bundle, inductance of two conductor lines and multi conductor lines, Maxwell's coefficient matrix. Line capacitance calculation. Capacitance of two conductor line, and capacitance of multi conductor lines, potential coefficients for bundled conductor lines, sequence inductances and capacitances and diagonalization.

UNIT – 2

Calculation of electro static field of AC lines - Effect of high electrostatic field on biological organisms and human beings. Surface voltage Gradient on conductors, surface gradient on two conductor bundle and cosine law, maximum surface voltage gradient of bundle with more than 3 sub conductors, Mangolt formula.

UNIT – 3

Corona : Corona in EHV lines – corona loss formulae – attenuation of traveling waves due to corona – Audio noise due to corona, its generation, characteristics and limits, measurement of audio noise.

UNIT – 4

Power Frequency voltage control : Problems at power frequency, generalized constants, No load voltage conditions and charging currents, voltage control using synchronous condenser, cascade connection of components : Shunt and series compensation, sub synchronous resonance in series – capacitor compensated lines

UNIT – 5

Reactive power compensating systems: Introduction, SVC schemes, Harmonics injected into network by TCR, design of filters for suppressing harmonics injected into the system.



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Course Outcomes: At the end of the course, student will be able to

- Calculate the transmission line parameters.
- Calculate the field effects on EHV and UHV AC lines.
- Determine the corona, RI and audible noise in EHV and UHV lines.
- Analyse voltage control and compensation problems in EHV and UHV transmission systems.
- Understand reactive power compensation using SVC and TCR

Text Books :

1. Extra High Voltage AC Transmission Engineering – Rakesh Das Begamudre, Wiley Eastern ltd., New Delhi – 1987.
2. EHV Transmission line reference book – Edison Electric Institute (GEC) 1986.



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II-Semester	FLEXIBLE AC TRANSMISSION SYSTEMS (ELECTIVE-III)	CATEGORY	L-T-P 3 -0-0	CREDITS 3
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Pre-requisite: Concepts on Power Electronics and Power Systems

Course Educational Objectives:

- To study the performance improvements of transmission system with FACTS.
- To study the effect of static shunt compensation.
- To study the effect of static series compensation.
- To study the effect of UPFC.

UNIT – 1

FACTS concepts, Transmission interconnections, power flow in an AC System, loading capability limits, Dynamic stability considerations, importance of controllable parameters, basic types of FACTS controllers, benefits from FACTS controllers.

UNIT – 2

Basic concept of voltage and current source converters, comparison of current source converters with voltage source converters.

Static shunt compensation : Objectives of shunt compensation, midpoint voltage regulation, voltage instability prevention, improvement of transient stability, Power oscillation damping, methods of controllable VAR generation, variable impedance type static VAR generation, switching converter type VAR generation, hybrid VAR generation.

UNIT – 3

SVC and STATCOM: The regulation slope, transfer function and dynamic performance, transient stability enhancement and power oscillation damping, operating point control and summary of compensation control.

UNIT – 4

Static series compensators: Concept of series capacitive compensation, improvement of transient stability, power oscillation damping, functional requirements. GTO thyristor controlled series capacitor (GSC), thyristor switched series capacitor (TSSC), and thyristor controlled series capacitor (TCSC), control schemes for GSC, TSSC and TCSC.

UNIT – 5

Unified Power Flow Controller: Basic operating principle, conventional transmission control capabilities, independent real and reactive power flow control, comparison of the UPFC to series compensators and phase angle regulators. Introduction to Inter line Power Flow Controller (IPFC)

Course Outcomes: At the end of the course, student will be able to

- Know the performance improvement of transmission system with FACTS.
- Get the knowledge of effect of static shunt and series compensation.
- Know the principle of operation and various controls of UPFC
- Determine an appropriate FACTS device for different types of applications.



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Text Books:

1. “Understanding FACTS Devices” N.G.Hingorani and L.Guygi, IEEE Press. Indian Edition is available:--Standard Publications

Reference Books:

1. Sang.Y.HandJohn.A.T, “Flexible AC Transmission systems” IEEE Press (2006).
2. HVDC & FACTS Controllers: applications of static converters in power systems-
Vijay K.Sood- Springer publishers



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II-Semester	HYBRID ELECTRIC VEHICLES (ELECTIVE-III)	CATEGORY	L-T-P 3 -0-0	CREDITS 3
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Pre-requisite: Knowledge of Power Electronics and Electric Drives

Course Educational Objectives:

To familiarize students with the concept of hybrid vehicles, types of electric drives used in hybrid vehicles and their control

UNIT- 1

Introduction:

History of hybrid vehicles, architectures of HEVs, series and parallel HEVs, complex HEVs.

UNIT- 2

Hybridization of Automobile:

Fundamentals of vehicle, components of conventional vehicle and propulsion load; Drive cycles and drive terrain; Concept of electric vehicle and hybrid electric vehicle; Plug-in hybrid vehicle, constituents of PHEV, comparison of HEV and PHEV; Fuel Cell vehicles and its constituents.

UNIT- 3

Plug-in Hybrid Electric Vehicle:

PHEVs and EREVs blended PHEVs, PHEV Architectures, equivalent electric range of blended PHEVs; Fuel economy of PHEVs, power management of PHEVs, end-of-life battery for electric power grid support, vehicle to grid technology, PHEV battery charging.

UNIT- 4

Power Electronics in HEVs:

Rectifiers used in HEVs, voltage ripples; Buck converter used in HEVs, non-isolated bidirectional DC-DC converter, regenerative braking, voltage source inverter, current source inverter, isolated bidirectional DC-DC converter, PWM rectifier in HEVs, EV and PHEV battery chargers.

UNIT- 5

Battery and Storage Systems

Energy Storage Parameters; Lead-Acid Batteries; Ultra capacitors; Flywheels - Superconducting Magnetic Storage System; Pumped Hydroelectric Energy Storage; Compressed Air Energy Storage - Storage Heat; Energy Storage as an Economic Resource

Course Outcomes: At the end of the course, student will be able to

- Know the concept of electric vehicles and hybrid electric vehicles.
- Familiar with different motors used for hybrid electric vehicles.
- Understand the power converters used in hybrid electric vehicles
- Know different batteries and other energy storage systems.

Text Books

1. Ali Emadi, Advanced Electric Drive Vehicles, CRC Press, 2014.
2. Iqbal Hussein, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2003.

Reference Books:

1. MehrdadEhsani, YimiGao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press, 2004.
2. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2003.
3. H. Partab: Modern Electric Traction - DhanpatRai& Co, 2007.
4. Pistoaa G., "Power Sources , Models, Sustainability, Infrstructure and the market", Elsevier 2008
5. Mi Chris, Masrur A., and Gao D.W., " Hybrid Electric Vehicle: Principles and Applications with Practical Perspectives" 1995.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

II-Semester	GENERATION AND MEASUREMENT OF HIGH VOLTAGES (ELECTIVE-II)	CATEGORY	L-T-P 3 -0-0	CREDITS 3
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Pre-requisite: Basics of Electrical circuits, Electronics and measurements for testing purpose.

Course Educational Objectives:

- To study the numerical methods for analysing electrostatic field problems.
- To study the fundamental principles of generation of high voltage for testing.
- To study the methods for measurement of high AC ,DC and transient voltages.
- To Study the measurement techniques for high AC ,DC and impulse currents.

UNIT – 1

Electrostatic fields and field stress control : Electric fields in homogeneous Isotropic materials and in multi dielectric media-Simple configurations-field stress control. Methods of computing electrostatic fields-conductive analogues-Impedance networks Numerical techniques-finite difference method-finite element method and charge simulation method.

UNIT – 2

Generation of High AC & DC Voltages:

Direct Voltages : AC to DC conversion methods, electrostatic generators, Cascaded Voltage Multipliers.

Alternating Voltages : Cascading transformers-Resonant circuits and their applications, Tesla coil.

UNIT – 3

Generation of Impulse Voltages :

Impulse voltage specifications-Impulse generation circuits-Operation, construction and design of Impulse generators-Generation of switching and long duration impulses.

Impulse Currents: Generation of high impulse currents and high current pulses.

UNIT – 4

Measurement of High AC & DC Voltages :

Measurement of High D.C. Voltages : Series resistance meters, voltage dividers and generating voltmeters.

Measurement of High A.C. Voltages : Series impedance meters electrostatic voltmeters potential transformers and CVTS-voltage dividers and their applications.

UNIT – 5

Measurement of Peak Voltages :

Sphere gaps, uniform field gaps, rod gaps. Chubb-Fortesque method, passive and active rectifier circuits for voltage dividers.

Measurement of Impulse Voltages: Voltage dividers and impulse measuring systems-generalized voltage measuring circuits-transfer characteristics of measuring circuits-L.V. Arms for voltage dividers-compensated dividers.

Measurement of Impulse Currents: Resistive shunts-current transformers-Hall Generators and Faraday generators and their applications-Impulse Oscilloscopes.



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Course Outcomes: At the end of the course, student will be able to

- Understand numerical computation of electrostatic problems.
- Understand the techniques of generation of high AC, DC and transient voltages.
- Measure high AC, DC and transient voltages.
- Measure high AC, DC and transient currents.

Text Books:

1. High Voltage Engineering – by E.Kuffel and W.S.Zaengl. Pergaman press Oxford, 1984.
2. High Voltage Engineering – by M.S.Naidu and V.Kamaraju, Mc.Graw-Hill Books Co., New Delhi, 2nd edition, 1995.

Reference Books:

1. High Voltage Technology – LL Alston, Oxford University Press 1968.
2. High Voltage Measuring Techniques – A. Schwab MIT Press, Cambridge,USA, 1972.
3. Relevant I.S. and IEC Specifications.



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II-Semester	Evolutionary Algorithms and Applications (ELECTIVE-III)	CATEGORY	L-T-P 3 -0-0	CREDITS 3
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Pre-Requisite: i) Optimization Techniques ii) Power System Operation

Course Educational Objectives:

- To distinguish between conventional optimization algorithms and evolutionary optimization algorithms.
- To apply genetic algorithm and particle swarm optimization algorithm to power system optimization problems.
- To analyse and apply Ant colony optimization algorithm and artificial Bee colony algorithm to optimize the control parameters./power system optimization problems.
- To apply shuffled frog leaping algorithm and bat optimization algorithm to power system optimization problem.
- To apply multi-objective optimization algorithm to power system multi-objective problems.

UNIT– 1

Fundamentals of Soft Computing Techniques

Definition-Classification of optimization problems- Unconstrained and Constrained optimization Optimality conditions- Introduction to intelligent systems- Soft computing techniques- Conventional Computing versus Swarm Computing - Classification of meta-heuristic techniques - Single solution based and population based algorithms – Exploitation and exploration in population based algorithms - Properties of Swarm intelligent Systems - Application domain - Discrete and continuous problems - Single objective and multi-objective problems.

UNIT– 2

Genetic Algorithm and Particle Swarm Optimization

Genetic algorithms- Genetic Algorithm versus Conventional Optimization Techniques - Genetic representations and selection mechanisms; Genetic operators- different types of crossover and mutation operators -Bird flocking and Fish Schooling – anatomy of a particle- equations based on velocity and positions -PSO topologies - control parameters – GA and PSO algorithms for solving ELD problem without loss, Selective Harmonic Elimination in inverters and PI controller tuning.

UNIT– 3

Ant Colony Optimization and Artificial Bee Colony Algorithms

Biological ant colony system - Artificial ants and assumptions - Stigmergic communications - Pheromone updating- local-global - Pheromone evaporation - ant colony system- ACO models-Touring ant colony system-max min ant system - Concept of Elitist Ants-Task partitioning in honey bees - Balancing foragers and receivers - Artificial bee colony (ABC) algorithms-binary ABC algorithms – ACO and ABC algorithms for solving Economic Dispatch without loss and PI controller tuning.

UNIT– 4

Shuffled Frog-Leaping Algorithm and Bat Optimization Algorithm

Bat Algorithm- Echolocation of bats- Behaviour of microbats- Acoustics of Echolocation- Movement of Virtual Bats- Loudness and Pulse Emission- Shuffled frog algorithm-virtual population of frogscomparison of memes and genes -memplex formation- memplexupdatation- BA and SFLA algorithms for solving ELD without loss and PI controller tuning.

UNIT– 5

Multi Objective Optimization

Multi-Objective optimization Introduction- Concept of Pareto optimality - Non-dominant sorting technique-Pareto fronts-best compromise solution-min-max method-NSGA-II algorithm and application to general two objective optimization problem.



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Course Outcomes: At the end of the course, student will be able to

- State and formulate the optimization problem, without and with constraints, by using design variables from an engineering design problem.
- Apply classical optimization techniques to minimize or maximize a multi-variable objective function, without or with constraints, and arrive at an optimal solution.
- Formulate a mathematical model and apply linear programming technique by using Simplex method. Also extend the concept of dual Simplex method for optimal solutions.
- Apply gradient and non-gradient methods to nonlinear optimization problems and use interior or exterior penalty functions for the constraints to derive the optimal solutions.
- Apply Genetic algorithms for simple electrical problems and able to solve practical problems using PSO.

Text Books

1. Xin-She Yang, „Recent Advances in Swarm Intelligence and Evolutionary Computation“, Springer International Publishing, Switzerland, 2015.
2. Kalyanmoy Deb „Multi-Objective Optimization using Evolutionary Algorithms“, John Wiley & Sons, 2001.
3. James Kennedy and Russel E Eberheart, „Swarm Intelligence“, The Morgan Kaufmann Series in Evolutionary Computation, 2001.

Reference Books:

1. Eric Bonabeau, Marco Dorigo and Guy Theraulaz, „Swarm Intelligence-From natural to Artificial Systems“, Oxford university Press, 1999.
2. David Goldberg, „Genetic Algorithms in Search, Optimization and Machine Learning“, Pearson Education, 2007.
3. Konstantinos E. Parsopoulos and Michael N. Vrahatis, „Particle Swarm Optimization and Intelligence: Advances and Applications“, Information Science reference, IGI Global, , 2010.
4. N P Padhy, „Artificial Intelligence and Intelligent Systems“, Oxford University Press, 2005.

Reference Papers:

1. “Shuffled frog-leaping algorithm: a memetic meta-heuristic for discrete optimization” by Muzaffareusuff, Kevin lansey and Fayzul pasha, Engineering Optimization, Taylor & Francis, Vol. 38, No. pp.129–154, March 2006.
2. “A New Metaheuristic Bat-Inspired Algorithm” by Xin-She Yang, Nature Inspired Cooperative Strategies for Optimization (NISCO 2010) (Eds. J. R. Gonzalez et al.), Studies in Computational Intelligence, Springer Berlin, 284, Springer, 65-74 (2010).
3. “Firefly Algorithms for Multimodal Optimization” Xin-She Yang, O. Watanabe and T. Zeugmann (Eds.), Springer-Verlag Berlin Heidelberg, pp. 169–178, 2009.



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KAKINADA – 533 003, Andhra Pradesh, India

II-Semester	PROGRAMMABLE LOGIC CONTROLLERS & APPLICATIONS (ELECTIVE-IV)	CATEGORY	L-T-P 3 -0-0	CREDITS 3
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Pre-requisite: Knowledge on relay logic and digital electronics

Course Educational Objectives:

- To have knowledge on PLC.
- To acquire the knowledge on programming of PLC.
- To understand different PLC registers and their description.
- To have knowledge on data handling functions of PLC.
- To know how to handle analog signal and converting of A/D in PLC.

UNIT– 1

PLC Basics:

PLC system, I/O modules and interfacing, CPU processor, programming equipment, programming formats, construction of PLC ladder diagrams, devices connected to I/O modules.

UNIT– 2

PLC Programming:

Input instructions, outputs, operational procedures, programming examples using contacts and coils. Drill press operation. Digital logic gates, programming in the Boolean algebra system, conversion examples. Ladder diagrams for process control: Ladder diagrams and sequence listings, ladder diagram construction and flow chart for spray process system.

UNIT– 3

PLC Registers:

Characteristics of Registers, module addressing, holding registers, input registers, output registers. PLC Functions: Timer functions and Industrial applications, counters, counter function industrial applications, Arithmetic functions, Number comparison functions, number conversion functions.

UNIT– 4

Data Handling functions:

SKIP, Master control Relay, Jump, Move, FIFO, FAL, ONS, CLR and Sweep functions and their applications. Bit Pattern and changing a bit shift register, sequence functions and applications, controlling of two axis and three axis Robots with PLC, Matrix functions.

UNIT– 5

Analog PLC operation:

Analog modules and systems, Analog signal processing, multi bit data processing, analog output application examples, PID principles, position indicator with PID control, PID modules, PID tuning, PID functions.

Course Outcomes: At the end of the course, student will be able to

- Understand the PLCs and their I/O modules.
- Develop control algorithms to PLC using ladder logic etc.
- Manage PLC registers for effective utilization in different applications.
- Handle data functions and control of two axis and their axis robots with PLC.
- Design PID controller with PLC.



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Text Books:

1. Programmable Logic Controllers – Principle and Applications by John W. Webb and Ronald A. Reiss, Fifth Edition, PHI
2. Programmable Logic Controllers – Programming Method and Applications by JR. Hackworth and F.D Hackworth Jr. – Pearson, 2004.

Reference Books:

1. Introduction to Programmable Logic Controllers- Gary Dunning-Cengage Learning.
2. Programmable Logic Controllers –W.Bolton-Elsevier publisher.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
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II-Semester	POWER SYSTEM SIMULATION LABORATORY-II	CATEGORY	L-T-P 3 -0-0	CREDITS 3
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Pre-requisite: Power systems

Course Educational Objectives:

The student should understand the modelling of various aspects of Power System analysis and develop the MATLAB programming.

List of Experiments

- 1 Load Flow Solution Using Gauss Siedel Method
- 2 Load Flow Solution Using Newton Raphson Method
- 3 Load Flow Solution Using Decoupled Method
- 4 Symmetrical Fault analysis using Z-bus
- 5 Unsymmetrical Fault analysis using Z-bus
- 6 Economic Load Dispatch with & without transmission losses
- 7 Transient Stability Analysis using modified Euler's method.
- 8 Transient Stability Analysis using modified R-K method.
- 9 Transient Stability Analysis Using Point By Point Method
- 10 Load Frequency Control of Single Area Control & Two Area Control system with and without controllers.

Course Outcomes:

The student should analyze load flow solution obtained using GS and NR methods, symmetrical and unsymmetrical faults, Transient stability and load frequency deviation in single and two area systems



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

II-Semester	POWER CONVERTERS LABORATORY	CATEGORY	L-T-P	CREDITS
			3-0-0	3

Pre-requisite: Fundamentals of Power Electronics

Course Educational Objectives: To study and understand the different converters and inverters for single and three phase loads.

Any 10 of the following experiments are to be conducted.

List of experiments

1. Study of DC-DC non-isolated converters such as Buck & Boost converter.
2. Study of DC-DC Buck-Boost and Cuk converters.
3. Study of 1- ϕ dual converter.
4. Determination of input p.f. and harmonic factor for 1- ϕ semi-converter and 1- ϕ full-converter (Inductive load)
5. Study of p.f. improvement in 1- ϕ full-converter with symmetric and extinction angle control.
6. Study of 1- ϕ square wave and sinusoidal PWM inverter.
7. Study of 3- ϕ inverter with 120° and 180° mode of operation.
8. Study of 3- ϕ sinusoidal PWM inverter.
9. Study of 3-level NPC inverter.
10. Study of 5-level cascaded H-bridge inverter.
11. Determination of input p.f. and harmonic factor for 3- ϕ full converter (Inductive load).
12. Determination of input p.f. and harmonic factor for 3- ϕ semi converter (Inductive load).
13. Study the characteristics of IGBT, MOSFET & GTO's.
14. Design of gate drive circuits for IGBT & MOSFET's.

Course Outcomes: Students are able to implement the converter and inverters in real time applications.



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II-Semester	MINI PROJECT WITH SEMINAR	CATEGORY	L-T-P	CREDITS
			0-0-4	2

Note:

It is recommended that a Supervisor/advisor should be allotted to each student at the end of the semester-I or allot at the start of the semester-II

Syllabus content:

A Student has to select one paper published in any of the IEEE Transactions and simulate the same. The student has to present the progress of the work at the middle of the semester. At the end of the semester, the student has to present the results by explaining the idea of the topic, methodology, finding of the simulations. A Student should also submit a report of the entire work carried out under this course. The end semester presentation must be video recorded and preserved.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
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III-Semester	Energy Audit Conservation & Management (Program Elective-V)	CATEGORY	L-T-P 3-0-0	CREDITS 3
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Pre-requisite:Electrical power systems and measurements.

Course Educational Objectives:

- To learn the basics of energy audit and energy conservation schemes.
- To comprehend the principles of energy management and understand the need of energy efficient motors and lighting design practices.
- To learn about power factor improvement techniques and energy instruments.
- To learn about the economic aspects of energy equipment.

UNIT– 1

Basic Principles of Energy Audit

Energy audit- definitions, concept , types of audit, energy index, cost index ,pie charts, Sankey diagrams and load profiles, Energy conservation schemes- Energy audit of industries- energy saving potential, energy audit of process industry, thermal power station, building energy audit.

UNIT– 2

Energy Management

Principles of energy management, organizing energy management program, initiating, planning, controlling, promoting, monitoring, reporting. Energy manager, qualities and functions, language, Questionnaire – check list for top management

UNIT– 3

Energy Efficient Motors and Lighting

Energy efficient motors, factors affecting efficiency, loss distribution, constructional details, characteristics – variable speed , variable duty cycle systems, RMS - voltage variation-voltage unbalance-over motoring-motor energy audit. lighting system design and practice, lighting control, lighting energy audit

UNIT– 4

Power Factor Improvement and energy instruments

Power factor – methods of improvement, location of capacitors, Power factor with non-linear loads, effect of harmonics on p.f, p.f motor controllers – Energy Instruments- watt meter, data loggers, thermocouples, pyrometers, lux meters, tongue testers, application of PLC's

UNIT– 5

Economic Aspects and their computation

Economics Analysis depreciation Methods, time value of money, rate of return, present worth method, replacement analysis, lifecycle costing analysis – Energy efficient motors. Calculation of simple payback method, net present value method- Power factor correction, lighting – Applications of life cycle costing analysis, return on investment.

Course Outcomes: At the end of the course, student will be able to

- Understand the principle of energy audit and their economic aspects.
- Recommend energy efficient motors and design good lighting system.
- Understand advantages to improve the power factor.
- Evaluate the depreciation of equipment.



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KAKINADA – 533 003, Andhra Pradesh, India

Text Books:

1. Energy management by W.R.Murphy&G.Mckay Butter worth, Heinemann publications, 1982.
2. Energy management hand book by W.CTurner, John Wiley and sons, 1982.

Reference Books:

1. Energy efficient electric motors by John.C.Andreas, Marcel Dekker Inc Ltd-2nd edition,1995
2. Energy management by Paul o' Callaghan, Mc-graw Hill Book company-1st edition, 1998
3. Energy management and good lighting practice : fuel efficiency- booklet12-EEO



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
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III-Semester	SMART GRID TECHNOLOGIES (ELECTIVE-V)	CATEGORY	L-T-P 3 -0-0	CREDITS 3
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Pre-requisite: Basic knowledge on smart concept communication protocols, renewable energy systems and electronic circuits.

Course Educational Objectives:

- To understand concept of smart grid and developments on smart grid.
- To understand smart grid technologies and application of smart grid concept in hybrid electric vehicles etc.
- To have knowledge on smart substations, feeder automation and application for monitoring and protection.

UNIT – 1

Introduction to Smart Grid: Evolution of Electric Grid, Concept of Smart Grid, Definitions, Need of Smart Grid, Functions of Smart Grid, Opportunities & Barriers of Smart Grid, Difference between conventional & smart grid, Concept of Resilient & Self-Healing Grid, Present development & International policies on Smart Grid. Case study of Smart Grid.

UNIT – 2

Smart Grid Technologies: Part 1: Introduction to Smart Meters, Real Time Pricing, Smart Appliances, Automatic Meter Reading(AMR), Outage Management System(OMS), Plug in Hybrid Electric Vehicles(PHEV), Vehicle to Grid, Smart Sensors, Home & Building Automation, Phase Shifting Transformers.

UNIT – 3

Smart Grid Technologies: Part 2: Smart Substations, Substation Automation, Feeder Automation. Geographic Information System(GIS), Intelligent Electronic Devices(IED) & their application for monitoring & protection, Smart storage like Battery, SMES, Pumped Hydro, Compressed Air Energy Storage, Wide Area Measurement System(WAMS), Phase Measurement Unit(PMU).

UNIT – 4

Micro grids and Distributed Energy Resources: Concept of micro grid, need & applications of microgrid, formation of microgrid, Issues of interconnection, protection & control of microgrid. Plastic & Organic solar cells, Thin film solar cells, Variable speed wind generators, fuel cells, microturbines, Captive power plants, Integration of renewable energy sources.

UNIT – 5

Power Quality Management in Smart Grid: Power Quality & EMC in Smart Grid, Power Quality issues of Grid connected Renewable Energy Sources, Power Quality Conditioners for Smart Grid, Web based Power Quality monitoring, Power Quality Audit.

Information and Communication Technology for Smart Grid: Advanced Metering Infrastructure (AMI), Home Area Network (HAN), Neighbourhood Area Network (NAN), Wide Area Network (WAN).



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Course Outcomes:

At the end of this course, the students will be able to:

- Understand smart grids and analyze the smart grid policies and developments in smart grids.
- Develop concepts of smart grid technologies in hybrid electrical vehicles etc.
- Understand smart substations, feeder automation, GIS etc.
- Analyze micro grids and distributed generation systems.
- Analyze the effect of power quality in smart grid and to understand latest developments in ICT for smart grid.

Text Books:

1. Ali Keyhani, Mohammad N. Marwali, Min Dai “Integration of Green and Renewable Energy in Electric Power Systems”, Wiley
2. Clark W. Gellings, “The Smart Grid: Enabling Energy Efficiency and Demand Response”, CRC Press

Reference Books:

1. JanakaEkanayake, Nick Jenkins, KithsiriLiyanage, Jianzhong Wu, AkihikoYokoyama, “Smart Grid: Technology and Applications”, Wiley
2. Jean Claude Sabonnadière, NouredineHadjsaïd, “Smart Grids”, Wiley Blackwell 19
3. Peter S. Fox Penner, “Smart Power: Climate Changes, the Smart Grid, and the Future of Electric Utilities”, Island Press; 1 edition 8 Jun 2010
4. S. Chowdhury, S. P. Chowdhury, P. Crossley, “Microgrids and Active Distribution Networks.” Institution of Engineering and Technology, 30 Jun 2009
5. Stuart Borlase, “Smart Grids (Power Engineering)”, CRC Press
6. Andres Carvallo, John Cooper, “The Advanced Smart Grid: Edge Power Driving Sustainability: 1”, Artech House Publishers July 2011



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KAKINADA – 533 003, Andhra Pradesh, India

III-Semester	POWER QUALITY AND CUSTOM POWER DEVICES (ELECTIVE–V)	CATEGORY	L-T-P 3 -0-0	CREDITS 3
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Pre requisite: Knowledge on electric circuit analysis, power systems and power electronics and concept of reactive power compensation techniques.

Course Educational Objectives:

- To understand significance of power quality and power quality parameters.
- To know types of transient over voltages and protection of transient voltages.
- To understand harmonics, their effects, harmonic indices and harmonic minimization techniques.
- To understand the importance of power devices and their applications.
- To understand different compensation techniques to minimize power quality disturbances.

UNIT– 1

Introduction to power quality: Overview of Power Quality, Concern about the Power Quality, General Classes of Power Quality Problems, Voltage Unbalance, Waveform Distortion, Voltage fluctuation, Power Frequency Variations, Power Quality Terms, Voltage Sags, swells, flicker and Interruptions - Sources of voltage and current interruptions, Nonlinear loads.

UNIT– 2

Transient and Long Duration Voltage Variations: Source of Transient Over Voltages - Principles of Over Voltage Protection, Devices for Over Voltage Protection, Utility Capacitor Switching Transients, Utility Lightning Protection, Load Switching Transient Problems.

Principles of Regulating the Voltage, Device for Voltage Regulation, Utility Voltage Regulator Application, Capacitor for Voltage Regulation, End-user Capacitor Application, Regulating Utility Voltage with Distributed generation

UNIT– 3

Harmonic Distortion and solutions: Voltage vs. Current Distortion, Harmonics vs. Transients - Power System Quantities under Non-sinusoidal Conditions, Harmonic Indices, Sources of harmonics, Locating Sources of Harmonics, System Response Characteristics, Effects of Harmonic Distortion, Inter harmonics, Harmonic Solutions Harmonic Distortion Evaluation, Devices for Controlling Harmonic Distortion, Harmonic Filter Design, Standards on Harmonics

UNIT– 4

Custom Power Devices: Custom power and custom power devices, voltage source inverters, reactive power and harmonic compensation devices, compensation of voltage interruptions and current interruptions, static series and shunt compensators, compensation in distribution systems, interaction with distribution equipment, installation considerations.

UNIT– 5

Application of custom power devices in power systems: Static and hybrid Source Transfer Switches, Solid state current limiter - Solid state breaker. P-Q theory – Control of P and Q, Dynamic Voltage Restorer (DVR): Operation and control – Interline Power Flow Controller (IPFC): Operation and control of Unified Power Quality Conditioner (UPQC); Generalized power quality conditioner

Course Outcomes: At the end of the course, student will be able to

- Identify the issues related to power quality in power systems.
- Address the problems of transient and long duration voltage variations in power systems.
- Analyze the effects of harmonics and study of different mitigation techniques.
- Identify the importance of custom power devices and their applications.
- Acquire knowledge on different compensation techniques to minimize power quality disturbances.



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Text Books:

1. Electrical Power Systems Quality, Dugan R C, McGranaghan M F, Santoso S, and Beaty H W, Second Edition, McGraw-Hill, 2002.
2. Understanding Power Quality Problems: Voltage Sags and Interruptions, Bollen M H J, First Edition, IEEE Press; 2000.
3. Guidebook on Custom Power Devices, Technical Report, Published by EPRI, Nov 2000
4. Power Quality Enhancement Using Custom Power Devices – Power Electronics and Power Systems, Gerard Ledwich, Arindam Ghosh, Kluwer Academic Publishers, 2002.

Reference Books:

1. Power Quality Primer, Kennedy B W, First Edition, McGraw-Hill, 2000.
2. Power System Harmonics, Arrillaga J and Watson N R, Second Edition, John Wiley & Sons, 2003.
3. Electric Power Quality control Techniques, W. E. Kazibwe and M. H. Sendaula, Van Nostrand Reinhold, New York.
4. Power Quality c.shankaran, CRC Press, 2001
5. Harmonics and Power Systems –Franciso C.DE LA Rosa-CRC Press (Taylor & Francis).
6. Power Quality in Power systems and Electrical Machines-EwaldF.fuchs, Mohammad A.S. Masoum-Elsevier
7. Power Quality, C. Shankaran, CRC Press, 2001
8. Instantaneous Power Theory and Application to Power Conditioning, H. Akagiet.al., IEEE Press, 2007.
9. Custom Power Devices - An Introduction, Arindam Ghosh and Gerard Ledwich, Springer, 2002
10. A Review of Compensating Type Custom Power Devices for Power Quality Improvement, Yash Pal et.al., Joint International Conference on Power System Technology and IEEE Power India Conference, 2008. POWERCON 2008.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
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III-Semester	INDUSTRIAL SAETY (OPEN ELECTIVE)	CATEGORY	L-T-P	CREDITS
			3 -0-0	3

Pre-requisite: Engineering Fundamentals

Course Educational Objectives:

- To learn safety aspects of any industrial area
- To learn fundamentals and types of maintenance engineering
- To learn causes and effects of wear and Corrosion and their prevention
- To learn identification of faults and their repair
- To learn preventive maintenance- periodic an preventive-maintenance of industrial systems

Unit-I: Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety colour codes. Fire prevention and fire fighting, equipment and methods.

Unit-II: Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

Unit-III: Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

Unit-IV: Fault tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

Unit-V: Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: i. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance

Course Outcomes: At the end of the course, the student should be able to

- Understand the general industrial requirements like lighting, cleanliness prevention from hazards and accidents.
- Analyze maintenance requirements of the industry and cost associated.
- Analyze wear and corrosion aspects of the industry and their prevention.
- Identify the faults prone areas and their repair and periodic maintenance.



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Reference Books:

1. Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.
2. Maintenance Engineering, H. P. Garg, S. Chand and Company.
3. Pump-hydraulic Compressors, Audels, Mcgrew Hill Publication.
4. Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
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III-Semester	ARTIFICIAL INTELLIGENT TECHNIQUES (OPEN ELECTIVE)	CATEGORY	L-T-P 3 -0-0	CREDITS 3
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Pre-requisite: Fundamentals of Neural networks and Fuzzy Logic.

Course Educational Objectives:

- To have knowledge on concept of neural network.
- To know different types of neural networks and training algorithms.
- To understand the concept of genetic algorithm and its application in optimization.
- To have the knowledge on fuzzy logic and design of fuzzy logic controllers.
- To know the applications of AI Techniques in electrical engineering.

UNIT– 1

Introduction

Artificial Neural Networks (ANN) – definition and fundamental concepts – Biological neural networks – Artificial neuron – activation functions – setting of weights – typical architectures – biases and thresholds – learning/training laws and algorithms. Perceptron – architectures, ADALINE and MADLINE – linear separability- XOR function.

UNIT– 2

ANN Paradigms

ADALINE – feed forward networks – Back Propagation algorithm- number of hidden layers – gradient decent algorithm – Radial Basis Function (RBF) network. Kohonen’s self organizing map (SOM), Learning Vector Quantization (LVQ) and its types – Functional Link Networks (FLN) – Bidirectional Associative Memory (BAM) – Hopfield Neural Network.

UNIT– 3

Classical and Fuzzy Sets

Introduction to classical sets- properties, Operations and relations; Fuzzy sets, Membership, Operations, Properties, Fuzzy relations, Cardinalities, Membership functions.

UNIT– 4

FUZZY LOGIC CONTROLLER (FLC)

Fuzzy logic system components: Fuzzification, Inference engine (development of rule base and decision making system), Defuzzification to crisp sets- Defuzzification methods.

UNIT– 5

Application of AI Techniques

Speed control of DC motors using fuzzy logic –load flow studies using back propagation algorithm, single area and two area load frequency control using fuzzy logic.

Course Outcomes: At the end of the course, student will be able to

- Differentiate between Algorithmic based methods and knowledge based methods.
- Use appropriate AI framework for solving power system problems.
- To design fuzzy logic controllers for power engineering applications.



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Text Books:

1. Introduction to Artificial Neural Systems - Jacek M. Zurada, Jaico Publishing House, 1997.
2. Fuzzy logic with Fuzzy Applications – T.J Ross – McGraw Hill Inc, 1997.

Reference Books:

1. Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by RajasekharanandPai – PHI Publication.
2. Modern power Electronics and AC Drives – B.K.Bose -Prentice Hall, 2002
3. Genetic Algorithms- David E Goldberg. Pearson publications.
5. Introduction to Neural Networks using MATLAB 6.0 by S N Sivanandam,SSumathi,S N Deepa TMGH
6. Introduction to Fuzzy Logic using MATLAB by S N Sivanandam,SSumathi,S N Deepa Springer, 2007.



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III Semester	OPERATIONS RESEARCH (OPEN ELECTIVE)	CATEGORY	L-T-P 3 -0-0	CREDITS 3
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Pre –requisite: Engineering Mathematics

Course Educational Objectives:

- To understand the mathematical modelling of physical systems and its solving techniques with and without constraints.
- To understand the solving of LPP problem using graphical and simplex method.
- To understand the Solving of non-linear programming problem.
- To understand the scheduling and sequencing problem of different models with geometric programming.
- To understand the Solving of LPP using dynamic programming and graph theory.

Unit 1:

Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models

Unit 2

Formulation of a LPP - Graphical solution revised simplex method - duality theory - dual simplex method - sensitivity analysis - parametric programming

Unit 3:

Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem - CPM/PERT

Unit 4

Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming.

Unit 5

Competitive Models, Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation

Course Outcomes: At the end of the course, the student should be able to

1. Students should be able to apply the dynamic programming to solve problems of discrete and continuous variables.
2. Students should be able to apply the concept of non-linear programming
3. Students should be able to carry out sensitivity analysis
4. Student should be able to model the real world problem and simulate it.

References:

1. H.A. Taha, Operations Research, An Introduction, PHI, 2008
2. H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982.
3. J.C. Pant, Introduction to Optimization: Operations Research, Jain Brothers, Delhi, 2008
4. Hitler Libermann Operations Research: McGraw Hill Pub. 2009
5. Pannerselvam, Operations Research: Prentice Hall of India 2010
6. Harvey M Wagner, Principles of Operations Research: Prentice Hall of India 2010



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III SEMESTER	DISSERTATION PHASE-I	CATEGORY	L-T-P 0-0-20	CREDIT 10
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IV SEMESTER	DISSERTATION PHASE-II	CATEGORY	L-T-P 0-0-32	CREDIT 16
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AUDIT 1 and 2: ENGLISH FOR RESEARCH PAPER WRITING

Course objectives: Students will be able to: Understand that how to improve your writing skills and level of readability Learn about what to write in each section Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission		
Syllabus		
Units	CONTENTS	Hours
1	Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness	4
2	Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction	4
3	Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.	4
4	key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature,	4
5	skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions	4
6	useful phrases, how to ensure paper is as good as it could possibly be the first- time submission	4

Suggested Studies:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman'sbook .
4. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
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AUDIT 1 and 2: DISASTER MANAGEMENT

Course Objectives: -Students will be able to:
learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in

Syllabus

Units	CONTENTS	Hours
1	Introduction Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.	4
2	Repercussions Of Disasters And Hazards: Economic Damage, Loss Of Human And Animal Life, Destruction Of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man- made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.	4
3	Disaster Prone Areas In India Study Of Seismic Zones; Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics	4
4	Disaster Preparedness And Management Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.	4
5	Risk Assessment Disaster Risk: Concept And Elements, Disaster Risk Reduction, Global And National Disaster Risk Situation. Techniques Of Risk Assessment, Global Co-Operation In Risk Assessment And Warning, People's Participation In Risk Assessment. Strategies for Survival.	4
6	Disaster Mitigation Meaning, Concept And Strategies Of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation And Non-Structural Mitigation, Programs Of Disaster Mitigation In India.	4



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Suggested Readings:

1. R. Nishith, Singh AK, “Disaster Management in India: Perspectives, issues and strategies “New Royal book Company.
2. Sahni, PardeepEt.Al. (Eds.),” Disaster Mitigation Experiences And Reflections”, Prentice Hall Of India, New Delhi.
3. Goel S. L. , Disaster Administration And Management Text And Case Studies” ,Deep &Deep Publication Pvt. Ltd., New Delhi.



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AUDIT 1 and 2: SANSKRIT FOR TECHNICAL KNOWLEDGE

Course Objectives

1. To get a working knowledge in illustrious Sanskrit, the scientific language in the world
2. Learning of Sanskrit to improve brain functioning
3. Learning of Sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power
4. The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature

Syllabus

Unit	Content	Hours
1	<ul style="list-style-type: none">• Alphabets in Sanskrit,• Past/Present/Future Tense,• Simple Sentences	8
2	<ul style="list-style-type: none">• Order• Introduction of roots• Technical information about Sanskrit Literature	8
3	<ul style="list-style-type: none">• Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics	8

Suggested reading

1. “Abhyaspustakam” – Dr. Vishwas, Samskrita-Bharti Publication, New Delhi
2. “Teach Yourself Sanskrit” Prathama Deeksha-Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
3. “India’s Glorious Scientific Tradition” Suresh Soni, Ocean books (P) Ltd., New Delhi.

Course Output

Students will be able to

1. Understanding basic Sanskrit language
2. Ancient Sanskrit literature about science & technology can be understood

Being a logical language will help to develop logic in



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AUDIT 1 and 2: SANSKRIT FOR TECHNICAL KNOWLEDGE

Course Objectives

5. To get a working knowledge in illustrious Sanskrit, the scientific language in the world
6. Learning of Sanskrit to improve brain functioning
7. Learning of Sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power
8. The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature

Syllabus

Unit	Content	Hours
1	<ul style="list-style-type: none">• Alphabets in Sanskrit,• Past/Present/Future Tense,• Simple Sentences	8
2	<ul style="list-style-type: none">• Order• Introduction of roots• Technical information about Sanskrit Literature	8
3	<ul style="list-style-type: none">• Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics	8

Suggested reading

4. “Abhyaspustakam” – Dr. Vishwas, Samskrita-Bharti Publication, New Delhi
5. “Teach Yourself Sanskrit” Prathama Deeksha-Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
6. “India’s Glorious Scientific Tradition” Suresh Soni, Ocean books (P) Ltd., New Delhi.

Course Output

Students will be able to

1. Understanding basic Sanskrit language
2. Ancient Sanskrit literature about science & technology can be understood
3. Being a logical language will help to develop logic in students



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KAKINADA – 533 003, Andhra Pradesh, India

AUDIT 1 and 2: VALUE EDUCATION

Course Objectives

Students will be able to

1. Understand value of education and self- development
2. Imbibe good values in students
3. Let the should know about the importance of character

Syllabus

Unit	Content	Hours
1	<ul style="list-style-type: none">• Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism.• Moral and non- moral valuation. Standards and principles.• Value judgements	4
2	<ul style="list-style-type: none">• Importance of cultivation of values.• Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness.• Honesty, Humanity. Power of faith, National Unity.• Patriotism.Love for nature ,Discipline	6
3	<ul style="list-style-type: none">• Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline.• Punctuality, Love and Kindness.• Avoid fault Thinking.• Free from anger, Dignity of labour.• Universal brotherhood and religious tolerance.• True friendship.• Happiness Vs suffering, love for truth.• Aware of self-destructive habits.• Association and Cooperation.• Doing best for saving nature	6
4	<ul style="list-style-type: none">• Character and Competence –Holy books vs Blind faith.• Self-management and Good health.• Science of reincarnation.• Equality, Nonviolence ,Humility, Role of Women.• All religions and same message.• Mind your Mind, Self-control.• Honesty, Studying effectively	6

Suggested reading

1 Chakroborty, S.K. “Values and Ethics for organizations Theory and practice”, Oxford University Press, New Delhi

Course outcomes

Students will be able to 1.Knowledge of self-development

2.Learn the importance of Human values 3.Developing the overall personality



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AUDIT 1 and 2: CONSTITUTION OF INDIA

Course Objectives:

Students will be able to:

1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

Syllabus

Units	Content	Hours
1	•History of Making of the Indian Constitution: History Drafting Committee, (Composition & Working)	4
2	•Philosophy of the Indian Constitution: Preamble Salient Features	4
3	<input type="checkbox"/> Contours of Constitutional Rights & Duties: <input type="checkbox"/> Fundamental Rights <input type="checkbox"/> Right to Equality <input type="checkbox"/> Right to Freedom <input type="checkbox"/> Right against Exploitation <input type="checkbox"/> Right to Freedom of Religion <input type="checkbox"/> Cultural and Educational Rights <input type="checkbox"/> Right to Constitutional Remedies <input type="checkbox"/> Directive Principles of State Policy <input type="checkbox"/> Fundamental Duties.	4
4	<input type="checkbox"/> Organs of Governance: <input type="checkbox"/> Parliament <input type="checkbox"/> Composition <input type="checkbox"/> Qualifications and Disqualifications <input type="checkbox"/> Powers and Functions • Executive <input type="checkbox"/> President <input type="checkbox"/> Governor <input type="checkbox"/> Council of Ministers <input type="checkbox"/> Judiciary, Appointment and Transfer of Judges, Qualifications <input type="checkbox"/> Powers and Functions	4



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5	<ul style="list-style-type: none"><input type="checkbox"/> Local Administration:<input type="checkbox"/> District's Administration head: Role and Importance,<input type="checkbox"/> Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation.<input type="checkbox"/> Pachayati raj: Introduction, PRI: ZilaPachayat.<input type="checkbox"/> Elected officials and their roles, CEO ZilaPachayat: Position and role.<input type="checkbox"/> Block level: Organizational Hierarchy (Different departments),<input type="checkbox"/> Village level: Role of Elected and Appointed officials,<input type="checkbox"/> Importance of grass root democracy	O 4
6	<ul style="list-style-type: none"><input type="checkbox"/> Election Commission:<input type="checkbox"/> Election Commission: Role and Functioning.<input type="checkbox"/> Chief Election Commissioner and Election Commissioners.<input type="checkbox"/> State Election Commission: Role and Functioning.<input type="checkbox"/> Institute and Bodies for the welfare of SC/ST/OBC and women.	4

Suggested reading

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

Course Outcomes:

Students will be able to:

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
4. Discuss the passage of the Hindu Code Bill of 1956.



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5.

AUDIT 1 and 2: PEDAGOGY STUDIES

Course Objectives:

Students will be able to:

4. Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
5. Identify critical evidence gaps to guide the development.

Syllabus

Units	Content	Hours
1	<ul style="list-style-type: none"> □ Introduction and Methodology: □ Aims and rationale, Policy background, Conceptual framework and terminology □ Theories of learning, Curriculum, Teacher education. □ Conceptual framework, Research questions. □ Overview of methodology and Searching. 	4
2	<ul style="list-style-type: none"> • Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. • Curriculum, Teacher education. 	2
3	<ul style="list-style-type: none"> • Evidence on the effectiveness of pedagogical practices • Methodology for the in depth stage: quality assessment of included studies. • How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? • Theory of change. • Strength and nature of the body of evidence for effective pedagogical practices. • Pedagogic theory and pedagogical approaches. • Teachers' attitudes and beliefs and Pedagogic strategies. 	4
4	<ul style="list-style-type: none"> • Professional development: alignment with classroom practices and follow-up support • Peer support • Support from the head teacher and the community. • Curriculum and assessment • Barriers to learning: limited resources and large class sizes 	4
5	<ul style="list-style-type: none"> □ Research gaps and future directions □ Research design □ Contexts □ Pedagogy □ Teacher education □ Curriculum and assessment □ Dissemination and research impact. 	2



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Suggested reading

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, *Compare*, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, *Journal of Curriculum Studies*, 36 (3): 361-379.
3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? *International Journal Educational Development*, 33 (3): 272–282.
5. Alexander RJ (2001) *Culture and pedagogy: International comparisons in primary education*. Oxford and Boston: Blackwell.
6. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.
7. www.pratham.org/images/resource%20working%20paper%202.pdf.

Course Outcomes:

Students will be able to understand:

1. What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?
2. What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
3. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?



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AUDIT 1 and 2: STRESS MANAGEMENT BY YOGA

Course Objectives

1. To achieve overall health of body and mind
2. To overcome stress

Syllabus

Unit	Content	Hours
1	<ul style="list-style-type: none">• Definitions of Eight parts of yog. (Ashtanga)	8
2	Yam and Niyam. Do`s and Don`t`s in life. i) Ahinsa, satya, astheya, bramhacharya and aparigraha ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan	8
3	<ul style="list-style-type: none">• Asan and Pranayam <ol style="list-style-type: none">1. Various yog poses and their benefits for mind & body2. Regularization of breathing techniques and its effects-Types of pranayam	8

Suggested reading

1. ‘Yogic Asanas for Group Training-Part-I’ : Janardan Swami YogabhyasiMandal, Nagpur
2. “Rajayoga or conquering the Internal Nature” by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata

Course Outcomes:

Students will be able to:

1. Develop healthy mind in a healthy body thus improving social health also
2. Improve efficiency



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**AUDIT 1 and 2: PERSONALITY DEVELOPMENT THROUGH LIFE
ENLIGHTENMENT SKILLS**

Course Objectives

1. To learn to achieve the highest goal happily
2. To become a person with stable mind, pleasing personality and determination
3. To awaken wisdom in students

Syllabus

Unit	Content	Hours
1	Neetisatakam-Holistic development of personality <ul style="list-style-type: none">• Verses- 19,20,21,22 (wisdom)• Verses- 29,31,32 (pride & heroism)• Verses- 26,28,63,65 (virtue)• Verses- 52,53,59 (don't's)• Verses- 71,73,75,78 (do's)	8
2	<ul style="list-style-type: none">• Approach to day to day work and duties.• Shrimad Bhagwad Geeta : Chapter 2-Verses 41, 47,48,• Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35,• Chapter 18-Verses 45, 46, 48.	8
3	<ul style="list-style-type: none">• Statements of basic knowledge.• Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68• Chapter 12 -Verses 13, 14, 15, 16,17, 18• Personality of Role model. Shrimad Bhagwad Geeta: Chapter2-Verses 17, Chapter 3-Verses 36,37,42,• Chapter 4-Verses 18, 38,39• Chapter18 – Verses 37,38,63	8

Suggested reading

1. "Srimad Bhagavad Gita" by Swami Swarupananda Advaita Ashram (Publication Department), Kolkata
2. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.

Course Outcomes

Students will be able to

1. Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
 2. The person who has studied Geeta will lead the nation and mankind to peace and prosperity
- Study of Neetishatakam will help in developing versatile personality of students



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE STRUCTURE & SYLLABUS M.Tech CSE for
COMPUTER SCIENCE & ENGINEERING PROGRAMME
(Applicable for batches admitted from 2019-2020)



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I-SEMESTER

S.No	Course Code	Courses	Category	L	T	P	C
1	MTCSE1101	Program Core-1 Mathematical Foundations of Computer Science	PC	3	0	0	3
2	MTCSE1102	Program Core-2 Advanced Data Structures & Algorithms	PC	3	0	0	3
3	MTCSE1103	Program Elective-1 1. Big Data Analytics 2. Digital Image Processing 3. Advanced Operating Systems	PE	3	0	0	3
4	MTCSE1104	Program Elective-2 1. Advanced Computer Networks 2. Internet of Things 3. Object Oriented Software Engineering	PE	3	0	0	3
5	MTCSE1105	Research Methodology and IPR	CC			0	2
6	MTCSE1106	Laboratory-1 Advanced Data Structures & Algorithms Lab	LB	0	0	4	2
7	MTCSE1107	Laboratory-2 Advanced Computing Lab	LB	0	0	4	2
8	MTCSE1108	Audit Course-1*	AC	2	0	0	0
Total Credits							18

***Student has to choose any one audit course listed below.**

II SEMESTER

S.No	Course Code	Courses	Category	L	T	P	C
1	MTCSE1201	Program Core-3 Machine learning	PC	3	0	0	3
2	MTCSE1202	Program Core-4 MEAN Stack Technologies	PC	3	0	0	3
3	MTCSE1203	Program Elective-3 1. Advanced Databases and Mining 2. Ad Hoc & Sensor Networks 3. Soft Computing	PE	3	0	0	3
4	MTCSE1204	Program Elective-4 1. Cloud Computing 2. Principles of computer security 3. High Performance Computing	PE	3	0	0	3
5	MTCSE1205	Laboratory-3 Machine Learning with python lab	LB	0	0	4	2
6	MTCSE1206	Laboratory-4 MEAN Stack Technologies Lab	LB	0	0	4	2
7	MTCSE1207	Mini Project with Seminar	MP	2	0	0	2
8	MTCSE1208	Audit Course-2 *	AC	2	0	0	0
Total Credits							18



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***Student has to choose any one audit course listed below.**

Audit Course 1 & 2:

- | | |
|---------------------------------------|--|
| 1. English for Research Paper Writing | 5. Constitution of India |
| 2. Disaster Management | 6. Pedagogy Studies |
| 3. Sanskrit for Technical Knowledge | 7. Stress Management by Yoga |
| 4. Value Education | 8. Personality Development through Life Enlightenment Skills |

III-SEMESTER

S.No	Course Code	Courses	Category	L	T	P	C
1	MTCSE2101	Program Elective-5 1. Deep Learning 2. Social Network Analysis 3. MOOCs-1 (NPTEL/SWAYAM) 12 Week Program related to the programme which is not listed in the course structure	PE	3	0	0	3
2	MTCSE2102	Open Elective 1. MOOCs-2 (NPTEL/SWAYAM)-Any 12 Week Course on Engineering/ Management/ Mathematics offered by other than parent department 2. Course offered by other departments in the college	OE	3	0	0	3
3	MTCSE2103	Dissertation-I/ Industrial Project #	PJ	0	0	20	10
Total Credits							16

#Students going for Industrial Project/Thesis will complete these courses through MOOCs

M. Tech. (CSE) IV SEMESTER							
S.No	Course Code	Courses	Category	L	T	P	C
1	MTCSE2201	Dissertation-II	PJ	0	0	32	16
Total Credits							16

Open Electives offered by the Department of CSE

1. Python Programming
2. Principles of Cyber Security
3. Internet of Things
4. Machine Learning
5. Digital forensics
6. Next Generation Databases



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I Year - I Semester	L	T	P	C
	3	0	0	3
Mathematical Foundations of Computer Science (MTCSE1101)				

Course Objectives: This course is aimed at enabling the students to

- To understand the mathematical fundamentals that is prerequisites for variety of courses like Data mining, Network protocols, analysis of Web traffic, Computer security, Software engineering, Computer architecture, operating systems, distributed systems bioinformatics, Machine learning.
- To develop the understanding of the mathematical and logical basis to many modern techniques in computer science technology like machine learning, programming language design, and concurrency.
- To study various sampling and classification problems.

Course Outcomes:

After the completion of the course, student will be able to

- To apply the basic rules and theorems of probability theory such as Baye's Theorem, to determine probabilities that help to solve engineering problems and to determine the expectation and variance of a random variable from its distribution.
- Able to perform and analyze of sampling, means, proportions, variances and estimates the maximum likelihood based on population parameters.
- To learn how to formulate and test hypotheses about sample means, variances and proportions and to draw conclusions based on the results of statistical tests.
- Design various ciphers using number theory.
- Apply graph theory for real time problems like network routing problem.

UNIT I: Basic Probability and Random Variables: Random Experiments, Sample Spaces Events, the Concept of Probability the Axioms of Probability, Some Important Theorems on Probability Assignment of Probabilities, Conditional Probability Theorems on Conditional Probability, Independent Events, Bayes Theorem or Rule. Random Variables, Discrete Probability Distributions, Distribution Functions for Random Variables, Distribution Functions for Discrete Random Variables, Continuous Random Variables

UNIT II: Sampling and Estimation Theory: Population and Sample, Statistical Inference Sampling With and Without Replacement Random Samples, Random Numbers Population Parameters Sample Statistics Sampling Distributions, Frequency Distributions, Relative Frequency Distributions, Computation of Mean, Variance, and Moments for Grouped Data. Unbiased Estimates and Efficient Estimates Point Estimates and Interval Estimates. Reliability Confidence Interval Estimates of Population Parameters, Maximum Likelihood Estimates

UNIT III: Tests of Hypothesis and Significance: Statistical Decisions Statistical Hypotheses. Null Hypotheses Tests of Hypotheses and Significance Type I and Type II Errors Level of Significance Tests Involving the Normal Distribution One-Tailed and Two-Tailed Tests P Value Special Tests of Significance for Large Samples Special Tests of Significance for Small Samples Relationship between Estimation Theory and Hypothesis Testing Operating Characteristic Curves. Power of a Test Quality Control Charts Fitting Theoretical Distributions to Sample Frequency



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Distributions, The Chi-Square Test for Goodness of Fit Contingency Tables Yates' Correction for Continuity Coefficient of Contingency.

UNIT IV: Algebraic Structures and Number Theory: Algebraic Systems, Examples, General Properties, Semi Groups and Monoids, Homomorphism of Semi Groups and Monoids, Group, Subgroup, Abelian Group, Homomorphism, Isomorphism. Properties of Integers, Division Theorem, The Greatest Common Divisor, Euclidean Algorithm, Least Common Multiple, Testing for Prime Numbers, The Fundamental Theorem of Arithmetic, Modular Arithmetic (Fermat's Theorem and Euler's Theorem)

UNIT V: Graph Theory: Basic Concepts of Graphs, Sub graphs, Matrix Representation of Graphs: Adjacency Matrices, Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs, Multigraphs, Planar Graphs, Euler's Formula, Graph Colouring and Covering, Chromatic Number, Spanning Trees, Algorithms for Spanning Trees (Problems Only and Theorems without Proofs).

Text Books:

1. Foundation Mathematics for Computer Science, John Vince, Springer.
2. Probability & Statistics, 3rd Edition, Murray R. Spiegel, John J. Schiller and R. Alu Srinivasan, Schaum's Outline Series, Tata McGraw-Hill Publishers
3. Probability and Statistics with Reliability, K. Trivedi, Wiley.
4. Discrete Mathematics and its Applications with Combinatorics and Graph Theory, 7th Edition, H. Rosen, Tata McGraw Hill.

Reference Books:

1. Probability and Computing: Randomized Algorithms and Probabilistic Analysis, M. Mitzenmacher and E. Upfal.
2. Applied Combinatorics, Alan Tucker, Wiley.



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I Year - I Semester	L	T	P	C
	3	0	0	3
Advanced Data Structures & Algorithms (MTCSE1102)				

Course Objectives: From the course the student will learn

- Single Linked, Double Linked Lists, Stacks, Queues, Searching and Sorting techniques, Trees, Binary trees, representation, traversal, Graphs- storage, traversal.
- Dictionaries, ADT for List, Stack, Queue, Hash table representation, Hash functions, Priority queues, Priority queues using heaps, Search trees.
- AVL trees, operations of AVL trees, Red- Black trees, Splay trees, comparison of search trees.

Course Outcomes:

After the completion of the course, student will be able to

- Ability to write and analyze algorithms for algorithm correctness and efficiency
- Master a variety of advanced abstract data type (ADT) and data structures and their Implementation
- Demonstrate various searching, sorting and hash techniques and be able to apply and solve problems of real life
- Design and implement variety of data structures including linked lists, binary trees, heaps, graphs and search trees
- Ability to compare various search trees and find solutions for IT related problems

UNIT I: Introduction to Data Structures, Singly Linked Lists, Doubly Linked Lists, Circular Lists-Algorithms. **Stacks and Queues:** Algorithm Implementation using Linked Lists.

UNIT II: Searching-Linear and Binary, Search Methods, **Sorting**-Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort. **Trees**- Binary trees, Properties, Representation and Traversals (DFT, BFT), Expression Trees (Infix, prefix, postfix). **Graphs**-Basic Concepts, Storage structures and Traversals.

UNIT III: Dictionaries, ADT, The List ADT, Stack ADT, Queue ADT, Hash Table Representation, Hash Functions, Collision Resolution-Separate Chaining, **Open Addressing**-Linear Probing, Double Hashing.

UNIT IV: Priority queues- Definition, ADT, Realizing a Priority Queue Using Heaps, Definition, Insertion, Deletion. **Search Trees**- Binary Search Trees, Definition, ADT, Implementation, **Operations**-Searching, Insertion, Deletion.

UNIT V: Search Trees- AVL Trees, Definition, Height of AVL Tree, Operations-, Insertion, Deletion and Searching, Introduction to Red-Black and Splay Trees, B-Trees, Height of B-Tree, Insertion, Deletion and Searching, Comparison of Search Trees.



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Text Books:

1. Data Structures: A Pseudo Code Approach, 2/e, Richard F.Gilberg, Behrouz A. Forouzon and Cengage
2. Data Structures, Algorithms and Applications in java, 2/e, Sartaj Sahni, University Press

Reference Books:

1. Data Structures and Algorithm Analysis, 2/e, Mark Allen Weiss, Pearson.
2. Data Structures and Algorithms, 3/e, Adam Drozdek, Cengage
3. C and Data Structures: A Snap Shot Oriented Treatise Using Live Engineering Examples, N.B.Venkateswarulu, E.V.Prasad and S Chand & Co, 2009



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I Year - I Semester	L	T	P	C
	3	0	0	3
Big Data Analytics (MTCSE11XX)				

Course Objectives: This course is aimed at enabling the students to

- To provide an overview of an exciting growing field of big data analytics.
- To introduce the tools required to manage and analyze big data like Hadoop, NoSQL, Map Reduce, HIVE, Cassandra, Spark.
- To teach the fundamental techniques and principles in achieving big data analytics with scalability and streaming capability.
- To optimize business decisions and create competitive advantage with Big Data analytics

Course Outcomes:

After the completion of the course, student will be able to

- Illustrate on big data and its use cases from selected business domains.
- Interpret and summarize on No SQL, Cassandra
- Analyze the HADOOP and Map Reduce technologies associated with big data analytics and explore on Big Data applications Using Hive.
- Make use of Apache Spark, RDDs etc. to work with datasets.
- Assess real time processing with Spark Streaming.

UNIT I: What is big data, why big data, convergence of key trends, unstructured data, industry examples of big data, web analytics, big data and marketing, fraud and big data, risk and big data, credit risk management, big data and algorithmic trading, big data and healthcare, big data in medicine, advertising and big data, big data technologies, introduction to Hadoop, open source technologies, cloud and big data, mobile business intelligence, Crowd sourcing analytics, inter and trans firewall analytics.

UNIT II: Introduction to NoSQL, aggregate data models, aggregates, key-value and document data models, relationships, graph databases, schema less databases, materialized views, distribution models, sharding, master-slave replication, peer- peer replication, sharding and replication, consistency, relaxing consistency, version stamps, Working with Cassandra ,Table creation, loading and reading data.

UNIT III: Data formats, analyzing data with Hadoop, scaling out, Architecture of Hadoop distributed file system (HDFS), fault tolerance ,with data replication, High availability, Data locality , Map Reduce Architecture, Process flow, Java interface, data flow, Hadoop I/O, data integrity, compression, serialization. Introduction to Hive, data types and file formats, HiveQL data definition, HiveQL data manipulation, Logical joins, Window functions, Optimization, Table partitioning, Bucketing, Indexing, Join strategies.

UNIT IV: Apache spark- Advantages over Hadoop, lazy evaluation, In memory processing, DAG, Spark context, Spark Session, RDD, Transformations- Narrow and Wide, Actions, Data frames ,RDD to Data frames, Catalyst optimizer, Data Frame Transformations, Working with Dates and Timestamps, Working with Nulls in Data, Working with Complex Types, Working with JSON, Grouping, Window Functions, Joins, Data Sources, Broadcast Variables,



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Accumulators, Deploying Spark- On-Premises Cluster Deployments, Cluster Managers- Standalone Mode, Spark on YARN , Spark Logs, The Spark UI- Spark UI History Server, Debugging and Spark First Aid

UNIT V: Spark-Performance Tuning, Stream Processing Fundamentals, Event-Time and State full Processing - Event Time, State full Processing, Windows on Event Time- Tumbling Windows, Handling Late Data with Watermarks, Dropping Duplicates in a Stream, Structured Streaming Basics - Core Concepts, Structured Streaming in Action, Transformations on Streams, Input and Output.

Text Books:

1. Big Data, Big Analytics: Emerging, Michael Minnelli, Michelle Chambers, and Ambiga Dhiraj
2. SPARK: The Definitive Guide, Bill Chambers & Matei Zaharia, O'Reilley, 2018 Edition
3. Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013
4. P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World Polyglot Persistence", Addison-Wesley Professional, 2012
5. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley, 2012

Reference Books:

1. "Hadoop Operations", O'Reilley, Eric Sammer, 2012
2. "Programming Hive", O'Reilley, E. Capriolo, D. Wampler, and J. Rutherglen, 2012
3. "HBase: The Definitive Guide", O'Reilley, Lars George, 2011
4. "Cassandra: The Definitive Guide", O'Reilley, Eben Hewitt, 2010
5. "Programming Pig", O'Reilley, Alan Gates, 2011



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I Year - I Semester		L	T	P	C
		3	0	0	3
Digital Image Processing (MTCSE11XX)					

Course Objectives:

- Describe and explain basic principles of digital image processing.
- Design and implement algorithms that perform basic image processing (e.g. noise removal and image enhancement).
- Design and implement algorithms for advanced image analysis (e.g. image compression, image segmentation).
- Assess the performance of image processing algorithms and systems.

Course Outcomes:

After the completion of the course, student will be able to

- Demonstrate the components of image processing
- Explain various filtration techniques.
- Apply image compression techniques.
- Discuss the concepts of wavelet transforms.
- Analyze the concept of morphological image processing.

UNIT I: Introduction: Fundamental steps in Image Processing System, Components of Image Processing System, Elements of Visual Perception, Image Sensing and acquisition, Image sampling & Quantization, Basic Relationship between pixels. **Image Enhancement Techniques:** Spatial Domain Methods: Basic grey level transformation, Histogram equalization, Image subtraction, image averaging.

UNIT II: Spatial filtering: Smoothing, sharpening filters, Laplacian filters, Frequency domain filters, Smoothing and sharpening filters, Homomorphism is filtering. **Image Restoration & Reconstruction:** Model of Image Degradation/restoration process, Noise models, Spatial filtering, Inverse filtering, Minimum mean square Error filtering, constrained least square filtering, Geometric mean filter, Image reconstruction from projections. Color Fundamentals, Color Models, Color Transformations.

UNIT III: Image Compression: Redundancies- Coding, Interpixel, Psycho visual; Fidelity, Source and Channel Encoding, Elements of Information Theory; Loss Less and Lossy Compression; Run length coding, Differential encoding, DCT, Vector quantization, Entropy coding, LZW coding; Image Compression Standards-JPEG, JPEG 2000, MPEG; Video compression.

UNIT IV: Wavelet Based Image Compression: Expansion of functions, Multi-resolution analysis, Scaling functions, MRA refinement equation, Wavelet series expansion, Discrete Wavelet Transform (DWT), Continuous, Wavelet Transform, Fast Wavelet Transform, 2-D wavelet Transform, JPEG-2000 encoding.



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UNIT V: Image Segmentation: Discontinuities, Edge Linking and boundary detection, Thresholding, Region Based Segmentation, Watersheds; Introduction to morphological operations; binary morphology- erosion, dilation, opening and closing operations, applications; basic gray-scale morphology operations; Feature extraction; Classification; Object recognition.
Digital Image Watermarking: Introduction, need of Digital Image Watermarking, applications of watermarking in copyright protection and Image quality analysis.

Text Books:

1. Digital Image Processing. 2nd ed. Gonzalez, R.C. and Woods, R.E. India: Person Education, (2009)

Reference Books:

1. Digital Image Processing. John Wiley, Pratt, W. K, (2001)
2. Digital Image Processing, Jayaraman, S., Veerakumar, T. and Esakkiranjana, S. (2009), Tata McGraw-Hill



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I Year - I Semester	L	T	P	C
	3	0	0	3
Advanced Operating Systems (MTCSE11XX)				

Course Objectives: This course is aimed at enabling the students to

- To provide comprehensive and up-to-date coverage of the major developments in distributed Operating System, Multi-processor Operating System and Database Operating System and to cover important theoretical foundations including Process Synchronization, Concurrency, Event ordering, Mutual Exclusion, Deadlock, Agreement Protocol, Security, Recovery and fault tolerance.

Course Outcomes:

After the completion of the course, student will be able to

- Illustrate on the fundamental concepts of distributed operating systems, its architecture and distributed mutual exclusion.
- Analyze on deadlock detection algorithms and agreement protocols.
- Make use of algorithms for implementing DSM and its scheduling.
- Apply protection and security in distributed operating systems.
- Elaborate on concurrency control mechanisms in distributed database systems.

UNIT-1: Architectures of Distributed Systems, System Architecture types, issues in distributed operating systems, communication networks, communication primitives. Theoretical Foundations, inherent limitations of a distributed system, lamp ports logical clocks, vector clocks, casual ordering of messages, global state, cuts of a distributed computation, termination detection. Distributed Mutual Exclusion, introduction, the classification of mutual exclusion and associated algorithms, a comparative performance analysis.

UNIT-2: Distributed Deadlock Detection, Introduction, deadlock handling strategies in distributed systems, issues in deadlock detection and resolution, control organizations for distributed deadlock detection, centralized and distributed deadlock detection algorithms, hierarchical deadlock detection algorithms. Agreement protocols, introduction-the system model, a classification of agreement problems, solutions to the Byzantine agreement problem, and applications of agreement algorithms. Distributed resource management: introduction-architecture, mechanism for building distributed file systems design issues, log structured file systems.

UNIT- 3: Distributed shared memory, Architecture, algorithms for implementing DSM, memory coherence and protocols, design issues. Distributed Scheduling, introduction, issues in load distributing, components of a load distributing algorithm, stability, load distributing algorithm, performance comparison, selecting a suitable load sharing algorithm, requirements for load distributing, task migration and associated issues. Failure Recovery and Fault tolerance: introduction, basic concepts, classification of failures, backward and forward error recovery, backward error recovery, recovery in concurrent systems, consistent set of check points, synchronous and asynchronous check pointing and recovery, check pointing for distributed database systems, recovery in replicated distributed databases.



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UNIT- 4: Protection and security, preliminaries, the access matrix model and its implementations.-safety in matrix model, advanced models of protection. Data security, cryptography: Model of cryptography, conventional cryptography modern cryptography, private key cryptography, data encryption standard public key cryptography, multiple encryptions, authentication in distributed systems.

UNIT-5: Multiprocessor operating systems, basic multiprocessor system architectures, inter connection networks for multiprocessor systems, caching hypercube architecture. Multiprocessor Operating System, structures of multiprocessor operating system, operating system design issues, threads, process synchronization and scheduling. Database Operating systems: Introduction, requirements of a database operating system Concurrency control :Theoretical aspects, introduction, database systems, a concurrency control model of database systems, the problem of concurrency control, serializability theory, distributed database systems, concurrency control algorithms, introduction, basic synchronization primitives, lock based algorithms, timestamp based algorithms, optimistic algorithms, concurrency control algorithms, data replication.

Text Books:

1. "Advanced concepts in operating systems: Distributed, Database and multiprocessor operating systems", Mukesh Singhal, Niranjana and G.Shivaratri, TMH, 2001

Reference Books:

1. "Modern operating system", Andrew S.Tanenbaum, PHI, 2003
2. "Distributed operating system-Concepts and design", Pradeep K.Sinha, PHI, 2003
3. "Distributed operating system", Pearson education, AndrewS.Tanenbaum, 2003



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I Year - I Semester	L	T	P	C
	3	0	0	3
ADVANCED COMPUTER NETWORKS (MTCSE11YY)				

Course Objectives: This course is aimed at enabling the students to

- The course is aimed at providing basic understanding of Computer networks starting with OSI Reference Model, Protocols at different layers with special emphasis on IP, TCP & UDP and Routing algorithms.
- Some of the major topics which are included in this course are CSMA/CD, TCP/IP implementation, LANs/WANs, internetworking technologies, Routing and Addressing.
- Provide the mathematical background of routing protocols.
- Aim of this course is to develop some familiarity with current research problems and research methods in advance computer networks.

Course Outcomes:

After the completion of the course, student will be able to

- Illustrate reference models with layers, protocols and interfaces.
- Describe the routing algorithms, Sub netting and Addressing of IP V4 and IPV6.
- Describe and Analysis of basic protocols of computer networks, and how they can be used to assist in network design and implementation.
- Describe the concepts Wireless LANS, WIMAX, IEEE 802.11, Cellular telephony and Satellite networks
- Describe the emerging trends in networks-MANETS and WSN

Unit-I: Network layer: Network Layer design issues: store-and forward packet switching, services provided transport layers, implementation connection less services, implementation connection oriented services, comparison of virtual –circuit and datagram subnets, Routing Algorithms-shortest path routing, flooding, distance vector routing, link state routing, Hierarchical routing, **congestion control algorithms** :Approaches to congestion control, Traffic aware routing, Admission control, Traffic throttling, choke Packets, Load shedding, Random early detection, Quality of Service, Application requirements, Traffic shaping, Leaky and Token buckets

Unit-II: Internetworking and IP protocols: How networks differ, How net works can be connected, internetworking, tunneling, The network layer in the internet, IPV4 Protocol, IP addresses, Subnets, CIDR, classful and Special addressing, network address translation (NAT), IPV6 Address structure address space, IPV6 Advantages, packet format, extension Headers, Transition from IPV4 to IPV6 , Internet Control Protocols-IMCP, ARP, DHCP

Unit-III: Transport Layer Protocols: Introduction, Services, Port numbers, User Datagram Protocol: User datagram, UDP services, UDP Applications, Transmission control Protocol: TCP services, TCP features, Segment, A TCP connection, State transition diagram, Windows in TCP, Flow control and error control, TCP Congestion control, TCP Timers, **SCTP:** SCTP services SCTP features, packet format, An SCTP association, flow control, error control.



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Unit- IV: Wireless LANS: Introduction, Architectural comparison, Access control, The IEEE 802.11 Project: Architecture, MAC sub layer, Addressing Mechanism, Physical Layer, Bluetooth: Architecture, Bluetooth Layers **Other Wireless Networks:** WIMAX: Services, IEEE project 802.16, Layers in project 802.16, Cellular Telephony: Operations, First Generation (1G), Second Generation (2G), Third Generation (3G), Fourth Generation (4G), Satellite Networks: Operation, GEO Satellites, MEO satellites, LEO satellites.

Unit–V: Emerging trends in Computer networks:

Mobile computing: Motivation for mobile computing, Protocol stack issues in mobile computing environment, mobility issues in mobile computing, security issues in mobile networks, MOBILE Ad Hoc Networks: Applications of Ad Hoc Networks, Challenges and Issues in MANETS, MAC Layer Issues Routing Protocols in MANET, Transport Layer Issues, Ad hoc Network Security. **Wireless Sensor Networks:** WSN functioning, Operating system support in sensor devices, WSN characteristics, sensor network operation, Sensor Architecture: Cluster management, Wireless Mesh Networks: WMN design , Issues in WMNs, Computational Grids, Grid Features, Issues in Grid construction design, Grid design features, P2P Networks: Characteristics of P2P Networks, Classification of P2P systems, Gnutella, BitTorrent, Session Initiation Protocol(SIP) , Characteristics and addressing, Components of SIP, SIP establishment, SIP security.

Text Books:

1. Data communications and networking 4th edition Behrouz A Fourzan, TMH
2. Computer networks 4th edition Andrew S Tanenbaum, Pearson
3. Computer networks, Mayank Dave, CENGAGE

Reference Books:

1. Computer networks, A system Approach, 5th ed, Larry L Peterson and Bruce S Davie, Elsevier



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I Year - I Semester		L	T	P	C
		3	0	0	3
Internet of Things (MTCSE11YY)					

Course Objectives:

- To Understand Smart Objects and IoT Architectures.
- To learn about various IOT-related protocols
- To build simple IoT Systems using Arduino and Raspberry Pi.
- To understand data analytics and cloud in the context of IoT
- To develop IoT infrastructure for popular applications.

Course Outcomes:

After the completion of the course, student will be able to

- Summarize on the term 'internet of things' in different contexts.
- Analyze various protocols for IoT.
- Design a PoC of an IoT system using Raspberry Pi/Arduino
- Apply data analytics and use cloud offerings related to IoT.
- Analyze applications of IoT in real time scenario

UNIT I: FUNDAMENTALS OF IoT: Evolution of Internet of Things, Enabling Technologies, IoT Architectures, oneM2M, IoT World Forum (IoTWF) and Alternative IoT models, Simplified IoT Architecture and Core IoT Functional Stack, Fog, Edge and Cloud in IoT, Functional blocks of an IoT ecosystem, Sensors, Actuators, Smart Objects and Connecting Smart Objects.

UNIT II: IoT PROTOCOLS: IT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and Lora WAN, Network Layer: IP versions, Constrained Nodes and Constrained Networks, Optimizing IP for IoT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks, Application Transport Methods: Supervisory Control and Data Acquisition, Application Layer Protocols: CoAP and MQTT.

UNIT III: DESIGN AND DEVELOPMENT: Design Methodology, Embedded computing logic, Microcontroller, System on Chips, IoT system building blocks, Arduino, Board details, IDE programming, Raspberry Pi, Interfaces and Raspberry Pi with Python Programming.

UNIT IV: DATA ANALYTICS AND SUPPORTING SERVICES: Structured Vs Unstructured Data and Data in Motion Vs Data in Rest, Role of Machine Learning – No SQL Databases, Hadoop Ecosystem, Apache Kafka, Apache Spark, Edge Streaming Analytics and Network Analytics, Xively Cloud for IoT, Python Web Application Framework, Django, AWS for IoT, System Management with NETCONF-YANG.

UNIT V: CASE STUDIES/INDUSTRIAL APPLICATIONS: Cisco IoT system, IBM Watson IoT platform, Manufacturing, Converged Plant wide Ethernet Model (CPwE), Power Utility Industry, Grid Blocks Reference Model, Smart and Connected Cities: Layered architecture, Smart Lighting, Smart Parking Architecture and Smart Traffic Control.



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Text Books:

1. IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, Cisco Press, 2017

Reference Books:

1. Internet of Things – A hands-on approach, Arshdeep Bahga, Vijay Madisetti, Universities Press, 2015
2. The Internet of Things – Key applications and Protocols, Olivier Hersent, David Boswarthick, Omar Elloumi and Wiley, 2012 (for Unit 2).
3. “From Machine-to-Machine to the Internet of Things – Introduction to a New Age of Intelligence”, Jan Höller, Vlasios Tsiatsis, Catherine Mulligan, Stamatis, Karnouskos, Stefan Avesand. David Boyle and Elsevier, 2014.
4. Architecting the Internet of Things, Dieter Uckelmann, Mark Harrison, Michahelles and Florian (Eds), Springer, 2011.
5. Recipes to Begin, Expand, and Enhance Your Projects, 2nd Edition, Michael Margolis, Arduino Cookbook and O’Reilly Media, 2011.



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I Year - I Semester	L	T	P	C
	3	0	0	3
Object Oriented Software Engineering (MTCSE11YY)				

Course Objectives:

- To elicit, analyze and specify software requirements through a productive working relationship with various stakeholders of the project.
- To understand the what software life cycle is, how software projects are planned and managed, types of resources involved in software development projects, risks are identified and assessed, predictions and assessments are made.
- To identify, formulate, and solve software engineering problems, including the specification, design, implementation, and testing of software systems that meet specification, performance, maintenance and quality requirements

Course Outcomes:

After the completion of the course, student will be able to

- Apply the Object Oriented Software-Development Process to design software
- Analyze and Specify software requirements through a SRS documents.
- Design and Plan software solutions to problems using an object-oriented strategy.
- Model the object oriented software systems using Unified Modeling Language (UML)
- Estimate the cost of constructing object oriented software.

UNIT I: Introduction to Software Engineering: Software, Software Crisis, Software Engineering definition, Evolution of Software Engineering Methodologies, Software Engineering Challenges. Software Processes: Software Process, Process Classification, Phased development life cycle, Software Development Process Models, Process, use, applicability and Advantages/limitations.

UNIT II: Object oriented Paradigm, Object oriented Concepts, Classes, Objects, Attributes, Methods and services, Messages, Encapsulation, Inheritance, Polymorphism, Identifying the elements of object model, management of object oriented Software projects, Object Oriented Analysis, Domain Analysis, Generic Components of OOA model, OOA Process, Object Relationship model, Object Behavior Model.

UNIT III: Object Oriented Design: Design for Object- Oriented systems, The Generic components of the OO design model, The System design process, The Object design process, Design Patterns, Object Oriented Programming.

UNIT IV: Object Oriented testing: Broadening the view of Testing, Testing of OOA and OOD models, Object-Oriented testing strategies, Test case design for OO software, testing methods applicable at the class level, Interclass test case design.

UNIT V: Technical Metrics for Object Oriented Systems: The Intent of Object Oriented metrics, The distinguishing Characteristics, Metrics for the OO Design model, Class-Oriented metrics, Operation-Oriented Metrics, Metrics for Object Oriented testing, Metrics for Object Oriented projects. CASE Tools.



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Text Books:

1. Object oriented and Classical Software Engineering, 7/e, Stephen R. Schach, TMH.
2. Object oriented and Classical Software Engineering, Timothy Lethbridge, Robert Laganier, TMH
3. Software Engineering by Roger S Pressman, Tata McGraw Hill Edition.

Reference Books:

1. Component based software engineering: 7th International symposium, ivicaCrnkovic, Springer, CBSE 2004



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I Year - I Semester	L	T	P	C
	2	0	0	2
RESEARCH METHODOLOGY AND IPR				

UNIT 1:

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

UNIT 2:

Effective literature studies approaches, analysis Plagiarism, Research ethics, Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

UNIT 3:

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

UNIT 4:

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

UNIT 5:

New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

REFERENCES:

- (1) Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students"
- (2) Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"
- (3) Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners"
- (4) Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.
- (5) Mayall, "Industrial Design", McGraw Hill, 1992.
- (6) Niebel, "Product Design", McGraw Hill, 1974.
- (7) Asimov, "Introduction to Design", Prentice Hall, 1962.
- (8) (8) Robert P. Merges, Peter S. Menell, Mark A. Lemley, " Intellectual Property in New Technological Age", 2016.
- (9) T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008



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I Year - I Semester		L	T	P	C
		0	0	4	2
Advanced Data Structures & Algorithms Lab (MTCSE1106)					

Course Objectives:

From the course the student will learn

- Knowing about oops concepts for a specific problem.
- Various advanced data structures concepts like arrays, stacks, queues, linked lists, graphs and trees.

Course Outcomes:

After the completion of the course, student will be able to

- Identify classes, objects, members of a class and relationships among them needed for a specific problem.
- Examine algorithms performance using Prior analysis and asymptotic notations.
- Organize and apply to solve the complex problems using advanced data structures (like arrays, stacks, queues, linked lists, graphs and trees.)
- Apply and analyze functions of Dictionary

Experiment 1:

Write a java program to perform various operations on single linked list

Experiment 2:

Write a java program for the following

- a) Reverse a linked list
- b) Sort the data in a linked list
- c) Remove duplicates
- d) Merge two linked lists

Experiment 3:

Write a java program to perform various operations on doubly linked list.

Experiment 4:

Write a java program to perform various operations on circular linked list.

Experiment 5:

Write a java program for performing various operations on stack using linked list.

Experiment 6:

Write a java program for performing various operations on queue using linked list.

Experiment 7:

Write a java program for the following using stack



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- a) Infix to postfix conversion.
- b) Expression evaluation.
- c) Obtain the binary number for a given decimal number.

Experiment 8:

Write a java program to implement various operations on Binary Search Tree Using Recursive and Non-Recursive methods.

Experiment 9:

Write a java program to implement the following for a graph.

- a) BFS
- b) DFS

Experiment 10:

Write a java program to implement Merge & Heap Sort of given elements.

Experiment 11:

Write a java program to implement Quick Sort of given elements.

Experiment 12:

Write a java program to implement various operations on AVL trees.

Experiment 13:

Write a java program to perform the following operations:

- a) Insertion into a B-tree
- b) Searching in a B-tree

Experiment 14:

Write a java program to implementation of recursive and non-recursive functions to Binary tree Traversals

Experiment 15:

Write a java program to implement all the functions of Dictionary (ADT) using Hashing.



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I Year - I Semester	L	T	P	C
	0	0	4	2
Advanced Computing Lab (MTCSE1107)				

Course Objectives:

From the course the student will learn

- The student should have hands on experience in using various sensors like temperature, humidity, smoke, light, etc. and should be able to use control web camera, network, and relays connected to the Pi.

Course Outcomes:

After the completion of the course, student will be able to

- The student should have hands on experience in using various sensors like temperature, humidity, smoke, light, etc. and should be able to use control web camera, network, and relays connected to the Pi.
- Development and use of s IoT technology in Societal and Industrial Applications.
- Skills to undertake high quality academic and industrial research in Sensors and IoT.
- To classify Real World IoT Design Constraints, Industrial Automation in IoT.

Experiment 1: Start Raspberry Pi and try various Linux commands in command terminal window: ls, cd, touch, mv, rm, man, mkdir, rmdir, tar, gzip, cat, more, less, ps, sudo, cron, chown, chgrp, ping etc.

Experiment 2: Study and Install IDE of Arduino and different types of Arduino.

Experiment 3: Study and Implement Zigbee Protocol using Arduino / RaspberryPi.

Experiment 4: Write a map reduce program that mines weather data. Weather sensors collecting data every hour at many locations across the globe gather a large volume of log data, which is a good candidate for analysis with Map Reduce, since it is semi structured and record-oriented.

Experiment 5: Data analytics using Apache Spark on Amazon food dataset, find all the pairs of items frequently reviewed together.

Write a single Spark application that

- Transposes the original Amazon food dataset, obtaining a PairRDD of the type<user_id>→<list of the product_ ids reviewed by user_id>
- Counts the frequencies of all the pairs of products reviewed together.
- Writes on the output folder all the pairs of products that appear more than once and their frequencies. The pairs of products must be sorted by frequency.

Experiment 6:

Write a program to Implement Bankers algorithm for Dead Lock Avoidance.

Experiment 7:

Write a program to Producer-consumer problem Using semaphores.

Experiment 8:



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Write a program for an image enhancement using pixel operation.

Experiment 9:

Write a Program to enhance image using image arithmetic and logical operations.

Experiment 10:

Write a program of bit stuffing used by Data Link Layer.

Experiment 11:

Write a program to configure a Network using Distance Vector Routing protocol.

Experiment 12:

Write a program to perform the function oriented diagram: DFD and Structured chart.

Experiment 13:

Write a program to perform the system analysis: Requirement analysis, SRS.

Experiment 14:

Write a program to draw the structural view diagram: Class diagram, object diagram.

Experiment 15:

Write C programs for implementing the Demorgan's law.



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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

COURSE STRUCTURE & SYLLABUS M.Tech ECE
VLSI, VLSI Design, VLSI System Design,
VLSI Micro-Electronic Programme
(Applicable for batches admitted from 2019-2020)



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I Semester								
S.No	Course No	Course Name	P.Os	Category	L	T	P	Credits
1	PC	CMOS Analog IC Design			3	0	0	3
2	PC	CMOS Digital IC design			3	0	0	3
3	PE	1. VLSI Technology 2. Nanomaterials and Nanotechnology 3. MEMS Technology			3	0	0	3
4	PE	1. Device Modeling 2. Nano-electronics 3. Photonics			3	0	0	3
5		Research methodology and IPR			2	0	0	2
6	Lab 1	CMOS Analog IC Design Lab			0	0	4	2
7	Lab 2	CMOS Digital IC Design Lab			0	0	4	2
8	Aud 1	Audit course-1			2	0	0	0
Total								18

II Semester								
S.No	Course No	Course Name	P.Os	Category	L	T	P	Credits
1	PC	Mixed Signal & RF IC Design			3	0	0	3
2	PC	Physical Design Automation			3	0	0	3
3	PE	1. Design For Testability 2. IOT & its Applications 3. VLSI Signal Processing			3	0	0	3
4	PE	1. Network Security & Cryptography 2. Microcontrollers & programmable Digital Signal Processors 3. Low Power VLSI Design			3	0	0	3
5	Lab 1	Mixed Signal IC Design Lab			0	0	4	2
6	Lab 2	Physical Design Automation Lab			0	0	4	2
7	MP	Mini Project			0	0	4	2
8	Aud 2	Audit Course – 2			2	0	0	0
Total								18

*Students be encouraged to go to Industrial Training/Internship for at least 2-3 weeks during semester break.



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III Semester*								
S.No	Course No	Course Name	P.Os	Category	L	T	P	Credits
1	PE	1. Scripting Languages for VLSI 2. Digital System Design & Verification 3. Hardware Software co-design			3	0	0	3
2	OE	1. Business Analytics 2. Industrial Safety 3. Operations Research 4. Cost Management of Engineering Projects 5. Composite Materials 6. Waste to Energy			3	0	0	3
3	Dissertation	Dissertation Phase -I /Industrial Project (to be continued and evaluated next semester)			0	0	20	10 [#]
					Total			16

#Evaluated and Displayed in IV Semester Marks list.

*Students going for Industrial Project/Thesis will complete these courses through MOOCs

IV Semester								
S.No	Course No	Course Name	P.Os	Category	L	T	P	Credits
1	Dissertation	Project/ Dissertation Phase-II (continued from III semester)			0	0	32	16
					Total			16

Audit Course 1& 2

1. English for Research Paper Writing
2. Disaster Management
3. Sanskrit for Technical Knowledge
4. Value Education
5. Constitution of India
6. Pedagogy Studies
7. Stress Management by Yoga
8. Personality Development through Life Enlightenment Skills



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I Year I Semester	L	P	C
	3	0	3

CMOS Analog IC Design

Course objectives:

- This course focuses on theory, analysis and design of analog integrated circuits in both Bipolar and Metal-Oxide-Silicon (MOS) technologies.
- Basic design concepts, issues and tradeoffs involved in analog IC design are explored.
- Intuitive understanding and real-life applications are emphasized throughout the course.
- To learn about Design of CMOS Op Amps, Compensation of Op Amps, Design of Two-Stage Op Amps, Power Supply Rejection Ratio of Two-Stage Op Amps, Cascade Op Amps, Measurement Techniques of OP Amp.
- To know about Characterization of Comparator, Two-Stage, Open-Loop Comparators, Improving the Performance of Open-Loop Comparators, Discrete-Time Comparators etc.

UNIT -I

Basic MOS Device Physics – General Considerations, MOS I/V Characteristics, Second Order effects, MOS Device models. Short Channel Effects and Device Models. Single Stage Amplifiers – Basic Concepts, Common Source Stage, Source Follower, Common Gate Stage, Cascode Stage.

UNIT -II:

Differential Amplifiers – Single Ended and Differential Operation, Basic Differential Pair, CommonMode Response, Differential Pair with MOS loads, Gilbert Cell. Passive and Active Current Mirrors– Basic Current Mirrors, Cascode Current Mirrors, Active Current Mirrors.

UNIT -III:

Frequency Response of Amplifiers – General Considerations, Common Source Stage, SourceFollowers, Common Gate Stage, Cascode Stage, Differential Pair. Noise – Types of Noise, Representation of Noise in circuits, Noise in single stage amplifiers, Noise in Differential Pairs.

UNIT -IV:

Feedback Amplifiers – General Considerations, Feedback Topologies, Effect of Loading.OperationalAmplifiers – General Considerations, One Stage Op Amps, Two Stage Op Amps, Gain Boosting,Common – Mode Feedback, Input Range limitations, Slew Rate, Power Supply Rejection, Noise in Op Amps. Stability and Frequency Compensation.

UNIT -V:

Characterization of Comparator, Two-Stage, Open-Loop Comparators, Other Open-Loop Comparators, Improving the Performance of Open-Loop Comparators, Discrete-Time Comparators.



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Text Books:

1. B.Razavi, “Design of Analog CMOS Integrated Circuits”, 2nd Edition, McGraw Hill Edition 2016.
2. Paul. R.Gray & Robert G. Meyer, “Analysis and Design of Analog Integrated Circuits”, Wiley, 5th Edition, 2009.

Reference Books:

1. T. C. Carusone, D. A. Johns & K. Martin, “Analog Integrated Circuit Design”, 2nd Edition, Wiley, 2012.
2. P.E.Allen & D.R. Holberg, “CMOS Analog Circuit Design”, 3rd Edition, Oxford University Press, 2011.
3. R. Jacob Baker, “CMOS Circuit Design, Layout, and Simulation”, 3rd Edition, Wiley, 2010.
4. Recent literature in Analog IC Design.

Course Outcomes:

At the end of the course, students will be able to:

- Design MOSFET based analog integrated circuits.
- Analyze analog circuits at least to the first order.
- Appreciate the trade-offs involved in analog integrated circuit design.
- Understand and appreciate the importance of noise and distortion in analog circuits.
- Analyze complex engineering problems critically in the domain of analog IC design for conducting research.
- Solve engineering problems for feasible and optimal solutions in the core area of analog ICs.



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	L	P	C
I Year I Semester	3	0	3

CMOS Digital IC design

Course objectives:

- To understand the fundamental properties of digital Integrated circuits using basic MOSFET equations and to develop skills for various logic circuits using CMOS related design styles.
- The course also involves analysis of performance metrics.
- To teach fundamentals of CMOS Digital integrated circuit design such as importance of Pseudo logic, Combinational MOS logic circuits, and Sequential MOS logic circuits.
- To teach the fundamentals of Dynamic logic circuits and basic semiconductor memories which are the basics for the design of high performance digital integrated circuits.

UNIT-I: MOS Design

Pseudo NMOS Logic – Inverter, Inverter threshold voltage, Output high voltage, Output Low voltage, Gain at gate threshold voltage, Transient response, Rise time, Fall time, Pseudo NMOS logic gates, Transistor equivalency, CMOS Inverter logic.

UNIT-II: Combinational MOS Logic Circuits:

MOS logic circuits with NMOS loads, Primitive CMOS logic gates – NOR & NAND gate, Complex Logic circuits design – Realizing Boolean expressions using NMOS gates and CMOS gates, AOI and OAI gates, CMOS full adder, CMOS transmission gates, Designing with Transmission gates.

UNIT-III: Sequential MOS Logic Circuits

Behaviour of bistable elements, SR Latch, Clocked latch and flip flop circuits, CMOS D latch and edge triggered flip-flop.

UNIT-IV: Dynamic Logic Circuits

Basic principle, Voltage Bootstrapping, Synchronous dynamic pass transistor circuits, Dynamic CMOS transmission gate logic, High performance Dynamic CMOS circuits.

UNIT-V: Semiconductor Memories

Types, RAM array organization, DRAM – Types, Operation, Leakage currents in DRAM cell and refresh operation, SRAM operation Leakage currents in SRAM cells, Flash Memory- NOR flash and NAND flash.

Text Books:

1. Digital Integrated Circuit Design – Ken Martin, Oxford University Press, 2011.
2. CMOS Digital Integrated Circuits Analysis and Design – Sung-Mo Kang, Yusuf Leblebici, TMH, 3rd Ed., 2011.



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Reference Books:

1. Introduction to VLSI Systems: A Logic, Circuit and System Perspective – Ming-BO Lin, CRC Press, 2011
2. Digital Integrated Circuits – A Design Perspective, Jan M. Rabaey, Anantha Chandrakasan Borivoje Nikolic, 2nd Ed., PHI.

Course Outcomes:

At the end of the course, students will be able to:

- Demonstrate advanced knowledge in Static and dynamic characteristics of CMOS, Alternative CMOS Logics, Estimation of Delay and Power, Adders Design.
- Classify different semiconductor memories.
- Analyze, design and implement combinational and sequential MOS logic circuits.
- Analyze complex engineering problems critically in the domain of digital IC design for conducting research.
- Solve engineering problems for feasible and optimal solutions in the core area of digital ICs.



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I Year I Semester	L	P	C
	3	0	3

VLSI Technology
(Elective I)

UNIT 1: MOS Transistors

Introduction, The Structure of MOS Transistors, The Fluid Model, The MOS Capacitor, The MOS Transistor, Modes of Operation of MOS Transistors, Electrical Characteristics of MOS Transistors, Threshold Voltage, Transistor Trans conductance g_m , Figure of Merit, Body Effect, Channel-Length Modulation, MOS Transistors as a Switch, Transmission Gate

UNIT 2: MOS Fabrication Technology

Introduction, Basic Fabrication Processes, Wafer Fabrication, Oxidation, Mask Generation, Photolithography, Diffusion, Deposition. N-MOS Fabrication Steps, CMOS Fabrication Steps, n-Well Process, p-Well Process, Twin-Tub Process, Latch-Up Problem and Its Prevention, Use of Guard Rings, Use of Trenches, Short-Channel Effects-Channel Length Modulation Effect. Drain-Induced Barrier Lowering, Channel Punch Through, Hot carrier effect, Velocity Saturation Effect

UNIT 3: Layout Design Rules

Scaling Theory, Scalable CMOS Design Rules, CMOS Process Enhancements, Transistors, Interconnects, Circuit Elements, Efficient layout Design techniques

UNIT 4: Combinational Logic Networks

Layouts for logic networks. Delay through networks. Power optimization. Switch logic networks. Combinational logic testing

UNIT 5: Sequential Systems

Memory cells and Arrays, clocking disciplines, sequential circuit Design, Performance Analysis, Power optimization, Design validation and testing.

Text Books:

1. Principals of CMOS VLSI Design-N.H.E.Weste, K. Eshraghian, 2nd Edition, Addison Wesley.
2. CMOS Digital Integrated Circuits Analysis and Design – Sung-Mo Kang, Yusuf Leblebici, TMH, 3rd Ed., 2011.
3. Low-Power VLSI Circuits and Systems, Ajit Pal, SPRINGER PUBLISHERS
4. Modern VLSI Design – Wayne Wolf, 3rd Ed., 1997, Pearson Education.



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Reference Books:

1. Digital Integrated Circuit Design – Ken Martin, Oxford University Press, 2011.
2. Digital Integrated Circuits – A Design Perspective, Jan M. Rabaey, AnanthaChandrakasan, Borivoje Nikolic, 2nd Ed., PHI.

Course outcomes

At the end of the course the student able to

- Understand the basics of MOS transistors and also the characteristics of MOS transistors.
- Learn about the MOS fabrication process and short channel effects.
- Learn about the basic rules in layout designing.
- Analyse various combinational logic networks and sequential systems.



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I Year I Semester

L	P	C
3	0	3

NANOMATERIALS AND NANOTECHNOLOGY
(Elective I)

UNIT I

Introduction of nano materials and nanotechnologies, Features of nanostructures, Applications of nano materials and technologies. Nano dimensional Materials 0D, 1D, 2D structures – Size Effects – Fraction of Surface Atoms – Specific Surface Energy and Surface Stress – Effect on the Lattice Parameter – Phonon Density of States – the General Methods available for the Synthesis of Nanostructures – precipitate – reactive– hydrothermal/solvo thermal methods – suitability of such methods for scaling – potential Uses.

UNIT II

Fundamentals of nano materials, Classification, Zero-dimensional nano materials, One-dimensional nano materials, Two-dimensional nano materials, Three dimensional nano materials. Low-Dimensional Nano materials and its Applications, Synthesis, Properties, and Applications of Low-Dimensional Carbon-Related Nano materials.

UNIT III

Micro- and Nanolithography Techniques, Emerging Applications Introduction to Micro electro mechanical Systems (MEMS), Advantages and Challenges of MEMS, Fabrication Technologies, Surface Micromachining, Bulk Micromachining, Molding. Introduction to Nano Phonics.

UNIT IV

Introduction, Synthesis of CNTs - Arc-discharge, Laser-ablation, Catalytic growth, Growth mechanisms of CNT's - Multi-walled nano tubes, Single-walled nano tubes Optical properties of CNT's, Electrical transport in perfect nano tubes, Applications as case studies. Synthesis and Applications of CNT's.

UNIT V

Ferroelectric materials, coating, molecular electronics and nano electronics, biological and environmental, membrane based application, polymer based application.

Text Books:

1. Kenneth J. Klabunde and Ryan M. Richards, “Nanoscale Materials in Chemistry”, 2nd edition, John Wiley and Sons, 2009.
2. I Gusev and A A Rempel, “Nanocrystalline Materials”, Cambridge International Science Publishing, 1st Indian edition by Viva Books Pvt. Ltd. 2008.
3. B. S. Murty, P. Shankar, Baldev Raj, B. B. Rath, James Murday, “Nanoscience and Nanotechnology”, Tata McGraw Hill Education 2012.



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Reference Books:

1. Bharat Bhushan, “Springer Handbook of Nanotechnology”, Springer, 3rd edition, 2010.
2. Kamal K. Kar, “Carbon Nanotubes: Synthesis, Characterization and Applications”, Research Publishing Services; 1 st edition, 2011, ISBN-13: 978-9810863975.

Course Outcomes:

At the end of the course, students will be able to:

- To understand the basic science behind the design and fabrication of nano scale systems.
- To understand and formulate new engineering solutions for current problems and competing technologies for future applications.
- To be able make inter disciplinary projects applicable to wide areas by clearing and fixing the boundaries in system development.
- To gather detailed knowledge of the operation of fabrication and characterization devices to achieve precisely designed systems



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I Year I Semester

L P C
3 0 3

MEMS Technology
(Elective I)

UNIT-I: Introduction to MEMS

Introduction to MEMS & Real world Sensor/Actuator examples (DMD, Air-bag, pressure sensors). MEMS Sensors in Internet of Things (IoT), Bio-Medical Applications

UNIT-II: MEMS Materials and Their Properties

Materials (eg. Si, SiO₂, SiN, Cr, Au, Ti, SU8, PMMA, Pt); Important properties: Young modulus, Poisson's ratio, density, piezo-resistive coefficients, TCR, Thermal Conductivity, Material Structure. Understanding Selection of materials based on applications.

UNIT-III: MEMS Fab Processes – 1

Understanding MEMS Processes & Process parameters for: Cleaning, Growth & Deposition, Ion Implantation & Diffusion, Annealing, Lithography. Understanding selection of Fab processes based on Applications.

UNIT-IV: MEMS Fab Processes – 2

Understanding MEMS Processes & Process parameters for: Wet & Dry etching, Bulk & Surface Micromachining, Die, Wire & Wafer Bonding, Dicing, Packaging. Understanding selection of Fab processes based on Applications

UNIT-V: MEMS Devices

Architecture, working and basic quantitative behaviour of Cantilevers, Micro heaters, Accelerometers, Pressure Sensors, Micro mirrors in DMD, Inkjet printer-head. Understanding steps involved in Fabricating above devices

Text Books:

1. An Introduction to Micro electromechanical Systems Engineering; 2nd Ed - by N.Maluf, K Williams; Publisher: Artech House Inc
2. Practical MEMS - by Ville Kaajakari; Publisher: Small Gear Publishing
3. Micro system Design - by S. Senturia; Publisher: Springer



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Reference Books:

1. Analysis and Design Principles of MEMS Devices - Minhang Bao; Publisher: Elsevier Science.
2. Fundamentals of Micro fabrication - by M. Madou; Publisher: CRC Press; 2 edition
3. Micro Electro Mechanical System Design - by J. Allen; Publisher: CRC Press
4. Micro machined Transducers Sourcebook - by G. Kovacs; Publisher: McGraw-Hill

Course Outcomes:

At the end of the course, students will be able to:

- To understand the basic concepts of MEMS technology and working of MEMS devices.
- To understand and selecting different materials for current MEMS devices and competing Technologies for future applications
- To understanding the concepts of fabrication process of MEMS, Design and Packaging Methodology.
- To analyze the various fabrication techniques in the manufacturing of MEMS Devices.



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I Year I Semester

L	P	C
3	0	3

Device Modelling
(Elective II)

UNIT I

2-terminal MOS device: threshold voltage modelling (ideal case as well as considering the effects of Q_f , Φ_{ms} and D_{it}).

UNIT II

C-V characteristics (ideal case as well as taking into account the effects of Q_f , Φ_{ms} and D_{it}); MOS capacitor as a diagnostic tool (measurement of non-uniform doping profile, estimation of Q_f , Φ_{ms} and D_{it})

UNIT III

4-terminal MOSFET: threshold voltage (considering the substrate bias); above threshold I-V modelling (SPICE level 1,2,3 and 4).

UNIT IV

Sub threshold current model; scaling; effect of threshold tailoring implant (analytical modelling of threshold voltage using box approximation); buried channel MOSFET. Short channel, DIBL and narrow width effects; small signal analysis of MOSFETs (Meyer's model)

UNIT V

SOI MOSFET: basic structure; threshold voltage modelling Advanced topics: hot carriers in channel; EEPROMs; CCDs; high-K gate dielectrics.

Text Books:

1. D.G.Ong , “Modern MOS Technology: Processes, Devices and Design”, McGraw Hill,1984.
2. Y.Taur and T.H.Ning, “Fundamentals of modern VLSI Devices” Cambridge Univ. Press,1998.
3. S.M.Sze, “Physics of Semiconductor Devices” Wiley,1981.

Course Outcomes:

At the end of the course, students will be able to:

- To understand the physics of 2-terminal MOS operation and its characteristics
- To understand the physics of 4-terminal MOSFET operation and its characteristics
- To analyze the SOI MOSFET electrical characteristics



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Nano-electronics
(Elective II)

UNIT I

Properties of Individual Nanoparticles: Introduction, Metal Nano Clusters, Semiconducting Nanoparticles, Rare Gas and Molecular Clusters, Methods of Synthesis.

UNIT II

The nanoscale MOSFET, FinFETs, Vertical MOSFETs, limits to scaling, system integration limits (interconnect issues etc.), Resonant Tunnelling Transistors.

Carbon NanoStructures: Introduction, Carbon Molecules, Carbon Clusters, Carbon Nano Tubes, Application of Carbon Nanotubes.

UNIT III

Carbon Nanotubes for Data Processing – Introduction, Electronic Properties, Synthesis of Carbon Nanotubes, Carbon Nanotube Interconnects, Carbon Nanotubes Field Effect Transistors (CNTFETs), Nanotubes for Memory Applications, Prospects of an All-CNT Nanoelectronics.

Neuroelectronic Interfacing: Semiconductor Chips with Ion Channels, Nerve Cells, and Brain: Introduction, Iono-Electronic Interface, Neuron-Silicon Circuits, Brain-Silicon Chips.

UNIT IV

Optical 3-D Time-of-Flight Imaging System: Introduction, Taxonomy of Optical 3-D Techniques, CMOS Imaging, CMOS 3-D Time-of-Flight Image Sensor, Application Examples

Pyroelectric Detector Arrays for IR Imaging: Introduction, Operation Principle of Pyroelectric IR Detectors, Pyroelectric Materials, Realized Devices, Characterization, and Processing Issues

UNIT V

Electronic Noses: Introduction, Operating Principles of Gas Sensor Elements, Electronic Noses, Signal Evaluation, Dedicated Examples. 2-D Tactile Sensors and Tactile Sensor Arrays: Introduction, Definitions and Classifications, Resistive Touch screens, Ultrasonic Touch screens, Robot Tactile Sensors, Fingerprint Sensors

Text Books:

1. Introduction to Nanotechnology, C.P. Poole Jr., F.J. Owens, Wiley (2003),
2. Nano electronics and Information Technology (Advanced Electronic Materials and Novel Devices), WaserRanier ,Wiley-VCH,2003



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Reference Books:

1. Nanosystems, K.E. Drexler, Wiley (1992).
2. The Physics of Low-Dimensional Semiconductors, John H. Davies, “Cambridge University Press, "1998

Course Outcomes:

At the end of the course, students will be able to:

- To understand and challenges due to scaling on CMOS devices
- To analyze and explain working of novel MOS based silicon devices and various multi gate devices.
- To understand working of spin electronic devices
- To understand nanoelectronic systems and building blocks such as: low dimensional semiconductors, heterostructures, carbon nanotubes, quantum dots, nano wires etc.



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I Year I Semester

L	P	C
3	0	3

PHOTONICS
(Elective II)

UNIT - I: Laser systems

General description, Laser structure, Single mode laser theory, Excitation mechanism and working of: CO₂, Nitrogen, Argon ion, Excimer, X-ray, Free-electron, Dye, Nd:YAG, Alexandrite and Ti:sapphire lasers, Diode pumped solid state laser, Optical parametric oscillator (OPO) lasers. Optical amplifiers- Semiconductor optical amplifiers, Erbium doped waveguide optical amplifiers, Raman amplifiers, Fiber Lasers. Laser Applications- Lasers in Isotope separation, Laser interferometry and speckle metrology, Velocity measurements.

UNIT - II: Properties of laser Radiation

Introduction, Laser linewidth, Laser frequency stabilization, Beam divergence, Beam coherence, Brightness, Focusing properties of laser radiation, Q-switching, Methods of Q-switching: Rotating-mirror method, Electro-optic Q-switching, Acousto-optic Q-switching and Passive Q-switching, Mode locking, Methods of mode locking: Active and passive mode locking techniques, Frequency doubling and Phase conjugation

UNIT - III: Opto-electronic Devices -I

Introduction, P-N junction diode, Carrier recombination and diffusion in P-N junction, Injection efficiency, Internal quantum efficiency, Hetero-junction, Double hetero-junction, Quantum well, Quantum dot and Super lattices; LED materials, Device configuration and efficiency.

UNIT - IV: Opto-electronic Devices -II

Light extraction from LEDs, LED structures-single heterostructures, double heterostructures, Device performances and applications, Quantum well lasers; Photodiode and Avalanche photodiodes (APDs), Laser Diodes-Amplification, Feedback and oscillation, Power and efficiency, Spectral and spatial characteristics.

UNIT – V: Modulation of Light

Introduction, Birefringence, Electro-optic effect, Pockels and Kerr effects, Electro-optic Phase modulation, Electro-optic amplitude modulation, Electro-optic modulators: scanning and switching, Acousto-optic effect, Acousto-optic modulation, Raman-Nath and Bragg modulators: deflectors and spectrum analyzer, Magneto-optic effect, Faraday rotator as an optical isolator. Advantages of optical modulation.

Text books:

1. Lasers: Principles and applications by J.Wilson and J.F.B.Hawkes, Prentice, Hall of India, New Delhi, 1996.
2. Laser fundamentals, W.T.Silfvast, Foundation books, New Delhi, 1999.
3. Semiconductor opto electronics devices, P. Bhattacharya, Prentice – Hall of India, New Delhi, 1995.17



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Reference Books:

1. Optical fiber communications, John M. Senior, Prentice-Hall of India, New Delhi, 2001
2. Optoelectronics: An Introduction, J.WilsonAndJ.F.B.Hawkes, Prentice-Hall of India, New Delhi, 1996.
3. Electro-Optical devices, M.A. Karim, Boston, Pws-Kent Publishers, 1990

Course Outcomes:

At the end of the course, students will be able to:

- Classify the Optical sources and detectors and to discuss their principle.
- Familiar with Design considerations of fiber optic systems.
- To perform characteristics of optical fiber, sources and detectors, design as well as conduct experiments in software and hardware, analyze the results to provide valid conclusions.
- apply the principles of atomic physics to materials used in optics and photonics;
- calculate properties of and design modern optical fibres and photonic crystals;
- use the tools, methodologies, language and conventions of physics to test and communicate ideas and explanations;
- integrate several components of the course in the context of a new situation (unique to postgraduate coursework).



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I Year I Semester

L	P	C
2	0	2

Research Methodology and IPR

Unit 1:

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

Unit 2:

Effective literature studies approaches, analysis Plagiarism, Research ethics. Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

Unit 3:

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grant of patents, Patenting under PCT.

Unit 4:

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

Unit 5:

New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

Text Books:

1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students"
2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"
3. Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners"
4. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd, 2007.



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Reference Books:

1. Mayall , “Industrial Design”, McGraw Hill, 1992.
2. Niebel , “Product Design”, McGraw Hill, 1974.
3. Asimov , “Introduction to Design”, Prentice Hall, 1962.
4. Robert P. Merges, Peter S. Menell, Mark A. Lemley, “ Intellectual Property in New
5. Technological Age”, 2016.
6. T. Ramappa, “Intellectual Property Rights Under WTO”, S. Chand, 2008

Course Outcomes:

At the end of this course, students will be able to

- Understand research problem formulation.
- Analyze research related information
- Follow research ethics
- Understand that today’s world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
- Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
- Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.



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I Year I Semester

L	P	C
0	4	2

CMOS Analog IC Design Lab

- The students are required to design and implement any TEN Experiments using CMOS 130nm Technology with Mentor Graphics Tool/ Cadence/ Synopsys/Industry Equivalent Standard Software.
- The students are required to implement LAYOUTS of any SIX Experiments using CMOS 130nm Technology with Mentor Graphics Tool/ Cadence/ Synopsys/Industry Equivalent Standard Software. and Compare the results with Pre-Layout Simulation.

List of Experiments:

1. MOS Device Characterization and parametric analysis
2. Common Source Amplifier
3. Common Source Amplifier with source degeneration
4. Cascode amplifier
5. simple current mirror
6. cascode current mirror.
7. Wilson current mirror.
8. Differential Amplifier
9. Operational Amplifier
10. Sample and Hold Circuit
11. Direct-conversion ADC
12. R-2R Ladder Type DAC

Lab Requirements:

Software:

Mentor Graphics – Pyxis Schematic, IC Station, Calibre, ELDO Simulator

Hardware:

Personal Computer with necessary peripherals, configuration and operating System.

Course Outcomes:

1. Have the ability to explain the VLSI Design Methodologies using Mentor Graphics Tools
2. Grasp the significance of various cmos analog circuits in full-custom IC Design flow
3. Have the ability to explain the Physical Verification in Layout Design
4. Fully Appreciate the design and analyze of analog and mixed signal simulation
5. Grasp the Significance of Pre-Layout Simulation and Post-Layout Simulation



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I Year I Semester	L	P	C
	0	4	2

CMOS Digital IC design Lab

- The students are required to design and implement the Circuit and Layout of any TEN Experiments using CMOS 130nm Technology with Mentor Graphics Tool/ Cadence/ Synopsys/Industry Equivalent Standard Software.

List of Experiments:

1. Inverter Characteristics.
2. NAND and NOR Gate
3. XOR and XNOR Gate
4. 2:1 Multiplexer
5. Full Adder
6. RS-Latch
7. Clock Divider
8. JK-Flip Flop
9. Synchronous Counter
10. Asynchronous Counter
11. Static RAM Cell
12. Dynamic Logic Circuits
13. Linear Feedback Shift Register

Lab Requirements:

Software:

Mentor Graphics Tool/ Cadence/ Synopsys/Industry Equivalent Standard Software

Hardware:

Personal Computer with necessary peripherals, configuration and operating System.

Course Outcomes:

1. Have the ability to explain the VLSI Design Methodologies using Mentor Graphics Tools
2. Grasp the significance of various design logic Circuits in full-custom IC Design.
3. Have the ability to explain the Physical Verification in Layout Extraction
4. Fully Appreciate the design and analyze of CMOS Digital Circuits
5. Grasp the Significance of Pre-Layout Simulation and Post-Layout Simulation



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I Year II Semester	L	P	C
	3	0	3

Mixed Signal & RF IC Design

Course Objectives:

- To understand the design of basic cells like Op-Amp, against process and temperature variations meeting the mixed signal specifications.
- To be able to design comparators that can meet the high speed requirements of digital circuitry.
- To be able to design a complete mixed signal system that includes efficient data conversion and RF circuits with minimizing switching.
- To understand the design bottlenecks specific to RF IC design, linearity related issues, and ISI.
- To have a comprehensive idea about different multiple access techniques, wireless standards and various transceiver architectures

UNIT -I

Basic Building Blocks, OpAmp, Capacitors, Switches, Non-overlapping Clocks, Basic Operation and Analysis, ResistorEquivalence of a Switched Capacitor, Parasitic-Sensitive Integrator,Parasitic-InsensitiveIntegrators, Signal-Flow-Graph Analysis, Noise in Switched-CapacitorCircuit

UNIT -II:

Ideal D/A Converter, Ideal A/D Converter, Quantization Noise, Deterministic Approach, Stochastic Approach, Signed Codes, Performance Limitations, Resolution, Offset and Gain Error, Accuracy and Linearity Integrating Converters, Successive-Approximation Converters, DAC-Based SuccessiveApproximation, Charge-Redistribution A/D, Resistor-Capacitor Hybrid, Speed Estimate forCharge-Redistribution Converters, Error Correction in Successive-Approximation Converters

UNIT -III:

Basic Phase-Locked Loop Architecture, Voltage Controlled Oscillator, Divider PhaseDetector, Loop Filer, The PLL in Lock, Linearized Small-Signal Analysis, Second-Order PLL Model,Limitations of the Second-Order Small-Signal Model, PLL Design Example, Jitter andPhase Noise, Period Jitter , P-Cycle Jitter, Adjacent Period Jitter, other SpectralRepresentations of Jitter, Probability Density Function of Jitter, Ring Oscillators , LCOscillators , phase Noise of Oscillators, jitter and Phase Noise in PLLS

UNIT -IV:

INTRODUCTION TO RF AND WIRELESS TECHNOLOGY: Complexity comparison, Design bottle necks, Applications, Analog and digital systems, Choice of Technology. BASICCONCEPTS IN RF DESIGN: Nonlinearity and time variance, ISI, Random process and noise, sensitivity and dynamic range, passive impedance transformation.



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UNIT -V:

Multiple Access: Techniques and wireless standards, mobile RF communication, FDMA, TDMA, CDMA, Wireless standards.

Transceiver Architectures: General considerations, receiver architecture, Transmitter Architecture, transceiver performance tests, case studies.

Amplifiers, Mixers And Oscillators: LNAs, down conversion mixers, Cascaded Stages, oscillators, Frequency synthesizers.

Text Books:

1. David A Johns, Ken Martin: Analog IC design, Wiley 2008.
2. R Gregorian and G C Temes: Analog MOS integrated circuits for signal processing, Wiley 1986

Reference Books:

1. Roubik Gregorian: Introduction to CMOS Op-amps and comparators, Wiley, 2008.
2. Behzad Razavi, RF Microelectronics Prentice Hall of India, 2001
3. Thomas H. Lee, The Design of CMOS Radio Integrated Circuits, Cambridge University Press.

Course Outcomes:

At the end of the course, students will be able to:

- Design basic cells like Op-Amp, against process and temperature variations meeting the mixed signal specifications
- Design comparators that can meet the high speed requirements of digital circuitry.
- Design a complete mixed signal system that includes efficient data conversion and RF circuits with minimizing switching.
- Understand the design bottlenecks specific to RF IC design, linearity related issues and ISI
- Comprehend different multiple access techniques, wireless standards and various transceiver architectures



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I Year II Semester	L	P	C
	3	0	3

Physical Design Automation

Course Objectives:

- To understand the relationship between design automation algorithms and various constraints posed by VLSI fabrication and design technology.
- To learn the design algorithms to meet the critical design parameters.
- To know the layout optimization techniques and map them to the algorithms
- To understand proto-type EDA tools and know how to test its efficacy

UNIT -I

VLSI design Cycle, Physical Design Cycle, Design Rules, Layout of Basic Devices, and Additional Fabrication, Design styles: full custom, standard cell, gate arrays, field programmable gate arrays, sea of gates and comparison, system packaging styles, multi-chip modules. Design rules, layout of basic devices, fabrication process and its impact on physical design, interconnect delay, noise and cross talk, yield and fabrication cost.

UNIT -II:

Factors, Complexity Issues and NP-hard Problems, Basic Algorithms (Graph and Computational Geometry): graph search algorithms, spanning tree algorithms, shortest path algorithms, matching algorithms, min-cut and max-cut algorithms, Steiner tree algorithms

UNIT -III:

Basic Data Structures, atomic operations for layout editors, linked list of blocks, bin based methods, neighbour pointers, corner stitching, multi-layer operations.

UNIT -IV:

Graph algorithms for physical design: classes of graphs, graphs related to a set of lines, graphs related to set of rectangles, graph problems in physical design, maximum clique and minimum coloring, maximum k-independent set algorithm, algorithms for circle graphs.

UNIT -V:

Partitioning algorithms: design style specific partitioning problems, group migrated algorithms, simulated annealing and evolution, and Floor planning and pin assignment, Routing and placement algorithms



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Text Books:

1. NaveedShervani, Algorithms for VLSI Physical Design Automation, 3rd Edition, Kluwer Academic, 1999.
2. Charles J Alpert, Dinesh P Mehta, Sachin S Sapatnekar, Handbook of Algorithms for Physical Design Automation, CRC Press, 2008

Course Outcomes:

At the end of the course, students will be able to:

- Understand the relationship between design automation algorithms and Various constraints posed by VLSI fabrication and design technology.
- Adapt the design algorithms to meet the critical design parameters.
- Identify layout optimization techniques and map them to the algorithms
- Develop proto-type EDA tool and test its efficacy



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Design for Testability
(Elective III)

UNIT -I

Testing Philosophy, Role of Testing, Digital and Analog VLSI Testing, VLSI Technology Trends affecting Testing, Types of Testing, Fault Modeling: Defects, Errors and Faults, Functional Versus Structural Testing, Levels of Fault Models, Single Stuck-at Fault.

UNIT -II:

Simulation for Design Verification and Test Evaluation, Modeling Circuits for Simulation, Algorithms for True-value Simulation, Algorithms for Fault Simulation.

UNIT -III:

SCOAP Controllability and Observability, High Level Testability Measures, Digital DFT and Scan Design: Ad-Hoc DFT Methods, Scan Design, Partial-Scan Design, Variations of Scan.

UNIT -IV:

The Economic Case for BIST, Random Logic BIST: Definitions, BIST Process, Pattern Generation, Response Compaction, Built-In Logic Block Observers, Test-Per-Clock, Test-Per-Scan BIST Systems, Circular Self-Test Path System, Memory BIST, Delay Fault BIST.

UNIT -V:

Motivation, System Configuration with Boundary Scan: TAP Controller and Port, Boundary Scan Test Instructions, Pin Constraints of the Standard, Boundary Scan Description Language: BDSL Description Components, Pin Descriptions.

Text Books:

1. Essentials of Electronic Testing for Digital, Memory and Mixed Signal VLSI Circuits -M.L. Bushnell, V. D. Agrawal, Kluwer Academic Publishers.

Reference Books:

1. Digital Systems and Testable Design - M. Abramovici, M.A. Breuer and A.D Friedman, Jaico Publishing House.
2. Digital Circuits Testing and Testability - P.K. Lala, Academic Press.

Course Outcomes:

At the end of the course, students will be able to:

- Demonstrate advanced knowledge in The basic faults that occur in digital systems, Testing of stuck at faults for digital circuits, Design for testability.
- Analyze testing issues in the field of digital system design critically for conducting research.
- Solve engineering problems by modeling different faults for fault free simulation in digital circuits.
- Apply appropriate research methodologies and techniques to develop new testing strategies for digital and mixed signal circuits and systems.



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IOT and its Applications
(Elective III)

UNIT I: Fundamentals of IoT- Evolution of Internet of Things, Enabling Technologies, IoT Architectures, oneM2M, IoT World Forum (IoTWF) and Alternative IoT models, Simplified IoT Architecture and Core IoT Functional Stack, Fog, Edge and Cloud in IoT, Functional blocks of an IoT ecosystem, Sensors, Actuators, Smart Objects and Connecting Smart Objects.

IoT Platform overview: Overview of IoT supported Hardware platforms such as: Raspberry pi, ARM Cortex Processors, Arduino and Intel Galileo boards.

UNIT II: IoT Protocols- IT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and Lora WAN, Network Layer: IP versions, Constrained Nodes and Constrained Networks, Optimizing IP for IoT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks, Application Transport Methods: Supervisory Control and Data Acquisition, Application Layer Protocols: CoAP and MQTT.

UNIT III: Design And Development- Design Methodology, Embedded computing logic, Microcontroller, System on Chips, IoT system building blocks, Arduino, Board details, IDE programming, Raspberry Pi, Interfaces and Raspberry Pi with Python Programming.

UNIT IV: Data Analytics And Supporting Services- Structured Vs Unstructured Data and Data in Motion Vs Data in Rest, Role of Machine Learning – No SQL Databases, Hadoop Ecosystem, Apache Kafka, Apache Spark, Edge Streaming Analytics and Network Analytics, Xively Cloud for IoT, Python Web Application Framework, Django, AWS for IoT, System Management with NETCONF-YANG

UNIT V: Case Studies/Industrial Applications: IoT applications in home, infrastructures, buildings, security, Industries, Home appliances, other IoT electronic equipments. Use of Big Data and Visualization in IoT, Industry 4.0 concepts.

Sensors and sensor Node and interfacing using any Embedded target boards (Raspberry Pi / Intel Galileo/ARM Cortex/ Arduino)

Text Books:

1. IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, Cisco Press, 2017



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Reference Books:

1. Internet of Things – A hands-on approach, ArshdeepBahga, Vijay Madiseti, Universities Press, 2015
2. The Internet of Things – Key applications and Protocols, Olivier Hersent, David Boswarthick, Omar Elloumi and Wiley, 2012 (for Unit 2).
3. “From Machine-to-Machine to the Internet of Things – Introduction to a New Age of Intelligence”,Jan Ho“ ller, VlasiosTsiatsis, Catherine Mulligan, Stamatis, Karnouskos, Stefan Avesand. David Boyle and Elsevier, 2014.
4. Architecting the Internet of Things,Dieter Uckelmann, Mark Harrison, Michahelles and Florian (Eds), Springer, 2011.
5. Recipes to Begin, Expand, and Enhance Your Projects, 2nd Edition,Michael Margolis, Arduino Cookbook and O’Reilly Media, 2011.

Course Outcomes:

At the end of this course, students will be able to

- Apply the Knowledge in IOT Technologies and Data management.
- Determine the values chains Perspective of M2M to IOT.
- Implement the state of the Architecture of an IOT.
- Compare IOT Applications in Industrial & real world.
- Demonstrate knowledge and understanding the security and ethical issues of an IOT.



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VLSI Signal Processing
(Elective III)

UNIT -I

Introduction to DSP: Typical DSP algorithms, DSP algorithms benefits, Representation of DSP algorithms Pipelining and Parallel Processing

Introduction, Pipelining of FIR Digital filters, Parallel Processing, Pipelining and Parallel Processing for Low Power Retiming Introduction, Definitions and Properties, Solving System of Inequalities, Retiming Techniques

UNIT –II

Folding and Unfolding: Folding- Introduction, Folding Transform, Register minimization Techniques, Register minimization in folded architectures, folding of Multirate systems

Unfolding- Introduction, An Algorithm for Unfolding, Properties of Unfolding, critical Path, Unfolding and Retiming, Applications of Unfolding

UNIT -III

Systolic Architecture Design: Introduction, Systolic Array Design Methodology, FIR Systolic Arrays, Selection of Scheduling Vector, Matrix Multiplication and 2D Systolic Array Design, Systolic Design for Space Representations contain Delays.

UNIT -IV

Fast Convolution: Introduction – Cook-Toom Algorithm – Winograd algorithm – Iterated Convolution – Cyclic Convolution – Design of Fast Convolution algorithm by Inspection

Unit 5: Digital lattice filter structures, bit level arithmetic, architecture, redundant arithmetic. Numerical strength reduction, synchronous, wave and asynchronous pipe lines, low power design.

Low Power Design: Scaling Vs Power Consumption, Power Analysis, Power Reduction techniques, Power Estimation Approaches

Text Books:

1. Keshab K. Parthi[A1] , VLSI Digital signal processing systems, design and implementation[A2] , Wiley, Inter Science, 1999.
2. Mohammad Isamail and Terri Fiez, Analog VLSI signal and information processing, McGraw Hill, 1994
3. S.Y. Kung, H.J. White House, T. Kailath, VLSI and Modern Signal Processing, Prentice Hall, 1985.

Course Outcomes

On successful completion of the module, students will be able to:

1. Ability to modify the existing or new DSP architectures suitable for VLSI.
 2. Understand the concepts of folding and unfolding algorithms and applications.
 3. Ability to implement fast convolution algorithms.
- Low power design aspects of processors for signal processing and wireless applications.



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Network Security and Cryptography
(Elective IV)

Unit 1: Security

Need, security services, Attacks, OSI Security Architecture, one time passwords, Model for Network security, Classical Encryption Techniques like substitution ciphers, Transposition ciphers, Cryptanalysis of Classical Encryption Techniques.

Number Theory

Introduction, Fermat's and Euler's Theorem, The Chinese Remainder Theorem, Euclidean Algorithm, Extended Euclidean Algorithm, and Modular Arithmetic.

Unit 2: Private-Key (Symmetric) Cryptography

Block Ciphers, Stream Ciphers, RC4 Stream cipher, Data Encryption Standard (DES), Advanced Encryption Standard (AES), Triple DES, RC5, IDEA, Linear and Differential Cryptanalysis.

Unit 3: Public-Key (Asymmetric) Cryptography

RSA, Key Distribution and Management, Diffie-Hellman Key Exchange, Elliptic Curve Cryptography, Message Authentication Code, hash functions, message digest algorithms: MD4 MD5, Secure Hash algorithm, RIPEMD-160, HMAC.

Unit 4: Authentication

IP and Web Security Digital Signatures, Digital Signature Standards, Authentication Protocols, Kerberos, IP security Architecture, Encapsulating Security Payload, Key Management, Web Security Considerations, Secure Socket Layer and Transport Layer Security, Secure Electronic Transaction.

Unit 5: System Security

Intruders, Intrusion Detection, Password Management, Worms, viruses, Trojans, Virus Countermeasures, Firewalls, Firewall Design Principles, Trusted Systems.

Text Books:

1. William Stallings, "Cryptography and Network Security, Principles and Practices", Pearson Education, 3rd Edition.
2. Charlie Kaufman, Radia Perlman and Mike Speciner, "Network Security, Private Communication in a Public World", Prentice Hall, 2nd Edition



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Reference Books:

1. Christopher M. King, Ertem Osmanoglu, Curtis Dalton, “Security Architecture, Design Deployment and Operations”, RSA Pres,
2. Stephen Northcutt, LenyZeltser, Scott Winters, Karen Kent, and Ronald W. Ritchey,
3. “Inside Network Perimeter Security”, Pearson Education, 2nd Edition
4. Richard Bejtlich, “The Practice of Network Security Monitoring: Understanding Incident

Course Outcomes:

At the end of the course, students will be able to:

- Identify and utilize different forms of cryptography techniques.
- Incorporate authentication and security in the network applications.
- Distinguish among different types of threats to the system and handle the same.



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Microcontrollers and Programmable Digital Signal Processors
(Elective IV)

Unit 1:

ARM Cortex-M3 processor: Applications, Programming model – Registers, Operation modes, Exceptions and Interrupts, Reset Sequence Instruction Set, Unified Assembler Language, Memory Maps, Memory Access Attributes, Permissions, Bit-Band Operations, Unaligned and Exclusive Transfers. Pipeline, Bus Interfaces

Unit 2:

Exceptions, Types, Priority, Vector Tables, Interrupt Inputs and Pending behavior, Fault Exceptions, Supervisor and Pendable Service Call, Nested Vectored Interrupt Controller, Basic Configuration, SYSTICK Timer, Interrupt Sequences, Exits, Tail Chaining, Interrupt Latency.

Unit 3:

LPC 17xx microcontroller- Internal memory, GPIOs, Timers, ADC, UART and other serial interfaces, PWM, RTC, WDT

Unit 4:

Programmable DSP (P-DSP) Processors: Harvard architecture, Multi port memory, architectural structure of P-DSP- MAC unit, Barrel shifters, Introduction to TI DSP processor family

Unit 5:

VLIW architecture and TMS320C6000 series, architecture study, data paths, cross paths, Introduction to Instruction level architecture of C6000 family, Assembly Instructions memory addressing, for arithmetic, logical operations Code Composer Studio for application development for digital signal processing, On chip peripherals, Processor benchmarking

Text Books:

1. Joseph Yiu, “The definitive guide to ARM Cortex-M3”, Elsevier, 2nd Edition
2. Venkatramani B. and Bhaskar M. “Digital Signal Processors: Architecture, Programming and Applications”, TMH, 2nd Edition
3. Sloss Andrew N, Symes Dominic, Wright Chris, “ARM System Developer's Guide: Designing and Optimizing”, Morgan Kaufman Publication

Reference Books:

1. Steve Furber, “ARM System-on-Chip Architecture”, Pearson Education
2. Frank Vahid and Tony Givargis, “Embedded System Design”, Wiley
3. Technical references and user manuals on www.arm.com, NXP Semiconductor www.nxp.com and Texas Instruments www.ti.com

Course Outcomes:

At the end of this course, students will be able to

- Compare and select ARM processor core based SoC with several features/peripherals based on requirements of embedded applications.
- Identify and characterize architecture of Programmable DSP Processors
- Develop small applications by utilizing the ARM processor core and DSP processor based platform.



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LOW POWER VLSI DESIGN
(Elective IV)

UNIT-I: Sources of Power Dissipation

Introduction, Short-Circuit Power Dissipation, Switching Power Dissipation, Dynamic Power for a Complex Gate, Reduced Voltage Swing, Switching Activity, Leakage Power Dissipation, p–n Junction Reverse-Biased Current, Band-to-Band Tunneling Current, Sub threshold Leakage Current, Short-Channel Effects

UNIT 2: Supply Voltage Scaling for Low Power

Device Feature Size Scaling, Constant-Field Scaling, Constant-Voltage Scaling, Architectural-Level Approaches: Parallelism for Low Power, Pipelining for Low Power, Combining Parallelism with Pipelining, Voltage Scaling Using High-Level Transformations: Multilevel Voltage Scaling Challenges in MVS Voltage Scaling Interfaces, Static Timing Analysis Dynamic Voltage and Frequency Scaling

UNIT-3: Switched Capacitance Minimization

Probabilistic Power Analysis: Random logic signals, probability and frequency, probabilistic power analysis techniques, signal entropy, Bus Encoding: Gray Coding, One-Hot Coding, Bus-Inversion, T0 Coding, Clock Gating, Gated-Clock FSMs FSM State Encoding, FSM Partitioning, Pre computation, Glitching Power Minimization

UNIT 4: Leakage Power Minimization

Fabrication of Multiple Threshold Voltages, Multiple Channel Doping, Multiple Oxide CMOS, Multiple Channel Length, Multiple Body Bias, VTCMOS Approach, MTCMOS Approach, Power Gating, Clock Gating Versus Power Gating, Power-Gating Issues, Isolation Strategy, State Retention Strategy, Power-Gating Controller, Power Management, Combining DVFS and Power Management

UNIT 5: Low power clock distribution & Simulation Power Analysis

Low power clock distribution: Power dissipation in clock distribution, single driver versus distributed buffers, Zero skew versus tolerable skew, chip and package co design for clock network.

Simulation Power Analysis: SPICE circuit simulators, gate level logic simulation, capacitive power estimation, architecture level analysis, data correlation analysis of DSP systems, Monte Carlo Simulation



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Text Books:

1. Low-Power VLSI Circuits and Systems, Ajit Pal, SPRINGER PUBLISHERS
2. Practical Low Power Digital Vlsi Design , Gary Yeap Motorola, Springer Science Business Media, LLC.

Reference Books:

1. Low Power CMOS Design – Anantha Chandrakasan, IEEE Press/Wiley International, 1998. 2
2. Massoud Pedram, Jan M. Rabaey , “Low power design methodologies “, Kluwer Academic Publishers.
3. Low Power CMOS VLSI Circuit Design – A. Bellamour, M. I. Elamasri, Kluwer Academic Press, 1995.

Course Outcomes:

At the end of the course, students will be able to:

- Identify the sources of power dissipation in digital IC systems & understand the impact of power on system performance and reliability.
- Characterize and model power consumption & understand the basic analysis methods.
- Understand leakage sources and reduction techniques.



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Mixed Signal IC Design Lab

Detailed Syllabus:

Cycle 1:

- 1) Fully compensated op-amp with resistor and miller compensation
- 2) High speed comparator design
 - i. Two stage cross coupled clamped comparator
 - ii. Strobed Flip-flop
- 3) Data converter

Cycle 2:

- 1) Switched capacitor circuits
 - i. Parasitic sensitive integrator
 - ii. Parasitic insensitive integrator
- 2) Design of PLL
- 3) Design of VCO
- 4) Bandgap reference circuit
- 5) Layouts of All the circuits Designed and Simulated

Software:

Mentor Graphics/ Cadence/ Tanner/Industry Equivalent Standard Software Tools

Hardware:

Personal Computer with necessary peripherals, configuration and operating System.

Reading:

- 1) David A Johns, Ken Martin, Analog Integrated Circuit Design, Wiley, 2008.
- 2) R. Gregorian and G.C Ternes, Analog MOS Integrated Circuits for Signal Processing, Wiley, 1986.
- 3) Roubik Gregorian, Introduction to CMOS OpAmp and Comparators, Wiley, 1999.
- 4) Alan Hastlings, The art of Analog Layout, Wiley, 2005.



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Physical Design Automation Lab

Detailed syllabus:

Cycle 1:

1) Graph algorithms

- a) Graph search algorithms
 - i. Depth first search
 - ii. Breadth first search
- b) Spanning tree algorithm
 - i. Kruskal's algorithm
- c) Shortest path algorithm
 - i. Dijkstra algorithm
 - ii. Floyd- Warshall algorithm
- d) Steiner tree algorithm

2) Computational geometry algorithm

- a) Line sweep method
- b) Extended line sweep method

Cycle 2:

3) Partitioning algorithms

- I) Group migration algorithms
 - a) Kernighan –Lin algorithm
 - b) Extensions of Kernighan-Lin algorithm
 - i) Fiduccias –Mattheyses algorithm
 - ii) Goldberg and Burstein algorithm
- II) Simulated annealing and evolution algorithms
 - a) Simulated annealing algorithm
 - b) Simulated evolution algorithm
- III) Metric allocation method

4) Floor planning algorithms

- i) Constraint based methods
- ii) Integer programming based methods
- iii) Rectangular dualization based methods
- iv) Hierarchical tree based methods
- v) Simulated evolution algorithms
- vi) Time driven Floorplanning algorithms



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5) Routing algorithms

- I) Two terminal algorithms
 - a) Maze routing algorithms
 - i) Lee's algorithm
 - ii) Soukup's algorithm
 - iii) Hadlock algorithm
 - b) Line-Probe algorithm
 - c) Shortest path based algorithm
- II) Multi terminal algorithm
 - a) Steiner tree based algorithm
 - i) SMST algorithm
 - ii) Z-RST algorithm

Software required: C/C++ Programming Language /Relevant software

Reading:

- 1) Naveed Shervani, Algorithms for Physical Design Automation, 3rd Edition, Kluwer Academic, 1998.
- 2) Charles J Alpert, Dinesh P Mehta, Sachin S. Sapatnekar, Handbook of Algorithms for Physical Design Automation, CRC Press, 2008.



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I Year II Semester

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MINI PROJECT

Syllabus Contents

The students are required to search / gather the material / information on a specific a topic comprehend it and present / discuss in the class.

Course Outcomes

At the end of this course, students will be able to

1. Understand of contemporary / emerging technology for various processes and systems.
2. Share knowledge effectively in oral and written form and formulate documents



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II Year I Semester

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Scripting Languages for VLSI
(Elective V)

UNIT-I:

Introduction to Scripts and Scripting: Basics of Linux, Origin of Scripting languages, scriptingtoday, Characteristics and uses of scripting languages.

PERL: Introduction to PERL, Names and values, Variables and assignment, Scalar expressions, Control structures, Built-in functions, Collections of Data, working with arrays, Lists and hashes,

Simple input and output, Strings, Patterns and regular expressions, Subroutines, Scripts with arguments.

UNIT-II:

Advanced PERL: Finer points of Looping, Subroutines, Using Pack and Unpack, working with files, Type globs, Eval, References, Data structures, Packages, Libraries and modules, Objects, Objects and modules in action, tied variables, interfacing to the operating systems, Security issues.

UNIT-III:

TCL: The TCL phenomena, Philosophy, Structure, Syntax, Parser, Variables and data in TCL, Control flow, Data structures, Simple input/output, Procedures, Working with Strings, Patterns, Files and Pipes, Example code.

UNIT-IV:

Advanced TCL: The eval, source, exec and up-level commands, Libraries and packages, Namespaces, trapping errors, Event-driven programs, Making applications 'Internet-aware', 'Nuts-and-bolts' internet programming, Security issues, TCL and TK integration.

UNIT-V:

PYTHON: Introduction to PYTHON language, PYTHON-syntax, statements, functions, Built-in functions and Methods, Modules in PYTHON, Exception Handling.

Text Books:

1. The World of Scripting Languages- David Barron, Wiley Student Edition, 2010.
2. PYTHON Web Programming, Steve Holden and David Beazley, New Riders Publications



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References:

1. TCL/TK: A Developer's Guide- ClifFlynt, 2003, Morgan Kaufmann Series.
2. Core PYTHON Programming, Chun, Pearson Education, 2006.
3. Learning Perl, Randal L. Schwartz, O' Reilly publications 6th edition 2011.
4. Linux: The Complete Reference”, Richard Peterson McGraw Hill Publications, 6th Edition,2008.

Course Outcomes:

At the end of this course, the student will be able to:

- Gain fluency in programming with scripting languages
- Create and run scripts using PERL/TCL/PYTHON in CAD Tools
- Demonstrate the use of PERL/PYTHON/ TCL in developing system and web applications



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Digital Design and Verification
(Elective V)

Unit 1

Revision of basic Digital systems: Combinational Circuits, Sequential Circuits, Logic families. Synchronous FSM and asynchronous design, Meta-stability, Clock distribution and issues, basic building blocks like PWM module, pre-fetch unit, programmable counter, FIFO, Booth's multiplier, ALU, Barrel shifter etc.

Unit 2

Verilog/VHDL Comparisons and Guidelines, Verilog: HDL fundamentals, simulation, and testbench design, Examples of Verilog codes for combinational and sequential logic, Verilog AMS. IP and Prototyping: IP in various forms: RTL Source code, Encrypted Source code, Soft IP, Netlist, Physical IP, and Use of external hard IP during prototyping, Case studies, and Speed issues.

Unit 3

System Verilog and Verification: Verification guidelines, Data types, procedural statements and routines, connecting the test bench and design, Assertions, Basic OOP concepts, Randomization. Testing of logic circuits: Fault models, BIST, JTAG interface Introduction to basic scripting language: Perl, Tcl/Tk

Unit 4

Current challenges in physical design: Roots of challenges, Delays: Wire load models Generic PD flow, Challenges in PD flow at different steps, SI Challenge - Noise & Crosstalk, IR Drop, Process effects: Process Antenna Effect & Electro migration

Unit 5

Programmable Logic Devices: Introduction, Evolution: PROM, PLA, PAL, Architecture of PAL's, Applications, Programming PLD's, FPGA with technology: Anti-fuse, SRAM, EPROM, MUX, FPGA structures, and ASIC Design Flows, Programmable Interconnections, Coarse grained reconfigurable devices

Text Books:

1. Douglas Smith, "HDL Chip Design: A Practical Guide for Designing, Synthesizing & Simulating ASICs & FPGAs Using VHDL or Verilog", Doone publications, 1998.
2. Samir Palnitkar, "Verilog HDL: A guide to Digital Design and Synthesis", Prentice Hall, 2nd Edition, 2003.



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Reference Books:

1. Doug Amos, Austin Lesea, Rene Richter, “FPGA based Prototyping Methodology Manual”, Synopsys Press, 2011.
2. Christophe Bobda, “Introduction to Reconfigurable Computing, Architectures, Algorithms and Applications”, Springer, 2007.
3. Janick Bergeron, “Writing Testbenches: Functional Verification of HDL Models”, Second Edition, Springer, 2003.

Course Outcomes:

At the end of this course, students will be able to

- Familiarity of Front end design and verification techniques and create reusable test environments.
- Verify increasingly complex designs more efficiently and effectively.
- Use EDA tools like Cadence, Mentor Graphics.



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HARDWARE SOFTWARE CO-DESIGN
(Elective V)

UNIT-I:

Co- Design Issues: Co- Design Models, Architectures, Languages, A Generic Co-design Methodology.

Co- Synthesis Algorithms: Hardware software synthesis algorithms: hardware – software partitioning distributed system co-synthesis.

UNIT-II:

Prototyping and Emulation

Prototyping and emulation techniques, prototyping and emulation environments, future developments in emulation and prototyping architecture specialization techniques, system communication infrastructure

Target Architectures

Architecture Specialization techniques, System Communication infrastructure, Target Architecture and Application System classes, Architecture for control dominated systems (8051-Architectures for High performance control), Architecture for Data dominated systems (ADSP21060, TMS320C60), Mixed Systems.

UNIT-III:

Compilation Techniques and Tools for Embedded Processor Architectures

Modern embedded architectures, embedded software development needs, compilation technologies, practical consideration in a compiler development environment.

UNIT-IV:

Design Specification and Verification

Design, co-design, the co-design computational model, concurrency coordinating concurrent computations, interfacing components, design verification, implementation verification, verification tools, Interface verification.

UNIT-V: Languages for System-Level Specification and Design-I

System-level specification, design representation for system level synthesis, system level specification languages. **Languages for System-Level Specification and Design-II**

Heterogeneous specifications and multi language co-simulation, the cosyma system and Lycos system.

Text Books:

1. Hardware / Software Co- Design Principles and Practice – Jorgen Staunstrup, Wayne Wolf – 2009, Springer.
2. Hardware / Software Co- Design - Giovanni De Micheli, Mariagiovanna Sami, 2002, Kluwer Academic Publishers.



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Reference Books:

1. A Practical Introduction to Hardware/Software Co-design -Patrick R. Schaumont - 2010 – Springer Publications.

Course outcomes

At the end of the course the student able to

- About the Hardware-Software Code sign Methodology.
- How to select a target architecture and how a prototype is built and how emulation of a prototype is done.
- Brief view about compilation technologies and compiler development environment.
- Understand the importance of system level specification languages and multi-language co-simulation.



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(DISSERTATION) DISSERTATION PHASE – I AND PHASE – II

Syllabus Contents:

The dissertation / project topic should be selected / chosen to ensure the satisfaction of the urgent need to establish a direct link between education, national development and productivity and thus reduce the gap between the world of work and the world of study. The dissertation should have the following

- Relevance to social needs of society
- Relevance to value addition to existing facilities in the institute
- Relevance to industry need
- Problems of national importance
- Research and development in various domain

The student should complete the following:

- Literature survey Problem Definition
- Motivation for study and Objectives
- Preliminary design / feasibility / modular approaches
- Implementation and Verification
- Report and presentation

The dissertation stage II is based on a report prepared by the students on dissertation allotted to them. It may be based on:

- Experimental verification / Proof of concept.
- Design, fabrication, testing of Communication System.
- The viva-voce examination will be based on the above report and work.

Guidelines for Dissertation Phase – I and II at M. Tech. (Electronics):

- As per the AICTE directives, the dissertation is a yearlong activity, to be carried out and evaluated in two phases i.e. Phase – I: July to December and Phase – II: January to June.
- The dissertation may be carried out preferably in-house i.e. department's laboratories and centers OR in industry allotted through department's T & P coordinator.
- After multiple interactions with guide and based on comprehensive literature survey, the student shall identify the domain and define dissertation objectives. The referred literature should preferably include IEEE/IET/IETE/Springer/Science Direct/ACM journals in the areas of Computing and Processing (Hardware and Software), Circuits-Devices and Systems, Communication-Networking and Security, Robotics and Control Systems, Signal Processing and Analysis and any other related domain. In case of Industry sponsored projects, the relevant application notes, while papers, product catalogues should be referred and reported.
- Student is expected to detail out specifications, methodology, resources required, critical issues involved in design and implementation and phase wise work distribution, and



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submit the proposal within a month from the date of registration.

- Phase – I deliverables: A document report comprising of summary of literature survey, detailed objectives, project specifications, paper and/or computer aided design, proof of concept/functionality, part results, A record of continuous progress.
- Phase – I evaluation: A committee comprising of guides of respective specialization shall assess the progress/performance of the student based on report, presentation and Q &A. In case of unsatisfactory performance, committee may recommend repeating the Phase-I work.
- During phase – II, student is expected to exert on design, development and testing of the proposed work as per the schedule. Accomplished results/contributions/innovations should be published in terms of research papers in reputed journals and reviewed focused conferences OR IP/Patents.
- Phase – II deliverables: A dissertation report as per the specified format, developed system in the form of hardware and/or software, a record of continuous progress.
- Phase – II evaluation: Guide along with appointed external examiner shall assess the progress/performance of the student based on report, presentation and Q &A. In case of unsatisfactory performance, committee may recommend for extension or repeating the work

Course Outcomes:

At the end of this course, students will be able to

- Ability to synthesize knowledge and skills previously gained and applied to an in-depth study and execution of new technical problem.
- Capable to select from different methodologies, methods and forms of analysis to produce a suitable research design, and justify their design.
- Ability to present the findings of their technical solution in a written report.
- Presenting the work in International/ National conference or reputed journals.



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II Year I Semester

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BUSINESS ANALYTICS
(Open Elective)

Unit1:

Business analytics: Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organisation, competitive advantages of Business Analytics.

Statistical Tools: Statistical Notation, Descriptive Statistical methods,

Review of probability distribution and data modelling, sampling and estimation methods overview.

Unit 2:

Trendiness and Regression Analysis: Modelling Relationships and Trends in Data, simple Linear Regression. Important Resources, Business Analytics Personnel, Data and models for Business analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology

Unit 3:

Organization Structures of Business analytics, Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes. Descriptive Analytics, predictive analytics, predictive Modelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization.

Unit 4:

Forecasting Techniques: Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Regression Forecasting with Casual Variables, Selecting Appropriate Forecasting Models.

Monte Carlo Simulation and Risk Analysis: Monte Carlo Simulation

Using Analytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.

Unit 5:

Decision Analysis: Formulating Decision Problems, Decision Strategies with the without Outcome Probabilities, Decision Trees, The Value of Information, Utility and Decision Making.

Recent Trends in : Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data journalism



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Reference:

1. Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FTPress.
2. Business Analytics by James Evans, personsEducation.

Course Outcomes:

- Students will demonstrate knowledge of data analytics.
- Students will demonstrate the ability of think critically in making decisions based on data and deep analytics.
- Students will demonstrate the ability to use technical skills in predicative and prescriptive modeling to support business decision-making.
- Students will demonstrate the ability to translate data into clear, actionable insights



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INDUSTRIAL SAFETY
(Open Elective)

Unit-1:

Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.

Unit-2:

Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

Unit-3:

Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

Unit-4:

Fault tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

Unit-5:

Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance



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Reference:

1. Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.
2. Maintenance Engineering, H. P. Garg, S. Chand and Company.
3. Pump-hydraulic Compressors, Audels, McgrewHill Publication.
4. Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London



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OPERATIONS RESEARCH
(Open Elective)

Unit 1:

Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models

Unit 2

Formulation of a LPP - Graphical solution revised simplex method - duality theory - dual simplex method - sensitivity analysis - parametric programming

Unit 3:

Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem - CPM/PERT

Unit 4

Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming.

Unit 5

Competitive Models, Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation

References:

1. H.A. Taha, Operations Research, An Introduction, PHI, 2008
2. H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982.
3. J.C. Pant, Introduction to Optimisation: Operations Research, Jain Brothers, Delhi, 2008
4. Hitler Libermann Operations Research: McGraw Hill Pub. 2009
5. Pannerselvam, Operations Research: Prentice Hall of India 2010
6. Harvey M Wagner, Principles of Operations Research: Prentice Hall of India 2010

Course Outcomes:

At the end of the course, the student should be able to

1. Students should able to apply the dynamic programming to solve problems of discreet and continuous variables.
2. Students should able to apply the concept of non-linear programming
3. Students should able to carry out sensitivity analysis
4. Student should able to model the real world problem and simulate it.



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COST MANAGEMENT OF ENGINEERING PROJECTS
(Open Elective)

Introduction and Overview of the Strategic Cost Management Process

Cost concepts in decision-making; Relevant cost, Differential cost, Incremental cost and Opportunity cost. Objectives of a Costing System; Inventory valuation; Creation of a Database for operational control; Provision of data for Decision-Making.

Project: meaning, Different types, why to manage, cost overruns centres, various stages of project execution: conception to commissioning. Project execution as conglomeration of technical and non- technical activities. Detailed Engineering activities. Pre project execution main clearances and documents Project team: Role of each member. Importance Project site: Data required with significance. Project contracts. Types and contents. Project execution Project cost control. Bar charts and Network diagram. Project commissioning: mechanical and process

Cost Behavior and Profit Planning Marginal Costing; Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis. Various decision-making problems. Standard costing and Variance Analysis. Pricing strategies: Pareto Analysis. Target costing, Life Cycle Costing. Costing of service sector. Just-in-time approach, Material Requirement Planning, Enterprise Resource Planning, Total Quality Management and Theory of constraints. Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value-Chain Analysis. Budgetary Control; Flexible Budgets; Performance budgets; Zero-based budgets. Measurement of Divisional profitability pricing decisions including transfer pricing.

Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory.

References:

1. Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi
2. Charles T. Horngren and George Foster, Advanced Management Accounting
3. Robert S Kaplan Anthony A. Alkinson, Management & Cost Accounting
4. Ashish K. Bhattacharya, Principles & Practices of Cost Accounting A. H. Wheeler publisher
5. N.D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill Book Co. Ltd.



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COMPOSITE MATERIALS
(Open Elective)

UNIT-I:

INTRODUCTION: Definition – Classification and characteristics of Composite materials. Advantages and application of composites. Functional requirements of reinforcement and matrix. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.

UNIT – II:

REINFORCEMENTS: Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures. Isostrain and Isostress conditions.

UNIT – III:

Manufacturing of Metal Matrix Composites: Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing. Properties and applications. **Manufacturing of Ceramic Matrix Composites:** Liquid Metal Infiltration – Liquid phase sintering. **Manufacturing of Carbon – Carbon composites:** Knitting, Braiding, Weaving. Properties and applications.

UNIT-IV:

Manufacturing of Polymer Matrix Composites: Preparation of Moulding compounds and prepregs – hand layup method – Autoclave method – Filament winding method – Compression moulding – Reaction injection moulding. Properties and applications.

UNIT – V:

Strength: Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygrothermal failure. Laminate first ply failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.

TEXT BOOKS:

1. Material Science and Technology – Vol 13 – Composites by R.W.Cahn – VCH, West Germany.
2. Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R. Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007.

References:

1. Hand Book of Composite Materials-ed-Lubin.
2. Composite Materials – K.K.Chawla.
3. Composite Materials Science and Applications – Deborah D.L.Chung.
4. Composite Materials Design and Applications – Danial Gay, Suong V. Hoa, and Stephen W. Tasi.



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WASTE TO ENERGY
(Open Elective)

Unit-I:

Introduction to Energy from Waste: Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors

Unit-II:

Biomass Pyrolysis: Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods - Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.

Unit-III:

Biomass Gasification: Gasifiers – Fixed bed system – Downdraft and updraft gasifiers – Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation

Unit-IV:

Biomass Combustion: Biomass stoves – Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.

Unit-V:

Biogas: Properties of biogas (Calorific value and composition) - Biogas plant technology and status - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion - Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India.

References:

1. Non Conventional Energy, Desai, Ashok V., Wiley Eastern Ltd., 1990.
2. Biogas Technology - A Practical Hand Book - Khandelwal, K. C. and Mahdi, S. S., Vol. I & II, Tata McGraw Hill Publishing Co. Ltd., 1983.
3. Food, Feed and Fuel from Biomass, Challal, D. S., IBH Publishing Co. Pvt. Ltd., 1991.
4. Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley & Sons, 1996.



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AUDIT 1 and 2: ENGLISH FOR RESEARCH PAPER WRITING

Course objectives: Students will be able to: Understand that how to improve your writing skills and level of readability Learn about what to write in each section Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission		
Syllabus		
Units	CONTENTS	Hours
1	Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness	4
2	Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction	4
3	Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.	4
4	key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature,	4
5	skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions	4
6	useful phrases, how to ensure paper is as good as it could possibly be the first- time submission	4

Suggested Studies:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman'sbook .
4. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011



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AUDIT 1 and 2: DISASTER MANAGEMENT

Course Objectives: -Students will be able to: learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response. critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives. develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations. critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in		
Syllabus		
Units	CONTENTS	Hours
1	Introduction Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.	4
2	Repercussions Of Disasters And Hazards: Economic Damage, Loss Of Human And Animal Life, Destruction Of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.	4
3	Disaster Prone Areas In India Study Of Seismic Zones; Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics	4
4	Disaster Preparedness And Management Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.	4
5	Risk Assessment Disaster Risk: Concept And Elements, Disaster Risk Reduction, Global And National Disaster Risk Situation. Techniques Of Risk Assessment, Global Co-Operation In Risk Assessment And Warning, People's Participation In Risk Assessment. Strategies for Survival.	4
6	Disaster Mitigation Meaning, Concept And Strategies Of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation And Non-Structural Mitigation, Programs Of Disaster Mitigation In India.	4



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Suggested Readings:

1. R. Nishith, Singh AK, “Disaster Management in India: Perspectives, issues and strategies “New Royal book Company.
2. Sahni, PardeepEt.Al. (Eds.),” Disaster Mitigation Experiences And Reflections”, Prentice Hall Of India, New Delhi.
3. Goel S. L. , Disaster Administration And Management Text And Case Studies” ,Deep &Deep Publication Pvt. Ltd., New Delhi.



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AUDIT 1 and 2: SANSKRIT FOR TECHNICAL KNOWLEDGE

Course Objectives

1. To get a working knowledge in illustrious Sanskrit, the scientific language in the world
2. Learning of Sanskrit to improve brain functioning
3. Learning of Sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power
4. The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature

Syllabus

Unit	Content	Hours
1	<ul style="list-style-type: none">• Alphabets in Sanskrit,• Past/Present/Future Tense,• Simple Sentences	8
2	<ul style="list-style-type: none">• Order• Introduction of roots• Technical information about Sanskrit Literature	8
3	<ul style="list-style-type: none">• Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics	8

Suggested reading

1. “Abhyaspustakam” – Dr.Vishwas, Samskrita-Bharti Publication, New Delhi
2. “Teach Yourself Sanskrit” Prathama Deeksha-Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
3. “India’s Glorious Scientific Tradition” Suresh Soni, Ocean books (P) Ltd., New Delhi.

Course Output

Students will be able to

1. Understanding basic Sanskrit language
2. Ancient Sanskrit literature about science & technology can be understood
3. Being a logical language will help to develop logic in students



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AUDIT 1 and 2: VALUE EDUCATION

Course Objectives

Students will be able to

1. Understand value of education and self- development
2. Imbibe good values in students
3. Let the should know about the importance of character

Syllabus

Unit	Content	Hours
1	<ul style="list-style-type: none">• Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism.• Moral and non- moral valuation. Standards and principles.• Value judgements	4
2	<ul style="list-style-type: none">• Importance of cultivation of values.• Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness.• Honesty, Humanity. Power of faith, National Unity.• Patriotism. Love for nature ,Discipline	6
3	<ul style="list-style-type: none">• Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline.• Punctuality, Love and Kindness.• Avoid fault Thinking.• Free from anger, Dignity of labour.• Universal brotherhood and religious tolerance.• True friendship.• Happiness Vs suffering, love for truth.• Aware of self-destructive habits.• Association and Cooperation.• Doing best for saving nature	6
4	<ul style="list-style-type: none">• Character and Competence –Holy books vs Blind faith.• Self-management and Good health.• Science of reincarnation.• Equality, Nonviolence ,Humility, Role of Women.• All religions and same message.• Mind your Mind, Self-control.• Honesty, Studying effectively	6

Suggested reading

1 Chakroborty, S.K. “Values and Ethics for organizations Theory and practice”, Oxford University Press, New Delhi

Course outcomes

- Students will be able to
1. Knowledge of self-development
 2. Learn the importance of Human values
 3. Developing the overall personality



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AUDIT 1 and 2: CONSTITUTION OF INDIA

Course Objectives:

Students will be able to:

1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

Syllabus

Units	Content	Hours
1	History of Making of the Indian Constitution: History Drafting Committee, (Composition & Working)	4
2	Philosophy of the Indian Constitution: Preamble Salient Features	4
3	Contours of Constitutional Rights & Duties: Fundamental Rights Right to Equality Right to Freedom Right against Exploitation Right to Freedom of Religion Cultural and Educational Rights Right to Constitutional Remedies Directive Principles of State Policy Fundamental Duties.	4
4	Organs of Governance: Parliament Composition Qualifications and Disqualifications Powers and Functions Executive President Governor Council of Ministers Judiciary, Appointment and Transfer of Judges, Qualifications Powers and Functions	4



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5	Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CE of Municipal Corporation. Pachayati raj: Introduction, PRI: ZilaPachayat. Elected officials and their roles, CEO ZilaPachayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy	O 4
6	Election Commission: Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.	4

Suggested reading

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

Course Outcomes:

Students will be able to:

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
4. Discuss the passage of the Hindu Code Bill of 1956.



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AUDIT 1 and 2: PEDAGOGY STUDIES

Course Objectives:

Students will be able to:

4. Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
5. Identify critical evidence gaps to guide the development.

Syllabus

Units	Content	Hours
1	Introduction and Methodology: <ul style="list-style-type: none">• Aims and rationale, Policy background, Conceptual framework and terminology• Theories of learning, Curriculum, Teacher education.• Conceptual framework, Research questions.• Overview of methodology and Searching.	4
2	<ul style="list-style-type: none">• Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries.• Curriculum, Teacher education.	2
3	<ul style="list-style-type: none">• Evidence on the effectiveness of pedagogical practices• Methodology for the in depth stage: quality assessment of included studies.• How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?• Theory of change.• Strength and nature of the body of evidence for effective pedagogical practices.• Pedagogic theory and pedagogical approaches.• Teachers' attitudes and beliefs and Pedagogic strategies.	4
4	<ul style="list-style-type: none">• Professional development: alignment with classroom practices and follow-up support• Peer support• Support from the head teacher and the community.• Curriculum and assessment• Barriers to learning: limited resources and large class sizes	4
5	Research gaps and future directions <ul style="list-style-type: none">• Research design• Contexts• Pedagogy• Teacher education• Curriculum and assessment• Dissemination and research impact.	2



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Suggested reading

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, *Compare*, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, *Journal of Curriculum Studies*, 36 (3): 361-379.
3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? *International Journal Educational Development*, 33 (3): 272–282.
5. Alexander RJ (2001) *Culture and pedagogy: International comparisons in primary education*. Oxford and Boston: Blackwell.
6. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.
www.pratham.org/images/resource%20working%20paper%202.pdf.

Course Outcomes:

Students will be able to understand:

1. What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?
2. What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
3. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

AUDIT 1 and 2: STRESS MANAGEMENT BY YOGA

Course Objectives

1. To achieve overall health of body and mind
2. To overcome stress

Syllabus

Unit	Content	Hours
1	<ul style="list-style-type: none">• Definitions of Eight parts of yog. (Ashtanga)	8
2	Yam and Niyam. Do`s and Don`t`s in life. i) Ahinsa, satya, astheya, bramhacharya and aparigraha ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan	8
3	<ul style="list-style-type: none">• Asan and Pranayam1. Various yog poses and their benefits for mind & body2. Regularization of breathing techniques and its effects-Types of pranayam	8

Suggested reading

1. ‘Yogic Asanas for Group Training-Part-I’ : Janardan Swami YogabhyasiMandal, Nagpur
2. “Rajayoga or conquering the Internal Nature” by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata

Course Outcomes:

Students will be able to:

1. Develop healthy mind in a healthy body thus improving social health also
2. Improve efficiency



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

AUDIT 1 and 2: PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS

Course Objectives

1. To learn to achieve the highest goal happily
2. To become a person with stable mind, pleasing personality and determination
3. To awaken wisdom in students

Syllabus

Unit	Content	Hours
1	Neetisatakam-Holistic development of personality <ul style="list-style-type: none">• Verses- 19,20,21,22 (wisdom)• Verses- 29,31,32 (pride & heroism)• Verses- 26,28,63,65 (virtue)• Verses- 52,53,59 (dont's)• Verses- 71,73,75,78 (do's)	8
2	<ul style="list-style-type: none">• Approach to day to day work and duties.• Shrimad Bhagwad Geeta : Chapter 2-Verses 41, 47,48,• Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35,• Chapter 18-Verses 45, 46, 48.	8
3	<ul style="list-style-type: none">• Statements of basic knowledge.• Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68• Chapter 12 -Verses 13, 14, 15, 16,17, 18• Personality of Role model. Shrimad Bhagwad Geeta: Chapter2-Verses 17, Chapter 3-Verses 36,37,42,• Chapter 4-Verses 18, 38,39• Chapter18 – Verses 37,38,63	8

Suggested reading

1. “Srimad Bhagavad Gita” by Swami Swarupananda Advaita Ashram (Publication Department), Kolkata
2. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.

Course Outcomes

Students will be able to

1. Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
2. The person who has studied Geeta will lead the nation and mankind to peace and prosperity
3. Study of Neetishatakam will help in developing versatile personality of students

ACADEMIC REGULATIONS

MASTER OF BUSINESS ADMINISTRATION

(Applicable for the batch admitted from 2019-20)



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY:
KAKINADA
KAKINADA-533003, Andhra Pradesh (India)**

ACADEMIC REGULATIONS

Applicable for the students of MBA from the Academic Year 2019-20.

1. Duration of the Program

The duration of the program is two academic years consisting of four semesters. However, a student is permitted to complete the course work of MBA program in the stipulated time frame of **FOUR** years from the date of joining.

2. Minimum Instruction Days

Each semester consists of a minimum of ninety instruction days.

3. Program Credits

MBA program is designed to have a total of 104 credits and the student shall have to complete the two year course work and earn all 104 credits for the award of MBA Degree.

4. Attendance Regulations

A student shall be eligible to write University examinations if he acquires a minimum of 75% of attendance in aggregate of all the subjects/courses, and with minimum 50% in each and every course including practicals.

- 4.1 Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester shall be granted by the College Academic Committee.
- 4.2 Shortage of Attendance **below** 65% in aggregate shall not be condoned and not eligible to write their end semester examination of that class.
- 4.3 Students whose shortage of attendance is not condoned in any semester are not eligible to write their end semester examination of that class.
- 4.4 A prescribed fee shall be payable towards condonation of shortage of attendance.
- 4.5 A student shall not be promoted to the next semester unless, he satisfies the attendance requirement of the present semester, as applicable. They may seek re-admission into that semester when offered next. If any candidate fulfills the attendance requirement in the present semester, he shall not be eligible for re-admission into the same class.

5. Examinations and Scheme of Evaluation

Theory Courses

Each theory course shall be evaluated for a total of 100 marks, consisting of 25 marks for internal assessment and 75 marks for end semester examination.

Internal Assessment

- i) 25 marks for internal assessment, 10 marks are for seminar / presentation and 15 marks are based on **average** of two mid-term examinations.
- ii) 10 marks for presentation (5 marks are for report content and 5 marks are for presentation).
- iii) Each mid-term examination is conducted for 15 marks with one and half hours (90mins) duration. Each mid-term examination consists of three questions, each for 5 marks. All the questions need to be answered.
- iv) The final marks are the sum of average of two mid-term examinations for 15 marks and 10 Marks for presentation.

External Assessment

The semester end examination shall be conducted for a duration of three hours with 5 questions and one case study which is compulsory. All questions are to be answered and for each question has “**either or**” option except case study. All 5 questions carries 12 marks each and case study carries 15 marks, total becomes 75 marks.

Laboratory Course

- i) For practical subjects the distribution shall be 20 marks for Internal Evaluation and 30 marks for the end semester examinations. There shall be continuous evaluation by the internal subject teacher during the semester for 20 internal marks. Out of 20 marks for internal, 10 marks shall be for day-to-day performance (5 marks for day-to-day evaluation and 5 marks for Record) and 10marks shall be evaluated by conducting an internal test conducted at the end of semester.

- ii) End semester laboratory examination shall be conducted for 30 marks with two Examiners, one of them being the Laboratory Class Teacher or teacher of the respective college and the second examiner shall be appointed by the University from the panel of examiners submitted by the respective college, with a break-up marks of Procedure-5, Experimentation-15, Results-5, Viva-voce-5.

Comprehensive Viva-Voce

Comprehensive Viva-Voce examination is conducted in all the subjects of four semesters of the course for 50 marks (internal evaluation only) at the end of fourth semester by a committee consisting of **two** senior faculty members of the department along with HOD.

Project Work

- i) The final project work shall be carried out during the 3rd semester and will be evaluated for 100 marks.
- ii) Out of 100 marks, 50 marks shall be for dissertation and 50 marks for the project Viva-Voce. Both are evaluated by the Board of Evaluators (BOE). BOE, which comprises of External Examiner appointed/nominated by the University, Head of the Department and Internal project guide.
- iii) Each student shall give one internal seminar (pre talk) on the topic of his/her project as a prerequisite for submission of the final project report. He needs to submit plagiarism report (not exceeding 30% similarity) along with the guide certificate in the final project report.

(a) Eligibility for Award of MBA Degree

A student will be declared eligible for the award of the MBA Degree if he fulfills the following academic regulations.

- (b) Pursued a course of study for not less than two academic years and not more than four academic years.
- (c) Registered for **104** credits and secured **104** credits.
- (d) Students, who fail to complete their Two years Course of study within Four years or fail to acquire the **104** Credits for the award of the degree within four academic years from the year of their

admission shall **forfeit** their seat in MBA course and their admission shall stands cancelled.

6. Criteria for Passing a Course and Award of Grades

A) Criteria for Passing a Course

- i) A candidate shall be deemed to have secured the minimum academic requirement in a subject if he secures a minimum of 40% of marks in the End semester Examination and a minimum aggregate of 50% of the total marks in the End Semester Examination and Internal Evaluation taken together.
- ii) A candidate shall be declared to have passed in comprehensive viva-voce, if he secures a minimum of 50% marks.
- iii) In case the candidate does not secure the minimum academic requirement in any subject (as specified in i & ii above) he has to re-appear for the End semester Examination in that subject. A candidate shall be given **one** chance to re-register for each subject provided the internal marks secured by a candidate **are less than 50% and has failed in the end examination.** In such a case, the candidate must re-register for the subject(s) and secure the required minimum attendance. The candidate's attendance in the re-registered subject(s) shall be calculated separately to decide upon his eligibility for writing the end examination in those subject(s). In the event of the student taking another chance, his internal marks and end examination marks obtained in the previous attempt shall **stands cancelled.** For re-registration the candidates have to apply to the University through the college by paying the requisite fees and get approval from the University before the start of the semester in which the re-registration is required.

B) Method of Awarding Letter Grade and Grade Points for a Course

A letter grade and grade points will be awarded to a student in each course based on his performance as per the grading system given below.

7. Cumulative Grade Point Average (CGPA)

Marks Range Theory / Project Work (Max – 100)	Marks Range Laboratory/ Comprehensive Viva- Voce (Max – 50)	Letter Grade	Level	Grade Point
≥ 90	≥ 45	O	Outstanding	10
≥80 to <90	≥40 to <45	S	Excellent	9
≥70 to <80	≥35 to <40	A	Very Good	8
≥60 to <70	≥30 to <35	B	Good	7
≥50 to <60	≥25 to <30	C	Fair	6
≥40 to <50	≥20 to <25	D	Satisfactory	5
<40	<20	F	Fail	0
			Absent	0

8. Computation of SGPA

- The following procedure is to be adopted to compute the Semester Grade Point Average(SGPA) and Cumulative Grade Point Average(CGPA):
- The **SGPA** is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e
- $SGPA (S_i) = \frac{\sum (C_i \times G_i)}{\sum C_i}$
- Where C_i is the number of credits of the i th course and G_i is the grade point scored by the student in the i th course.

Computation of CGPA

- The **CGPA** is also calculated in the same manner taking into account all the courses undergone by a student over all the semester of a Programme, i.e.
- $CGPA = \frac{\sum (C_i \times S_i)}{\sum C_i}$
- Where S_i is the SGPA of the i^{th} semester and C_i is the total number of credits in that semester.
- The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.
- Equivalent Percentage = $(CGPA - 0.75) \times 10$

9. AWARD OF DEGREE AND CLASS

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of M. Tech. Degree he shall be placed in one of the following four classes:

Class Awarded	CGPA to be secured	
First Class with Distinction	≥ 7.75	From the CGPA secured from 68 Credits.
First Class	≥ 6.75	
Second Class	≥ 5.75 to < 6.75	
Pass Class	≥ 4.75 to < 5.75	

The Grades secured, Grade points and Credits obtained will be shown separately in the memorandum of marks.

1. WITHHOLDING OF RESULTS

If the student is involved in indiscipline/malpractices/court cases, the result of the student will be withheld.

2. **Supplementary Examinations**

i) Supplementary examinations will be conducted twice in a year at the end of odd and even semesters as per the University norms & Regulations.

ii) **Advanced Supplementary Examinations:**

Candidate(s), who failed in theory / comprehensive Viva-Voce / project work courses in 4th semester can appear for advanced supplementary examination may be conducted as per the University norms & Regulations.

3. **Revaluation**

As per the norms of the University.

10. TRANSITORY REGULATIONS (for R19)

- 10.1 Discontinued or detained candidates are eligible for re-admission into same or equivalent subjects at a time as and when offered.
- 10.2 The candidate who fails in any subject will be given two chances to pass the same subject; otherwise, he has to identify an equivalent subject as per R16 academic regulations.

11. GENERAL

- 11.1 Wherever the words “he”, “him”, “his”, occur in the regulations, they include “she”, “her”, “hers”.
- 11.2 The academic regulation should be read as a whole for the purpose of any interpretation.
- 11.3 In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.
- 11.4 The University may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the University.

**MALPRACTICES RULES
DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN
EXAMINATIONS**

	Nature of Malpractices/Improper conduct	Punishment
	<i>If the candidate:</i>	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators,	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate

	<p>palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.</p>	<p>has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year.</p> <p>The Hall Ticket of the candidate is to be cancelled and sent to the University.</p>
3.	<p>Impersonates any other candidate in connection with the examination.</p>	<p>The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.</p>

4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats.

<p>person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.</p>	<p>In case of outsiders, they will be handed over to the police and a police case is registered against them.</p>
<p>7. Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.</p>	<p>Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The</p>

		candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.

10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action to award suitable punishment.	

Malpractices identified by squad or special invigilators

1. Punishments to the candidates as per the above guidelines.
2. Punishment for institutions : (if the squad reports that the college is also involved in encouraging malpractices)
 - (i) A show cause notice shall be issued to the college.
 - (ii) Impose a suitable fine on the college.
 - (iii) Shifting the examination centre from the college to another college for a specific period of not less than one Year



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

MASTER OF BUSINESS ADMINISTRATION (MBA)
COURSE STRUCTURE & SYLLABUS
(Applicable for batches admitted from 2019-2020)



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

I YEAR I SEMESTER							
S.No	Course Code	Courses	Marks	L	T	P	C
1	C-101	Management and Organizational Behavior	100	4	0	0	4
2	C-102	Managerial Economics	100	4	0	0	4
3	C-103	Accounting for Managers	100	4	0	0	4
4	C-104	Quantitative Analysis for Business Decisions	100	4	0	0	4
5	C-105	Legal and Business Environment	100	4	0	0	4
6	C-106	Business Communication and Soft skills	100	4	0	0	4
7	C-107 Open Elective	Cross Cultural Management Rural Innovation projects MOOCs : SWAYAM/NPTEL- Related to Management Courses other than listed courses in the syllabus	100	4	0	0	4
8	C-108	Business Communication and Soft skills Lab	50	0	0	2	2
9	C-109	Information Technology – Lab1(Spreadsheet and Tally)	50	0	0	2	2
Total			800	28	0	4	32

I YEAR II SEMESTER							
S.No	Course Code	Courses	Marks	L	T	P	C
1	C-201	Financial Management	100	4	0	0	4
2	C-202	Human Resource Management	100	4	0	0	4
3	C-203	Marketing Management	100	4	0	0	4
4	C-204	Operations Management	100	4	0	0	4
5	C-205	Business Research Methods	100	4	0	0	4
6	C-206 open elective	Project Management Technology Management Lean Management Database Management System	100	4	0	0	4
7	C-207	IT-lab 2(Programming R)	50	0	0	2	2
Total			650	24	0	2	26



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

II YEAR III SEMESTER							
S.No	Course Code	Courses	Marks	L	T	P	C
1	C-301	Strategic Management	100	4	0	0	4
2	C -302	Operations Research	100	4	0	0	4
3	E -301	Elective – 1	100	4	0	0	3
4	E-302	Elective – 2	100	4	0	0	3
5	E-303	Elective – 3	100	4	0	0	3
6	E-304	Elective – 4	100	4	0	0	3
7	C-304	Industrial Project based on Summer Internship	150	4	0	0	4
Total			750	28	0	0	24

II YEAR IV SEMESTER							
S.No	Course Code	Courses	Marks	L	T	P	C
1	C -401	Supply Chain Management and Analytics	100	4	0	0	4
2	C-402	Innovation and Entrepreneurship	100	4	0	0	4
3	E-401	Elective – 5	100	4	0	0	3
4	E-402	Elective – 6	100	4	0	0	3
5	E-403	Elective – 7	100	4	0	0	3
6	E-404	Elective – 8	100	4	0	0	3
7	C-403	Comprehensive Viva- voce	50	0	0	0	2
Total Marks / Credits			650	28	0	0	22
			2800				102

*The project work documentation shall be checked with anti plagiarism software (Turnitin). The permissible similarity shall be less than 30%.

*Comprehensive Viva is to verify the student knowledge as a whole from which he was studied during the two year course work.

III SEMESTER
Human Resource Management

S. no	Course Code	SUBJECT TITLE
1	EH-301	Leadership and Change Management
2	EH-302	Performance Evaluation and Compensation Management
3	EH-303	Human Resource Metrics and Analytics
4	EH-304	Human Capital Management
5	EH-305	Manpower Planning, Recruitment, and Selection

IV SEMESTER
Human Resource Management

S. no	Course Code	SUBJECT TITLE
6	EH-401	Labor Welfare and employment laws
7	EH-402	International HRM
8	EH-403	Employee Relations and Engagement
9	EH-404	Human Resources Development
10	EH-405	Strategic HRM

III SEMESTER
FINANCE

S. no	Course Code	SUBJECT TITLE
1	EF-301	Investment Analysis and Portfolio Management
2	EF-302	Managing Banks and Financial Institutions
3	EF-303	Financial Markets and Services
4	EF-304	Mergers, Acquisitions and Corporate Restructuring
5	EF-305	Taxation

IV SEMESTER
FINANCE

S. no	Course Code	SUBJECT TITLE
6	EF-401	Financial Derivatives
7	EF-402	Global Financial Management
8	EF-403	Financial Risk Management
9	EF-404	Strategic Financial Management
10	EF-405	Behavioral Finance

III SEMESTER MARKETING

S. no	Course Code	SUBJECT TITLE
1	EM-301	Consumer Behavior
2	EM-302	Retail Management
3	EM-303	Customer Relationship Management
4	EM-304	Strategic Marketing Management
5	EM-305	Digital and Social Media Marketing

IV SEMESTER MARKETING

S. no	Course Code	SUBJECT TITLE
6	EM-401	Services Marketing
7	EM-402	Promotional and Distribution Management
8	EM-403	Green Marketing
9	EM-404	Advertising and Brand Management
10	EM-405	Global Marketing Management

III SEMESTER SYSTEMS

S. no	Course Code	SUBJECT TITLE
1	ES-301	Data Mining for Business Decisions
2	ES-302	Managing Software Projects
3	ES-303	Web Designing
4	ES-304	Business Analytics
5	ES-305	Managing Digital Innovation and Transformation

IV SEMESTER SYSTEMS

S. no	Course Code	SUBJECT TITLE
6	ES-401	Big Data Analytics
7	ES-402	Enterprise Resource Planning
8	ES-403	Cyber Laws & Security
9	ES-404	Information Systems Audit
10	ES-405	Artificial Intelligence and Machine Learning

OPERATIONS MANAGEMENT

III SEMESTER

S. no	Course Code	SUBJECT TITLE
1	EO-301	Service Operations Management
2	EO-302	Quality Toolkit for Managers
3	EO-303	Pricing and Revenue Management
4	EO-304	Operations Strategy
5	EO-305	Sales and Operations Planning

IV SEMESTER

S. no	Course Code	SUBJECT TITLE
6	EO-401	Behavioral Operations Management
7	EO-402	Theory of Constraints
8	EO-403	Management of Manufacturing Systems
9	EO-404	Sourcing Management
10	EO-405	Supply Chain Analytics

TRAVEL AND TOURISM MANAGEMENT

III SEMESTER

S. no	Course Code	SUBJECT TITLE
1	ET-301	Travel agency and Tour Operations
2	ET-302	Hospitality Management
3	ET-303	Resort Planning and Destination Management
4	ET-304	Tourism Policy and Planning
5	ET-305	Recreation Management

IV SEMESTER

S. no	Course Code	SUBJECT TITLE
6	ET-401	Travel Media and Journalism
7	ET-402	Event Management
8	ET-403	Front Office Management
9	ET-404	Information Technology and Tourism
10	ET-405	Eco Tourism Practices

HEALTH CARE AND HOSPITAL MANAGEMENT

III SEMESTER

S. no	Course Code	SUBJECT TITLE
1	EHC-301	Hospital organization and Management
2	EHC-302	Health Care Policies and Delivery Systems
3	EHC-303	Health Economics
4	EHC-304	Hospital Functions and Support Services
5	EHC-305	Revenue Cycle Management

IV SEMESTER

S. no	Course Code	SUBJECT TITLE
6	EHC-401	Patient Care & Services Management
7	EHC-402	Managed Health Care and Insurance
8	EHC-403	Health Laws, Ethics and Regulations
9	EHC-404	Hospital Management Information System
10	EHC-405	Health Analytics

ENTREPRENEURSHIP AND SMALL ENTERPRISE MANAGEMENT

III SEMESTER

S. no	Course Code	SUBJECT TITLE
1	EE-301	Indian Models in Entrepreneurship
2	EE-302	Social Entrepreneurship
3	EE-303	Business Plan Preparation for Small Business
4	EE-304	Entrepreneurial Marketing
5	EE-305	Planning, Structuring, and Financing Small Business

IV SEMESTER

S. no	Course Code	SUBJECT TITLE
6	EE-401	Marketing for Small Business
7	EE-402	Finance and Accounting for Small Business
8	EE-403	Technology Appreciation and Intellectual Property Rights
9	EE-404	Innovation Technology Management
10	EE-405	Venture Valuation and Accounting

AGRO-BUSINESS MANAGEMENT

III SEMESTER

S. no	Course Code	SUBJECT TITLE
1	EA-301	Agro-Marketing Management
2	EA-302	Agro-Business and Rural Green Market
3	EA-303	Agro-Business Environment
4	EA-304	Agro-Supply Chain Management
5	EA-305	Entrepreneurship for Agriculture

IV SEMESTER

S. no	Course Code	SUBJECT TITLE
6	EA-401	Food Processing Management
7	EA-402	Disaster Management
8	EA-403	Food Retail Management
9	EA-404	Agro- Technology Management
10	EA-405	Organic Food Technology

LOGISTICS AND SUPPLY CHAIN MANAGEMENT
III SEMESTER

S. no	Course Code	SUBJECT TITLE
1	EL-301	Store keeping and Warehousing management
2	EL-302	Transportation and Infrastructure Management for SCM
3	EL-303	Purchasing and Material Management
4	EL-304	Reverse Logistics
5	EL-305	Supply Chain Risk Management

IV SEMESTER

S. no	Course Code	SUBJECT TITLE
6	EL-401	Enterprise Resource Planning
7	EL-402	International Logistics Management
8	EL-403	Lean Supply Chain Management
9	EL-404	Shipping and Maritime law
10	EL-405	Green Supply Chain Management

BUSINESS ANALYTICS

III SEMESTER

S. no	Course Code	SUBJECT TITLE
1	EB-301	Essentials of Business Analytics
2	EB-302	Text, Social Media& Web Analytics
3	EB-303	Predictive Analytics
4	EB-304	Big Data Analytics
5	EB-305	Marketing Analytics

IV SEMESTER

S. no	Course Code	SUBJECT TITLE
6	EB-401	Financial Analytics
7	EB-402	HR Analytics
8	EB-403	Econometrics and Business Forecasting
9	EB-404	Data Warehousing and OLAP
10	EB-405	Data Mining& Machine learning

I YEAR I SEMESTER

C-101	Management and Organizational Behavior	100	4	0	0	4
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Objective:

Objective of the course is to give a basic perspective of Management. This will form foundation to study other functional areas of management and to provide the students with the conceptual framework and the theories underlying Organizational Behaviour.

Unit – I

Definition, Nature, Functions and Importance of Management – Evolution of Management thought – Scientific management, administrative management, Hawthorne experiments – systems approach - Levels of Management - Managerial Skills - Planning – Steps in Planning Process – importance and Limitations – Types of Plans - Characteristics of a sound Plan - Management By Objectives (MBO) - Techniques and Processes of Decision Making - Social Responsibilities of Business

Unit-II

Organizing – Principles of organizing – Organization Structure and Design – Types of power - Delegation of Authority and factors affecting delegation – Span of control – Decentralization – Line and staff structure conflicts - Coordination definition and principles - Emerging Trends in Corporate Structure – Formal and Informal Organization- Nature and importance of Controlling, process of Controlling, Requirements of effective control and controlling techniques.

Unit – III

Organizational behavior: Nature and scope – Linkages with other social sciences – Individual roles and organizational goals – perspectives of human behavior - Perception– perceptual process – Learning - Learning Process- Theories - Personality and Individual Differences - Determinants of Personality - Values, Attitudes and Beliefs - Creativity and Creative thinking.

Unit – IV

Motivation and Job Performance – Content and process Theories of Motivation - Leadership - Styles - Approaches – Challenges of leaders in globalized era – Groups – stages formation of groups – Group Dynamics - Collaborative Processes in Work Groups - Johari Window-Transactional Analysis.

Unit – V:

Organizational conflict-causes and consequences-conflict and Negotiation Team Building, Conflict Resolution in Groups and problem solving Techniques – Organizational change - change process - resistance to change - Creating an Ethical Organization.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

1. Harold Koontz, Heinz Weihrich, A.R.Aryasri, Principles of Management, TMH, 2010.
2. Dilip Kumar Battacharya, Principles of Management, Pearson, 2012.
3. Kumar, Rao, Chhaalil “Introduction to Management Science” Cengage Publications, New Delhi
4. V.S.P.Rao, Management Text and Cases, Excel, Second Edition, 2012.
5. K.Anbuvelan, Principles of Management, University Science Press, 2013.
6. K.Aswhathappa “ Organizational Behaviour-Text, Cases and Games”, Himalaya Publishing House, New Delhi, 2008.
7. Steven L Mc Shane, Mary Ann Von Glinow, Radha R Sharma: “Organizational Behaviour”, TMH Education, New Delhi, 2008

C-102	Managerial Economics	100	4	0	0	4
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Objective: This subject seeks to equip the students with the analytical tools of Economics and apply the same to rational managerial decision-making. It further seeks to develop economic way of thinking in dealing with practical business problems and challenge.

UNIT-I:

Introduction to Managerial Economics: Nature and Scope- Fundamental Concepts: Incremental reasoning, Concept of Time Perspective, Discounting Principle, Opportunity Cost Principle, Equi -Marginal Concept,-Theory of Firm.

UNIT-II:

Demand Analysis and Forecasting: Concepts of Demand, Supply, Determinants of Demand and Supply, Elasticities of Demand and Supply- Methods of demand forecasting for established and new products.

UNIT-III:

Cost and Production Analysis: Cost: Concept and types, Cost-Output Relationships, Cost Estimation, Reduction and Control- Economies and Diseconomies of Scale- Law of Variable Proportions- Returns to Scale- Isoquants-Cobb-Douglas and CES Production functions.

UNIT-IV:

Theory of Pricing: Price determination under Perfect Competition, Monopoly, Oligopoly and Monopolistic Competitions- Methods of Pricing- Game Theory basics- Dominant Strategy-Nash Equilibrium and Prisoner's Dilemma.

UNIT-V:

Macro Economics and Business: Concept, Nature and Measurement of National Income- Inflation and Deflation: Inflation - Meaning and Kinds, Types, Causes and measurement of inflation Measures to Control Inflation, Deflation- - Philips curve- Stagflation-Theory of Employment- Business cycles: Policies to counter Business Cycles.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

1. D.M.Mithani, Managerial Economics, Himalaya Publishing House
2. H.Craig Peterson, W.Cris Lewis, Managerial Economics, Pearson, 2005.
3. Gupta G.S., Managerial Economics, TMH, 1988.
4. P.L. Mehta, Managerial Economics, PHI, 2001.
5. K .K Dawett, Modern Economic Theory, Sultan Chand & Sons.
6. D.N. Dwivedi, Managerial Economics, 7th Ed, Vikas Publishing.
7. Rangarajan and Dholkia, Macroeconomics, TMH.

C-103	Accounting for Managers	100	4	0	0	4
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Objective:

The objective of this course is to acquaint the students regarding various accounting concepts and its application in managerial decision making.

Unit – I:

Financial Accounting- concept, Importance and scope, accounting principles, accounting cycle, journal ledger, trial balance, Preparation of final accounts with adjustments.

Unit – II:

Analysis and interpretation of financial statements – meaning, importance and techniques, ratio analysis, Fund flow analysis, cash flow analysis (AS - 3).

Unit – III:

Cost accounting–meaning, importance, methods, techniques; classification of costs and cost sheet; Inventory valuation methods- LIFO, FIFO, HIFO and weighted average method, an elementary knowledge of activity based costing.

Unit – IV:

Management accounting – concept, need, importance and scope; budgetary control-meaning, need, objectives, essentials of budgeting, different types of budgets and their preparation.

Unit-V:

Standard costing and variance analysis (materials, labour)-Marginal costing and its application in managerial decision making, Break Even Analysis.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

1. MAHESWARI AND MAHESWARI" Financial Accounting", Vikas Publishing House, New Delhi, 2013.
2. Pandey, I.M. Management Accounting, Vikas Publishing House, New Delhi.
3. Horngen, Sundem & Stratton, Introduction to Management Accounting, Pearson Education, New Delhi.
4. Hansen & Mowen, Cost Management, Thomson Learning.
5. Mittal, S.N. Management Accounting and Financial management, Shree Mahavir Book Depot, New Delhi.
6. Jain S.P. and Narang K.L. Advanced Cost Accounting, Kalyani Publishers Ludhiana.
7. Khan M.Y. and Jain, P.K. Management Accounting, TMH, N. Delhi.

C-104	Quantitative Analysis for Business Decisions	100	4	0	0	4
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Objective:

Students would be able to acquire an understanding of descriptive statistical tools like measures of central tendency & measures of variation and apply these tools to real life situations.

Unit I

Basic Mathematical & Statistical Techniques: Linear, Quadratic, Logarithmic and Exponential Functions- Permutations and Combinations – Matrices - Elementary operations of matrices.

Unit II

Measures of Central Tendency – Measures of Dispersion – Simple Correlation and Regression Analysis
Concept of Probability- Probability Rules – Joint and Marginal Probability – Baye’s Theorem- Probability Distributions- Binomial, Poisson, Normal and Exponential Probability Distributions.

UNIT III

Introduction to Decision Theory: Steps involved in Decision Making, different environments in which decisions are made, Criteria for Decision Making, Decision making under uncertainty, Decision making under conditions of Risk-Utility as a decision criterion, Decision trees, Graphic displays of the decision making process, Decision making with an active opponent.

Unit-IV

Sampling and Sampling Distributions – Estimation – Point and Interval Estimates of Averages and proportions of small and Large Samples – Concepts of Testing Hypothesis – One Sample Test for Testing Mean and Proportion of Large and Small Samples.

Unit-V

Tests Two Samples – Tests of Difference between Mean and Proportions of Small and Large Samples – Chi-square Test of Independence and Goodness of Fitness- Analysis of Variance.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

1. N.D.Vohra: “Quantitative Techniques in Management”, Tata-McGraw Hill Private Limited, New Delhi, 2011.
2. Gupta S.P: “Statistical Methods”, S. Chand and Sons, New Delhi.
3. Anand Sharma: “Quantitative Techniques for Business decision Making”, Himalaya Publishers, New Delhi, 2012.
4. D P Apte: “Operation Research and Quantitative Techniques”, Excel Publication, New Delhi, 2013.
5. Hamdy, A.Taha: “Operations Research: An Introduction”, Prentice-Hall of India, New Delhi 2003.
6. Anderson: “Quantitative Methods for Business”, Cengage Learning, New Delhi 2013.
7. Sancheti, Dc & VK Kapoor, “Business Mathematics”, S Chand and Sons, New Delhi.

C-105	Legal and Business Environment	100	4	0	0	4
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Objective:

To acquaint students with the issues of Indian business environment in which business has to operate, to relate the impact of environment on business in an integrated manner, and to give an exposure to important commercial and industrial laws.

UNIT-I

Introduction: Concept of Business Environment-Definition-Characteristics-Environmental factors, Importance at national and international level – problems and challenges – Environmental Scanning: Importance, Process of scanning- NITI Aayog: It's Role in Economic Development of India- Technological Environment: Features, Its impact on Business, Restraints on Technological Growth.

UNIT-II

Economic and Political Environment: Concept-Definition of Economic Environment-Economic Systems-Relative merits and demerits of each systems-Economic Policies-Monetary-Fiscal- Industrial policies since independence and their significance – regulatory and promotional framework . Structure of Indian Economy-Nature and significance. Economic Planning- Objectives, Merits, Limitations- Concept and Meaning of Political Environment.

UNIT-III

Legal Environment: - Business Law: Meaning, scope and need for Business Law- Source of Business Law- Indian Contract Act 1872: Its Essentials, Breach of Contract and remedies. Intellectual Property Rights. Negotiable Instruments Act 1881.

UNIT-IV

Company Act 2013: Memorandum and alteration of Articles of Association-Partnership Act 1932: Duties of Partners- Dissolution of Partnership-Information Technology Act 2000: Digital signature-Cyber Frauds.

UNIT-V

Miscellaneous Acts: Sales of Goods Act 1930-Sale- agreement to Sale – Implied Conditions and Warranties- Consumer Protection Act 1986- Competition Act- Environment (Protection) Act 1986- Foreign Exchange Management Act (FEMA).

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

- References: 1. Francis Cherunillam, Business Environment, Himalaya Publishers.
 2. K.Aswathappa, Essentials of Business Environment, Himalaya Publishers.
 3. P.K.Dhar, Indian Economy Growing Dimensions, Kalyani Publishers 4.
 4. N.D.Kapoor , Mercantile Law, Sultan Chand Publishers.
 5. Chaula and Garg, Mercantile Law, Kalyani Publishers

C-106	Business Communication and Soft skills	100	4	0	0	4
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Objective:

To acquaint the students with fundamentals of communication, help them honing oral, written and non-verbal communication skills and to transform them as effective communicators.

Unit – I

Purpose and process of communication: Objectives of Communication-Process of Communication- Types of communication; noise, listening skills, Types of listening, essentials of good listening and tips.

LAB: LISTENING AND SPEAKING SKILLS- Conversational skills (formal and informal) – group discussion. Listening to lectures, discussions, talk shows, news programmes, dialogues from TV/radio/Ted talk/Podcast – watching videos on interesting events on YouTube.(Presenting before the class).

Unit – II

Managing Organizational Communication: Formal and Informal Communication- Interpersonal and Intrapersonal communication- Role of Emotion in Interpersonal Communication- Barriers to Interpersonal Communication- Exchange Theory-Gateways for Effective Interpersonal Communication.

LAB:

Choosing the organization – goal setting - time management — leadership traits – team work – communicating across teams- designing career and life planning.

Unit – III

Non verbal communication and Body Language: Kinesics, Proxemics, Paralanguage, Haptics, handshakes, appropriate body language and mannerisms for interviews: business etiquettes- across different cultures.

LAB: Understanding Body Language Aspects and presenting oneself to an interviewer, Proper handshakes.

Unit – IV

Written communication: mechanics of writing, report writing- business correspondence-business letter format- Meetings and managing meetings- Resume writing-Formats and Skills.

LAB: Writing job applications – cover letter – resume – emails – letters – memos – reports – blogs – writing for publications.

Unit- V

Presentation skills: prerequisites of effective presentation, format of presentation; Assertiveness –strategies of assertive behavior; Communication skills for group discussion and interviews, Interview Techniques.

LAB: Designing presentations and enhancing presentation skills.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

1. Mallika Nawal: “Business Communication”, Cengage Learning, New Delhi, 2012.
2. Edwin A. Gerloff, Jerry C. Wofford, Robert Cummins Organizational Communication: The key stone to managerial effectiveness.
3. Meenakshi Rama: “*Business Communication*”, Oxford University Press, NewDelhi
4. C.S.G. Krishnamacharyulu and Dr. Lalitha Ramakrishnan, Business Communication, Himalaya Publishing House, Mumbai
5. Paul Turner: “*Organisational Communication*”, JAICO Publishing House, New Delhi.
6. SathyaSwaroopDebasish, Bhagaban Das” “*Business Communication*”, PHIPrivate Limited, New Delhi, 2009.
7. R.K.Madhukar: “Business Communication”, Vikas Publishing House, New Delhi, 2012.
8. Kelly M Quintanilla, Shawn T.Wahl:“Business and Professional Communication”, SAGE,New Delhi, 2012.
9. Sangita Mehta, NeetyKaushish: “Business Communication”, University Science Press, New Delhi, 2010.
10. Anjali Ghanekar: “Business Communication Skills”, Everest Publishing House, New Delhi,2011

C-107 Open Elective	Cross Cultural Management	100	4	0	0	4
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Objective:

The objective of this course is to enhance the ability of class members to interact effectively with people from cultures other than their own, specifically in the context of international business. The course is aimed at significantly improving the ability of practicing managers to be effective global managers.

Unit – I

Introduction – Concept of Culture for a Business Context; Brief wrap up of organizational culture & its dimensions; Cultural Background of business stakeholders [managers, employees, shareholders, suppliers, customers and others] – An Analytical framework.

Unit – II

Culture and Global Management – Global Business Scenario and Role of Culture. Framework for Analysis; Elements & Processes of Communication across Cultures; Communication Strategy for/ of an Indian MNC and Foreign MNC & High-Performance Winning Teams and Cultures; Culture Implications for Team Building.

Unit – III

Cross Culture – Negotiation & Decision Making – Process of Negotiation and Needed Skills & Knowledge Base – Overview with two illustrations from multicultural contexts [India – Europe/ India – US settings, for instance]; International and Global Business Operations- Strategy Formulation & Implementation; Aligning Strategy, Structure & Culture in an organizational Context.

Unit – IV

Global Human Resources Management – Staffing and Training for Global Operations – Expatriate – Developing a Global Management Cadre.. Motivating and Leading; Developing the values and behaviours necessary to build high-performance organization personnel [individuals and teams included] – Retention strategies.

Unit – V

Corporate Culture – The Nature of Organizational Cultures Diagnosing the As is Condition; Designing the Strategy for a Culture Change Building; Successful Implementation of Culture Change Phase; Measurement of ongoing Improvement.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

1. Cashby Franklin, Revitalize your corporate culture: PHI, Delhi
2. Deresky Helen, International Management: Managing Across Borders and Cultures, PHI, Delhi
3. Esenn Drlarry, Rchildress John, The Secret of a Winning Culture: PHI, Delhi

C-107 Open Elective	Rural Innovation projects	100	4	0	0	4
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Objective:

To make the students understand various natural resources and their importance in rural development.

Unit-I

Definition and meaning of Resources, Types of Rural Resources, Natural and Man-made, Characteristics of Resources, Importance of different resources in Rural Development. Rural Governance and Administration in India- Pre & Post independence- Elements of Indian constitution Constitutional amendment to Panchayati Raj system- Development (Department) Administration in Rural India.

Unit-II

Land Resources development experience: Classification of land based on utility, Soils – Structure and importance, Properties of Soil- Physical and Chemical, Soil Conservation- methods and importance. Status of Rural Development in the SAARC countries.

Unit-III

Human Resources Dimensions of Rural Development-Quantitative aspects of rural human resource (Gender & Age wide classification, Density, Issue in rural human resources- Scarcity, lack of skill, attitude, and social status). Food security and public distribution system-Rural Financial Sector –Sources of Rural Credit: Institutional and Non Institutional - Service Delivery System in Rural areas, Rural Infrastructural Sector and Millennium Development Goals Housing in Rural Areas.

Unit-IV

Approaches of Rural Development in India- institutional, technological, area and target group, participatory, individualistic. Rural Development Policies during different plan periods. Strategies of Rural Development – growth oriented strategy, Welfare strategy, Responsive strategy, Holistic strategy, right-based strategy. PURA Model.

Unit-V

Review of Rural Development Programmes in the area of agricultural sector – crop, non- crop, livestock, fishery, forestry. Review of Rural Development Programmes in area of Social Sectors – Health, Sanitation and Education. Project Planning and Management.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

1. Rural Development: Principles, Policies and Management, Katar Singh, Sage Publications India Pvt. Ltd., 2009.
2. Soil & Water Conservation & Watershed Management Hardcover – 2012, Singh PK Mahnot

C-107 Open Elective	MOOCs : SWAYAM/NPTEL- Related to Management Courses other than listed courses in the syllabus	100	4	0	0	4
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NOTE: Students opting for SWAYAM should register for 12 weeks course and need to produce the Pass certificate with minimum 40% (Percentage) for receiving the Academic Credits. The actual percentage mentioned on the certificate will be transferred to the marks memo.

C-108	Business Communication and Soft skills Lab	50	0	0	2	2
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(LAB):

Evaluation Process:

- i) For practical (LAB) subject the distribution shall be **20 marks** for internal evaluation and **30 marks** for the semester end examinations. There shall be continuous evaluation by the internal subject teacher during the semester for **20** internal marks. Out of the **20 marks internal, 10** marks shall be for day-to-day performance (**5 marks for day-to-day evaluation and 5 marks for Record**) and **10 marks** shall be evaluated by conducting an internal test towards the end of semester.
- ii) Semester End examination shall be conducted by the teacher concerned and external examiner for **30 marks. Three QUESTIONS will be given in the external examination from the activities listed in each unit. Each question carries 10 marks. Duration of the examination is 90 minutes.**

Unit: 1

Listening and speaking skills- Conversational skills (formal and informal) – group discussion. Listening to lectures, discussions, talk shows, news programmes, dialogues from TV/radio/Ted talk/Podcast – watching videos on interesting events on YouTube. (Presenting before the class).

Activities for Unit-1:

- 1) Dos and Don'ts of Group Discussions.
- 2) Tell me about yourself.
- 3) Self SWOT Analysis
- 4) Analysis of Academic Video clip uploaded on the system for the student.
- 5) News Presentation- Current affairs.

Unit – II

Organizational Communication:

Choosing the organization – goal setting - Time management — leadership traits – Team work – communicating across teams- designing career and life planning.

Activities for Unit-II:

- 1) Individual goal setting – process / SMART goals.
- 2) Designing a team activity to be conducted in the class.
- 3) Preparing a schedule plan for conducting an event (with proper time management).
- 4) Designing a self career plan.
- 5) Prepare a time management chart for your daily schedule. (Prioritization)

Unit – III

Non verbal communication and Body Language:

Understanding Body Language Aspects and presenting oneself to an interviewer, Proper handshakes.

Activities for Unit-III:

- 1) Maintaining the body language for interviews.
- 2) Presenting oneself to an interviewer.
- 3) Importance of kinesics in an interview.
- 4) Role plays on cross cultural communication.

Unit – IV

Written communication:

Writing job applications – cover letter – resume – emails – letters – memos – reports – blogs – writing for publications.

Activities for Unit-IV:

- 1) Preparation of effective Resume.
- 2) Write dialogues for the following situation: Mr. A calls a Hotel in Shimla to make a reservation for four people.
- 3) Write dialogues for the following situation: Mr.K gives direction to his friend how to reach the JNTUK University.
- 4) Write a covering letter for job application in TCS.
- 5) Write at least 5 E-mail etiquette.

Unit- V

Presentation skills:

Designing presentations and enhancing presentation skills.

Activities for Unit-V:

- 1) Prepare a PowerPoint presentation on presentation skills.
- 2) How to make an effective presentation.
- 3) Prepare and present a PPT on any topic given by the examiner.

References:

- 1.Mallika Nawal: "Business Communication", Cengage Learning, New Delhi, 2012.
- 2.Edwin A. Gerloff, Jerry C. Wofford, Robert Cummins Organisational Communication: The key stone to managerial effectiveness.
- 3.Meenakshi Rama: "*Business Communication*", Oxford University Press, NewDelhi
4. C.S.G. Krishnamacharyulu and Dr. Lalitha Ramakrishnan, Business Communication, Himalaya Publishing House, Mumbai
5. Paul Turner: "*Organisational Communication*", JAICO Publishing House, New Delhi.
6. SathyaSwaroopDebasish, Bhagaban Das" "*Business Communication*", PHIPrivate Limited, New Delhi, 2009.
7. R.K.Madhukar: "Business Communication", Vikas Publishing House, New Delhi, 2012.
8. Kelly M Quintanilla, Shawn T.Wahl:"Business and Professional Communication", SAGE,New Delhi, 2012.
9. Sangita Mehta, NeetyKaushish: "Business Communication", University Science Press, New Delhi, 2010.
10. Anjali Ghanekar: "Business Communication Skills", Everest Publishing House, New Delhi,2011

C-109	Information Technology – Lab1 (Spreadsheet and Tally)	50	0	0	2	2
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Lab Evaluation:

- i) For practical (LAB) subject the distribution shall be **20 marks** for internal evaluation and **30 marks** for the semester end examinations. There shall be continuous evaluation by the internal subject teacher during the semester for **20 internal marks**. Out of the **20 marks internal, 10 marks** shall be for day-to-day performance (**5 marks for day-to-day evaluation and 5 marks for Record**) and **10 marks** shall be evaluated by conducting an internal test towards the end of semester.
- ii) Semester End examination shall be conducted by the teacher concerned and external examiner for **30 marks**. **Three QUESTIONS will be given in the external examination from the experiments based on the syllabus. Each question carries 10 marks. Duration of the examination is 90 minutes.**

UNIT- 1

Introducing spreadsheet: Choosing the correct tool; Creating and Saving; Spreadsheet workspace; Managing the workspace; Entering and editing data; Data entry; Selecting cells; Saving time when entering data. Presenting a spreadsheet; Number and date/time format tools; Percentages; Dates and Times; Currency; Text; Performing calculations; Basic arithmetic; Using functions; Replicating formulae; Absolute cell addressing; References between worksheets.

UNIT -II

Ranges and functions: Creating named ranges; Using named ranges; Finding and inserting functions; Excel – Functions: what if, Conditional count, sum and average, Multiple criteria with count, sum and if. Time and date calculations.

UNIT- III

Basic of Accounting: Type of Accounts, Rules of Accounting, Principles of concepts and conventions, double entry system, book keeping Mode of Accounting, Financial Statements, Transaction, Recording Transactions. Getting the functional with Tally, Creation and setting up of company in Tally.

UNIT- IV

Accounting Masters in Tally- Features- Configurations- Setting up Account Heads.

UNIT- V

Inventory in Tally- Stock – groups – Stock Categories - Godowns / Location Units of Measure - Stock Items - Creating Inventory Masters for National Traders

I YEAR II SEMESTER

C-201	Financial Management	100	4	0	0	4
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Objective:

The Course is designed for the students to understand the Financial Management concepts and to identify, enrich and fulfill the needs of Financial Markets.

UNIT- I

Financial Management: Concept - Nature and Scope - Evolution of financial Management - The new role in the contemporary scenario – Goals and objectives of financial Management - Firm's mission and objectives - Profit maximization Vs. Wealth maximization – Maximization Vs Satisfying - Major decisions of financial manager.

UNIT-II

Financing Decision: Sources of finance - Concept and financial effects of leverage – EBIT – EPS analysis. Cost of Capital: Weighted Average Cost of Capital– Theories of Capital Structure.

UNIT -III

Investment Decision: Concept and Techniques of Time Value of Money – Nature and Significance of Investment Decision – Estimation of Cash flows – Capital Budgeting Process – Techniques of Investment Appraisal – Discounting and Non Discounting Methods.

UNIT-IV

Dividend Decision: Meaning and Significance – Major forms of dividends – Theories of Dividends – Determinants of Dividend – Dividends Policy and Dividend valuation – Bonus Shares –Stock Splits – Dividend policies of Indian Corporate.

UNIT-V

Liquidity Decision: Meaning - Classification and Significance of Working Capital – Components of Working Capital – Factors determining the Working Capital – Estimating Working Capital requirement – Cash Management Models – Accounts Receivables –Credit Policies – Inventory Management.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

1. I.M. Pandey: “**Financial Management**”, Vikas Publishers, New Delhi, 2013.
2. Khan and Jain: Financial Management, Tata McGraw Hill, New Delhi,
3. Prasanna Chandra: “**Financial Management Theory and Practice**”, Tata McGrawHill 2011.
4. P.Vijaya Kumar, M.Madana Mohan, G. Syamala Rao: “**Financial Management**”, Himalaya Publishing House, New Delhi, 2013.
5. Brigham,E.F: “**Financial Management Theory and Practice**”, Cengae Learning, New Delhi, 2013
6. RM Srivastava, Financial Management, Himalaya Publishing house, 4th edition.

C-202	Human Resource Management	100	4	0	0	4
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Objective:

To equip the students with basic concepts of Human Resource Management and the various functions of HRM including Industrial Relations in the liberalized, socialism environment.

UNIT -I

HRM: Significance - Definition and Functions – evolution of HRM- Principles - Ethical Aspects of HRM- - HR policies, Strategies to increase firm performance - Role and position of HR department –aligning HR strategy with organizational strategy - HRM –changing , global perspective challenges, environment – cross-cultural problems – emerging trends in HRM.

UNIT -II

Investment perspectives of HRM: HR Planning – Demand and Supply forecasting - Recruitment and Selection- Sources of recruitment - Tests and Interview Techniques - Training and Development – Methods and techniques– Job design , evaluation and Analysis - Management development - HRD concepts.

UNIT -III

Performance Appraisal: Importance – Methods – Traditional and Modern methods – Latest trends in performance appraisal - Career Development and Counseling- Compensation - Concepts and Principles- Influencing Factors- Current Trends in Compensation- Methods of Payments in detail - Incentives rewards compensation mechanisms.

UNIT -IV

Wage and Salary Administration: Concept- Wage Structure- Wage and Salary Policies- Legal Frame Work- Determinants of Payment of Wages- Wage Differentials - Incentive Payment Systems. Welfare management: Nature and concepts – statutory and non-statutory welfare measures.

UNIT -V

Managing Industrial Relations: Trade Unions - Employee Participation Schemes-Collective Bargaining– Grievances and disputes resolution mechanisms – Safety at work – nature and importance – work hazards – safety mechanisms - Managing work place stress.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

1. K Aswathappa: “Human Resource and Personnel Management”, Tata McGraw Hill, New Delhi, 2013.
2. N.Sambasiva Rao and Dr. Nirmal Kumar: “Human Resource Management and Industrial Relations”, Himalaya Publishing House, Mumbai.
3. Mathis, Jackson, Tripathy: “Human Resource Management: A South-Asian Perspective”, Cengage Learning, New Delhi, 2013.
4. Subba Rao P: “Personnel and Human Resource Management-Text and Cases”, Himalaya Publications, Mumbai, 2013.
5. Madhurima Lall, Sakina Qasim Zaidi: “Human Resource Management”, Excel Books, New Delhi, 2010.

C-203	Marketing Management	100	4	0	0	4
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Objective:

The Course is designed for the students to understand the Marketing concepts and to identify, enrich and fulfill the needs of customers and markets.

UNIT -I

Introduction to Marketing: Needs - Wants – Demands - Products - Exchange - Transactions - Concept of Market and Marketing and Marketing Mix - Production Concept- Product Concept - Sales and Marketing Concept - Societal Marketing Concept - Green Marketing concept - Indian Marketing Environment.

UNIT -II

Market Segmentation, Targeting and Positioning: Identification of Market Segments - Consumer and Institutional/corporate Clientele - Segmenting Consumer Markets - Segmentation Basis – Evaluation and Selection of Target Markets – Positioning significance - Developing and Communicating a Positioning Strategy.

UNIT -III

Product and Pricing Aspects: Product – Product Mix - Product Life cycle -Obsolescence- Pricing- Objectives of Pricing - Methods of Pricing - Selecting the Final price - Adopting price - Initiating the price cuts - Imitating price increases-Responding to Competitor’s price changes.

UNIT -IV

Marketing Communication: Communication Process – Communication Mix – Integrated Marketing Communication - Managing Advertising Sales Promotion - Public relations and Direct Marketing - Sales force – Determining the Sales Force Size - Sales force Compensation.

UNIT -V

Distribution, Marketing Organization and Control: Channels of Distribution-Intensive, Selective and Exclusive Distribution- Organizing the Marketing Department - Marketing Implementation - Control of Marketing Performance - Annual Plan Control - Profitability Control - Efficiency Control - Strategic Control.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References

1. Phillip Kotler: “**Marketing Management** “, Pearson Publishers, New Delhi, 2013.
2. Rajan Saxena: “**Marketing Management**”, Tata McGraw Hill, New Delhi, 2012.
3. V S Ramaswamy & S Namakumari, Marketing Management Global Perspective Indian Context 4th Edition, Mac Millan Publishers 2009.
4. Tapan K Panda: “**Marketing Management**”, Excel Books, New Delhi, 2012
5. Paul Baines, Chris Fill, Kelly Page Adapted by Sinha K: “**Marketing**”, Oxford University Press, Chennai, 2013

C-204	Operations Management	100	4	0	0	4
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This Course is designed to make student understand the strategic significance of Operation management, to acquaint them with application of discipline to deal with real life business problem.

UNIT-I:

Introduction to Operation Management: Nature & Scope of Operation/ Production Management, Relationship with other functional areas, Recent trend in Operation Management, Manufacturing & Theory of Constraint, Types of Production System, Just in Time (JIT) & lean system.

UNIT -II:

Product Design & Process Selection: Stages in Product Design process, Value Analysis, Facility location & Layout: Types, Characteristics, Advantages and Disadvantages, Work measurement, Job design.

UNIT- III:

Forecasting & Capacity Planning: Methods of Forecasting, Overview of Operation Planning, Aggregate Production Planning, Production strategies, Capacity Requirement Planning, MRP, Scheduling, Supply Chain Management, Purchase Management, Inventory Management.

Unit- IV:

Productivity: Factors, Affecting Productivity – Job Design – Process Flow Charts – Methods Study – Work Measurement – Engineering and Behavioral Approaches.

UNIT -V:

Quality Management: Quality- Definition, Dimension, Cost of Quality, Quality Circles-Continuous improvement (Kaizen), ISO (9000&14000 Series), Statistical Quality Control: Variable & Attribute, Process Control, Control Charts -Acceptance Sampling Operating Characteristic Curve (AQL , LTPD, Alpha & Beta risk), Total Quality Management (TQM).

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

1. Krajewski & Ritzman (2004). Operation Management -Strategy and Analysis. Prentice Hall of India.
2. Panner Selvem, Production and Operation Management, Prentice Hall of India.
3. Chunnawals, Production & Operation Management Himalaya, Mumbai
4. Charry, S.N (2005). Production and Operation Management- Concepts, Methods Strategy. John Willy & Sons Asia Pvt Limited.
5. K Aswathappa & Sridhar Bhatt, Production & Operations Management, Himalaya, Mumbai.

C-205	Business Research Methods	100	4	0	0	4
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Developing the students in Research orientation and to acquaint them with fundamental of research methods.

UNIT -I

Introduction : Nature and Importance of Research, The role of Business Research, Aims of social research, Types of Research- Pure research vs. Applied research, Qualitative research vs. Quantitative research, Exploratory research, Descriptive research and Experimental research, ethical issues in business research- Defining Research Problem, Steps in Research process.

UNIT -II

Data Base: Discussion on primary data and secondary data, tools and techniques of collecting data. Methods of collecting data. Sampling design and sampling procedures. Random vs. Non-random sampling techniques, determination of sample size and an appropriate sampling design. Designing of Questionnaire –Measurement and Scaling – Nominal Scale – Ordinal Scale – Interval Scale – Ratio Scale – Guttman Scale – Likert Scale – Schematic Differential Scale.

UNIT -III

Survey Research and data analysis: Selection of an appropriate survey research design, the nature of field work and Field work management. Media used to communicate with Respondents, Personal Interviews, Telephone interviews, Self-administered Questionnaires- Editing – Coding – Classification of Data – Tables and Graphic Presentation –Preparation and Presentation of Research Report.

UNIT -IV

Statistical Inference: Formulation of Hypothesis –Tests of Hypothesis - Introduction to Null hypothesis vs. alternative hypothesis, parametric vs. non-parametric tests, procedure for testing of hypothesis, tests of significance for small samples, application, t-test, Chi Square test.

UNIT -V

Multivariate Analysis: Nature of multivariate analysis, classifying multivariate techniques, analysis of dependence, analysis of interdependence. Bi-Variate analysis-tests of differences-t test for comparing two means and z-test for comparing two proportions and ANOVA for complex experimental designs.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References

1. C.R. Kothari: Research Methodology, methods and Techniques New Age International Publisher.
2. Navdeep and Gupta : “**Statistical Techniques & Research Methodology**”, Kalyani Publishers
3. Willam G.Zikmund, Adhkari: “**Business Research Methods**”, Cengage Learning, New Delhi, 2013.
4. A.N. Sadhu, Amarjit singh, Research methodology in social sciences, 7th Edition Himalaya Publications.
5. A Bhujanga rao , Research methodology, Excel Books, 2008.

C-206 Open Elective	Project Management	100	4	0	0	4
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The objective of this course is to enable the students to gain basic knowledge about the concept of project, project management, project life-cycle, project appraisal; to acquaint the students about various issues of project management.

Unit -I:

Basics of Project Management –Concept– Project environment – Types of Projects – Project life cycle – Project proposals – Monitoring project progress – Project appraisal and Project selection – Causes of delay in Project commissioning– Remedies to avoid overruns. Identification of Investment opportunities – Sources of new project ideas, preliminary screening of projects – Components for project feasibility studies.

Unit- II:

Market feasibility -Market survey – Categories of Market survey – steps involved in conducting market survey – Demand forecasting techniques, sales projections.

Unit- III:

Technical and Legal feasibility: Production technology, materials and inputs, plant capacity, site selection, plant layout, Managerial Feasibility Project organization and responsibilities. Legalities – Basic legal provisions. Development of Programme Evaluation & Review Technique (PERT) –Construction of PERT (Project duration and valuation, slack and critical activities, critical path interpretation) – Critical Path Method (CPM)

Unit- IV:

Financial feasibility – Capital Expenditure – Criteria and Investment strategies – Capital Investment Appraisal Techniques (Non DCF and DCF) – Risk analysis – Cost and financial feasibility – Cost of project and means of financing — Estimation of cash flows – Estimation of Capital costs and operating costs; Revenue estimation – Income – Determinants – Forecasting income –Operational feasibility - Breakeven point – Economics of working.

Unit -V:

Project Implementation and Review: Forms of project organization – project planning – project control – human aspects of project management – prerequisites for successful project implementation – project review – performance evaluation – abandonment analysis.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

1. Prasanna Chandra, “Projects, Planning, Analysis, Selection, Financing, Implementation and Review”, Tata McGraw Hill Company Pvt. Ltd., New Delhi 1998.
2. Gido: Effective Project Management, 2e, Thomson, 2007.
3. Singh M.K, “Project Evaluation and Management”.
4. Vasanth Desai, Project Management, 4th edition, Himalaya Publications 2018.
5. Clifford F. Gray, Erik W. Larson, “Project Management, the Managerial Emphasis”, McGraw Hill, 2000.

C-206 Open Elective	Technology Management	100	4	0	0	4
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The course aims at providing an overview of various issues connected with Management of Technology in organizations.

UNIT-I.

Evolution of Technology-Effects of New Technology- Technology Innovation- Invention-Innovation-Diffusion- Revolutionary and Evolutionary Innovation- Product and Process Innovation- Strategic Implications of Technology- Technology - Strategy Alliance- -Convergent and Divergent Cycle- The Balanced Approach.

UNIT-II:

Technology Assessment- Technology Choice- Technological Leadership and Followership- Technology Acquisition- Technological Forecasting- Exploratory, Intuitive, Extrapolation, Growth Curves, Technology Monitoring- Normative: Relevance Tree, Morphological Analysis, Mission Flow Diagram.

UNIT-III:

Diffusion of Technology- Rate of Diffusion; Innovation Time and Innovation Cost- Speed of Diffusion- Technology Indicators- Various Indicators- Organizational Implications of Technology- Relationship between Technical Structure and Organizational Infrastructure- Flexible Manufacturing Management System (FMMS).

UNIT-IV:

Financial Aspects in Technology Management- Improving Traditional Cost -Management System- Barriers to the Evaluation of New Technology- Social Issues in Technology Management- Technological Change and Industrial Relations- Technology Assessment and Environmental Impact Analysis.

UNIT-V:

Human Aspects in Technology Management- Integration of People and Technology- Organizational and Psychological Factors- Organizational Outcome- Technology Transfer-Technology Management Scenario in India.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

Suggested Readings:

1. Sharif Nawaz: Management of Technology Transfer & Development, APCFT, Bangalore, 1983.
2. Rohtagi P K, Rohtagi K and Bowonder B: Technological Forecasting, Tata McGraw Hill, New Delhi.
3. Betz Fredrick: Managing Technology, Prentice Hall, New Jersey.
4. Gaynor: Handbook of Technology Management, McGraw Hill.
5. Tarek Khalil: Management of Technology, McGraw Hill International, 2000.

C-206 Open Elective	Lean Management	100	4	0	0	4
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To understand issues and challenges in implementing and development in lean manufacturing techniques from TPS and its contribution for improving organizational performance.

Unit- I

Introduction: Mass production system, Craft Production, Origin of Lean production system , Why Lean production , Lean revolution in Toyota , Systems and systems thinking , Basic image of lean production , Customer focus , Waste Management.

UNIT- II

Just In Time: Why JIT , Basic Principles of JIT, JIT system, Kanban, Six Kanban rules, Expanded role of conveyance, Production leveling, Three types of Pull systems, Value stream mapping. JIDOKA, Development of Jidoka concept, Why Jidoka, Poka, Yoke systems, Inspection systems and zone control – Types and use of Poka-Yoke systems, Implementation of Jidoka

UNIT -III

Kaizen: Six – Sigma philosophy and Methodologies ,QFD, FMEA Robust Design concepts; SPC, QC circles standardized work in lean system , Standards in the lean system, 5S system.

UNIT- IV

Total Productive Maintenance: Why Standardized work, Elements of standardized work, Charts to define standardized work, Kaizen and Standardized work Common layouts.

UNIT- V

Hoshin Planning & Lean Culture: Involvement, Activities supporting involvement, Quality circle activity, Kaizen training, Key factors of PKT success, Hoshin Planning System, Four Phases of Hoshin Planning, Why Lean culture – How lean culture feels.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

1. Jeffrey Liker, The Toyota Way: Fourteen Management Principles from the World's Greatest Manufacturer, McGraw Hill, 2004.
2. Debashish Sarkar , Lessons in Lean Management,
3. Dale H., Besterfield , Carol, Besterfield, etal, Total Quality Management (TQM) 5e by Pearson 2018.

C-206 Open Elective	Data Base Management System	100	4	0	0	4
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The course is to present an introduction to database management systems, with an emphasis on how to organize, maintain and retrieve - efficiently, and effectively - information from a DBMS.

UNIT- I

Introduction to Database Systems: Data - Database Applications - Evolution of Database - Need for Database Management – Data models - Database Architecture - Key Issues and Challenges in Database Systems.

UNIT -II

ER and Relational Models: ER Models – ER to Relational Mapping –Object Relational Mapping - Relational Model Constraints - Keys - Dependencies - Relational Algebra - Normalization - First, Second, Third & Fourth Normal Forms - BCNF – Join Dependencies.

UNIT- III

Data Definition and Querying: Basic DDL - Introduction to SQL - Data Constraints - Advanced SQL - Views - Triggers - Database Security – Embedded & Dynamic SQL.

UNIT -IV

Transactions and Concurrency: Introduction to Transactions - Transaction Systems - ACID Properties - System & Media Recovery - Need for Concurrency - Locking Protocols – SQL for Concurrency – Log Based Recovery - Two Phase Commit Protocol - Recovery with SQL- Deadlocks & Managing Deadlocks.

UNIT -V

Advanced Topics in Databases: Indexing & Hashing Techniques - Query Processing & Optimization - Sorting & Joins – Database Tuning - Introduction to Special Topics - Spatial & Temporal Databases – Data Mining and Warehousing.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, —Database System Concepts, Sixth Edition, Tata McGraw Hill, 2010.
2. Ramez Elmasri, Shamkant B. Navathe, —Fundamentals of Database Systems, Sixth Edition, Pearson/Addison - Wesley, 2010.
3. C.J. Date, A. Kannan and S. Swamynathan, —An Introduction to Database Systems, Pearson Education, Eighth Edition, 2006.
4. Raghu Ramakrishnan, —Database Management Systems, Fourth Edition, McGraw Hill, 2015.

C-207	IT Lab 2 (Programming R)	50	0	1	1	2
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OBJECTIVE:

After taking the course, students will be able to

- Use R for statistical programming, computation, graphics, and modeling,
- Write functions and use R in an efficient way,
- Fit some basic types of statistical models
- Use R in their own research,
- Be able to expand their knowledge of R on their own.

OUTCOMES:

At the end of this course, students will be able to:

- List motivation for learning a programming language
- Access online resources for R and import new function packages into the R workspace
- Import, review, manipulate and summarize data-sets in R
- Explore data-sets to create testable hypotheses and identify appropriate statistical tests
- Perform appropriate statistical tests using R Create and edit visualizations with

SYLLABUS:

UNIT-I:

All the theory content here below shall be executed with examples.

Introduction, How to run R, R Sessions and Functions, Basic Math, Variables, Data Types, Vectors, Conclusion, Advanced Data Structures, Data Frames, Lists, Matrices, Arrays, Classes.

UNIT-II:

All the theory content here below shall be executed with examples.

R Programming Structures, Control Statements, Loops, - Looping Over Non vector Sets,- If-Else, Arithmetic and Boolean Operators and values, Default Values for Argument, Return Values, Deciding Whether to explicitly call return- Returning Complex Objects, Functions are Objective, No Pointers in R, Recursion, A Quicksort Implementation-Extended Extended Example: A Binary Search Tree.

UNIT-III:

All the theory content here below shall be executed with examples.

Doing Math and Simulation in R, Math Function, Extended Example Calculating Probability-Cumulative Sums and Products-Minima and Maxima- Calculus, Functions Fir Statistical Distribution, Sorting, Linear Algebra Operation on Vectors and Matrices, Extended Example: Vector cross Product-Extended Example: Finding Stationary Distribution of Markov Chains, Set Operation, Input /out put, Accessing the Keyboard and Monitor, Reading and writer Files,

UNIT-IV:

All the theory content here below shall be executed with examples.

Graphics, Creating Graphs, The Workhorse of R Base Graphics, the plot() Function –Customizing Graphs, Saving Graphs to Files.

UNIT-V:

All the theory content here below shall be executed with examples.

Probability Distributions, Normal Distribution- Binomial Distribution- Poisson Distributions Other Distribution, Basic Statistics, Correlation and Covariance, T-Tests,-ANOVA.

Note: From all the theory content above three examples from each unit has to be taken as lab exercises. Out of all the 15 programs, the lab exam has to be conducted.

REFERENCE BOOKS:

- 1) The Art of R Programming, Norman Matloff, Cengage Learning
- 2) R for Everyone, Lander, Pearson
- 3) R Cookbook, Paul Teetor, Oreilly
- 4) R Programming By Dr.T. Murali Mohan , S.Chand Publications.
- 5) Garrett Golemund, Hands on Programming with R, Oreilly