COURSE STRUCTURE
AND
DETAILED SYLLABUS

B.Tech

in

ELECTRONICS AND COMMUNICATION ENGINEERING

Academic Regulation – R24

Applicable for the batches admitted from 2024-2025

AVANTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)
(Approved by A.I.C.T.E., NewDelhi,& Permanently Affiliated to J.N.T.U-GV, Vizianagaram)
NAAC"A+" Accredited Institute
Cherukupally (Village), Near Tagarapuvalasa Bridge, Vizianagaram(Dist), A.P- 531162.
www.aietta.ac.in,principal@aietta.ac.in

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Proposed Course Structure

Programme: B.Tech- Electronics and Communication Engineering **Regulation**-R24

(Applicable from the academic year 2024-2025 to 2026-2027)

Induction Programme

S. No	Course Title	Category	L-T-P-C
1	Physical Activities--Sports, Yoga and Meditation, Plantation	MC	0-0-6-0
2	Career Counseling	MC	2-0-2-0
3	Orientation to all branches -- career options, tools, etc	MC	3-0-0-0
4	Orientation on admitted Branch -- corresponding labs, tools and platforms	EC	2-0-3-0
5	Proficiency Modules & Productivity Tools	ES	2-1-2-0
6	Assessment on basic aptitude and mathematical skills	MC	2-0-3-0
7	Remedial Training in Foundation Courses	MC	2-1-2-0
8	Human Values & Professional Ethics	MC	3-0-0-0
9	Communication Skills -- focus on Listening, Speaking, Reading, Writing skills	BS	2-1-2-0
10	Concepts of Programming	ES	2-0-2-0

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Program: B.Tech-Electronics and Communication Engineering **Regulation:** R24

I Year I Semester- Course Structure

S.No	Category	CourseCode	Course Title	Hours per Week			
				L	T	P	Credits
1	BS	R24BS01	Linear Algebra and Calculus	3	0	0	3
2	BS	R24BS05	Applied Chemistry	3	0	0	3
3	ES	R24ES02	Problem Solving and Programming with C	3	0	0	3
4	ES	R24ES06	Engineering Graphics	1	0	4	3
5	ES	R24ES05	Basic Electrical and Electronics Engineering	3	0	0	3
6	BS	R24BS06	Applied Chemistry Lab	0	0	2	1
7	ES	R24ES03	Problem Solving and Programming with C Lab	0	0	3	1.5
8	ES	R24ES07	Basic Electrical and Electronics Engineering Lab	0	0	3	1.5
9	ES	R24ES08	Engineering Workshop	0	0	3	1.5
10	MC	R24MC01	Health and Wellness, Yoga and Sports	0	0	1	0.5
			Total	**13**	**0**	**16**	**21.0**

Category	Courses	Credits
BS-Basic Sciences Course	3	7.0
ES-Engineering Science Course	6	13.5
MC-Mandatory Course	1	0.5
Total	**10**	**21.0**

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Program: B.Tech- Electronics and Communication Engineering **Regulation:** R24

I Year II Semester- Course Structure

S.No	Category	Course Code	Course Title	Hours per Week			
				L	T	P	Credits
1	BS	R24BS04	Differential Equations and Vector Calculus	3	0	0	3
2	BS	R24BS02	Engineering Physics	3	0	0	3
3	HS	R24HS01	Communicative English	2	0	0	2
4	ES	R24ES01	Basic Civil and Mechanical Engineering	3	0	0	3
5	PC	R24ECPC01	Network Analysis	3	0	0	3
6	HS	R24HS02	Communicative English Lab	0	0	2	1
7	BS	R24BS03	Engineering Physics Lab	0	0	2	1
8	ES	R24ES04	IT Workshop	0	0	2	1
9	PC	R24ECPC02	Network Analysis and Simulation Lab	0	0	3	1.5
10	MC	R24MC02	NSS/NCC/Scouts Guides/ Community Service	0	0	1	0.5
			Total	14	0	10	**19**

Category	Courses	Credits
BS- Basic Sciences Course	3	7.0
ES-Engineering Science Courses	2	4.0
HS-Humanities and Management	2	3.0
PC-Professional competence Course	1	4.5
MC-Mandatory Course	1	0.5
Total	**10**	**19.0**

Chairperson
BoS (ECE)

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Program: B. Tech Electronics and Communication Engineering Regulation: R24

II Year I Semester- Course Structure

S.No	Category	Course Code	Course Title	Hours per Week			
				Lecture	Tutorial	Practical	Credits
1	PC	R24ECPC03	Random Variables and Stochastic Processes	3	0	0	3
2	HS	R24HS03	Universal Human Values–Understanding Harmony & Ethical Human Conduct	2	0	0	2
3	PC	R24ECPC04	Signals and Systems	3	0	0	3
4	PC	R24ECPC05	Electronic Devices and Circuits	3	0	0	3
5	PC	R24ECPC06	Digital Circuit Design	3	0	0	3
6	PC	R24ECPC07	Electronic Devices and Circuits Lab	0	0	3	1.5
7	PC	R24ECPC08	Digital Circuit Design and Simulation lab	0	0	3	1.5
8	SC	R24CSSC03	Computing skills using C	0	1	2	2
9	HS	R24HS04	Logical Reasoning and Corporate Skills	0	0	2	1
10	MC	R24MC03	Environmental scienc	2	0	0	-
			Total	**16**	**01**	**10**	**20**

Category	Courses	Credits
PC-Professional competence Course	6	15
HS-Humanities and Management	2	03
SC- Skill Oriented Course	1	02
MC-MandatoryCourse	1	-
Total	**10**	**20**

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Program: B. Tech Electronics and Communication Engineering Regulation: R24

II Year II Semester- Course Structure

S. No	Catgory	Course Code	CourseTitle	Hours per Week			
				Lecture	Tutorial	Practical	Credits
1	HS	R24HS06	Financial Management and Economics	2	0	0	2
2	ES	R24ES10	Analog Electronic Circuits Design	3	0	0	3
3	PC	R24ECPC09	Linear IC Applications	3	0	0	3
4	PC	R24ECPC10	Advanced Control Systems	3	0	0	3
5	PC	R24ECPC11	Analog and Digital Communications	3	0	0	3
6	PC	R24ECPC12	Analog Electronic Circuits Lab	0	0	3	1.5
7	PC	R24ECPC13	Analog and Digital Communications Lab	0	0	3	1.5
8	SC	R24CSSC01	Python Programming	0	1	2	2
9	HS	R24HS05	Numerical Ability and Professional Communication Skills	0	0	2	1
10	ES	R24ES13	Design Thinking and Innovation	1	0	2	2
			Total	**15**	**1**	**12**	**22**
Mandatory Community Service Project Internship of 08 weeks duration during summer vacation							

Category	Courses	Credits
HS-Humanities and Management	2	03
PC-Professional competence Course	5	12
ES-Engineering Science	2	05
SC- Skill Oriented Course	1	02
Total	**10**	**22**

Chairperson
Board of Studies (ECE)

24BS01 **Linear Algebra and Calculus** **3 0 0 3**

(Common to all Branches)

Course Objectives:

1. To equip the students with standard concepts and tools of mathematics to handle various real- world problems and their applications.
2. To enable the students to apply linear algebra to solve engineering problems.
3. To enable the students to apply calculus to solve engineering problems.

Course Code	Course Outcomes	Mapping with POs			Dok
		PO1	PO2	PO12	
R24BS01.1	Develop matrix algebra techniques that are needed by engineers for practical applications.	3	2	1	L1,L2,L3
R24BS01.2	To find the eigen values and eigen vectors and solve the problems by using linear transformation.	3	2	1	L1,L2,L3
R24BS01.3	Apply the knowledge of mean value theorems, solve inequality.	3	2	1	L1,L2,L3
R24BS01.4	Familiarize with functions of several variables which is useful in optimization.	3	2	1	L3,L4
R24BS01.5	Familiarize with double and triple integrals of functions of several variables in two and three dimensions.	3	2	1	L4,L5

SYLLABUS

UNIT-I: Matrices and Linear System of Equations **10 Hours**

Matrices: Vector Space, Linear independent, dependent (only definitions).

Rank of a matrix by echelon form, normal form. Cauchy-Binet formulae (without proof). Inverse of Non- singular matrices by Gauss- Jordan method.

System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations by Gauss elimination method. **COs-CO1**

Self-Learning Topic: Encoding and Decoding messages by using matrices

UNIT- II: Linear Transformation and Orthogonal Transformation **10 Hours**

Eigen values and Eigen vectors and their properties(without proof), Diagonalization of a matrix, Cayley-Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley–Hamilton Theorem, Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadratic form to canonical forms by Orthogonal Transformation. **COs-CO2**

Self-Learning Topic: Google's page rank Algorithm.

UNIT–III: Calculus **10 Hours**

Mean Value Theorems: Rolle's Theorem, Lagrange's mean value theorem with their geometrical interpretation, Cauchy's mean value theorem, Taylor's and Maclaurin theorems with remainders (without proof), problems on the above theorems. **COs-CO3**

Self-Learning Topic: Application of mean value theorems

UNIT- IV: Partial differentiation and Applications **10 Hours**

Partial derivatives, total derivatives, chain rule, change of variables, Taylor's and Maclaurin's series expansion of functions of two variables. Jacobian, maxima and minima of functions of two variables, method of Lagrange multipliers. **COs-CO4**

Self-Learning Topic: Jacobian of implicit functions.

UNIT-V: Multiple Integrals **10 Hours**

Double integrals - change of variables (Cartesian and Polar coordinates), change of order of integration, Cylindrical and Spherical coordinates, triple integrals. Finding areas (by double integrals) and volumes (by double integrals and triple integrals). **COs-CO5**

Self-Learning topic: Calculating Centers of Mass and Moment of inertia

Board of Studies : Mathematics-Basic Science and Humanities
Approved in BOS No:01, August, 2024
Approved in ACM No: 01, August, 2024

Text Books:

1. B.S.Grewal, Higher Engineering Mathematics, 44/e, Khanna publishers, 2017.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2018.

Reference Books:

1. Dennis G. Zill and Warren S. Wright , Advanced Engineering Mathematics, Jones and Bartlett, 2018.
2. Michael Green berg, Advanced Engineering Mathematics, 9th edition, Pearson edn.
3. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 14/e, Pearson Publishers, 2018.
4. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 5/e, Alpha Science
5. International Ltd., 2021 (9th reprint).
6. B.V. Ramana, Higher Engineering Mathematics, McGraw Hill Education, 2017.

Web References:

1. http://onlinecourses.nptel.ac.in
2. https://nptel.ac.in/courses/111105121
3. https://onlinecourses.nptel.ac.in/noc24_ma91/course
4. https://onlinecourses.nptel.ac.in/noc24_ma53/course
5. https://onlinecourses.nptel.ac.in/noc24_ma11/course

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1(%)	Internal Assessment #2(%)
L1	30	10
L2	30	10
L3	40	30
L4	--	25
L5	--	25
Total (%)	100	100

Sample Short and Long Answers questions of Various Cognitive Levels

UNIT-I

1. State Cauchy-Binet formulae (L1)
2. Define Echelon form of a matrix(L1)
3. Test for consistency and solve $2x+3y+7z=5;3x+y-3z=12;2x+19y-47z=32(L2)$
4. Discuss for what value of λ,μ the simultaneous equations

$x+y+z=6, x+2y+3z=10, x+2y+\lambda z=10$ have (i)no solution(ii) a unique solution (iii) an infinite number of solutions.(L2)

5. Reduce the matrix $\begin{bmatrix} 8 & 1 & 3 & 6 \\ 0 & 3 & 2 & 2 \\ -8 & -1 & -3 & 4 \end{bmatrix}$ into its normal form and hence find its rank.(L2)
6. Find the value of k such that the rank of $\begin{bmatrix} 1 & 2 & 3 \\ 2 & k & 7 \\ 3 & 6 & 10 \end{bmatrix}$ is 2. (L2)

UNIT-II

1. State Cayley-Hamilton theorem (L1)
2. Find the sum and product of the eigen values of $\begin{bmatrix} 3 & 1 & 4 \\ 0 & 2 & 6 \\ 0 & 0 & 5 \end{bmatrix}$ (L1)
3. Find the latent roots and latent vectors of $A=\begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$ (L2)
4. Use Cayley-Hamilton theorem to express $A^5-4A^4-7A^3+11A^2-A-10I$ as a linear polynomial in A. where $A=\begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$ (L3)

UNIT-III

1. State Lagrange's mean value theorem(L1)
2. Verify Rolle's theorem for the function $f(x)=(x-a)^m(y-b)^n$ where m.n are positive integers in $[a,b]$ (L2)
3. Calculate approximately $\sqrt[5]{245}$ by using Lagrange's mean value theorem (L3)

UNIT-IV

1. Find the maximum and minimum values of $3x^4-2x^3-6x^2+6x+1$ in $(0,2)$ (L4)
2. If $x+y+z, uv=y+z, uvw=z$, show that $\frac{\partial(x,y,z}{\partial(u,v,w)}=u^2v$ (L4)
3. In plane triangle, finds the maximum value of $\cos A\cos B\cos C$ (L4)

UNIT-V

1. $\int_0^\infty\int_0^\infty e^{-(x^2+y^2)}dxdy$ (L5)
2. Evaluate $\iint(x^2+y^2)dxdy$ over the area bounded by the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ (L5)

Chairperson
Board of Studies (Mathematics)

R24BS05 **APPLIED CHEMISTRY** **3 0 0 3**

(Common to EEE, ECE, CSE, CSE (AI&ML), CSE (DS))

Course objectives:

1. To familiarize Applied Chemistry and its application.
2. To train the students on the principles and applications of electrochemistry and polymers
3. To elucidate the Structure and bonding of molecules
4. To impart Basic concepts of Semiconductors
5. To introduce modern engineering materials
6. To introduce instrumental methods, chromatographic technique

At the end of the course, students will be able to:

Course Code	Course Outcomes	Mapping with Pos		DOK
		PO1	PO12	
R24BS05.1	Describe Molecular orbital diagrams	3	1	L1, L2, L4
R24BS05.2	Importance of Graphenes. Apply the principle of band diagrams in the applications of Super conductors and semiconductors.	3	1	L1, L2, L4,L5
R24BS05.3	Compare the Materials of Construction for Battery and Electro Chemical Sensors.	3	1	L1, L2, L3
R24BS05.4	Explain the Preparation, Properties and applications of thermos plastics and thermo setting plastics, Elastomers and conducting polymers.	3	1	L1, L2, L3
R24BS05.5	Summarize the concepts of instrumental methods	3	1	L1, L2, L4, L5

SYLLABUS

UNIT- I: Structure and Bonding models **10 Hours**

Fundamentals of Quantum mechanics, Schrodinger Wave equation, significance of Ψ and Ψ2, LCAO theory, molecular orbital theory – bonding in homo and hetero nuclear diatomic molecules – energy level diagrams of O2,N2 and CO, NO etc. π-molecular orbitals of butadiene and calculation of bond order. **COs-CO1**

Self-Learning Topics: Energy Level Diagrams of H2 & CN Molecules.

UNIT- II: Modern Engineering materials **10 Hours**

Semiconductors – Introduction, Classification semiconductor devices P-N junction diode as a rectifier and transistor, applications. Super conductors-Introduction basic concept, Classification, applications. Super capacitors: Introduction, Basic Concept-Classification – Applications. Nanomaterials: Introduction, Sol-gel method, classification, properties and applications of Fullerenes, carbon nano tubes and Graphenes **COs-CO2**

Self Learning Topics: Band Theory of Solids, Preparation of Fullerenes.

UNIT- III: Electrochemistry and Applications **14 Hours**

Electrochemical cell, Nernst equation, cell potential calculations and numerical problems, potentiometry- potentiometric titrations (redox titrations), Conductometry- conduct metric titrations (acid-base titrations).

Primary cells – Zinc-air battery, Secondary cells –Lead-acid and lithium-ion batteries- working of the batteries including cell reactions.

Fuel cells- hydrogen-oxygen and Methanol-Oxygen fuel cells. **COs-CO3**

Self Learning Topics: Galvanic Cell, Differences between Primary Cells & secondary cells.

UNIT- IV: Polymer Chemistry **14 Hours**

Introduction to polymers, functionality of monomers, chain growth and step growth polymerization, coordination polymerization, with specific examples and mechanisms of polymer formation (Freeradical).

Plastics –Thermo and Thermosetting plastics, Preparation, properties and applications of – PVC, Teflon, Bakelite, Nylon-6 6.

Elastomers– Buna-S, Buna-N–preparation, properties and applications.

Conducting polymers – polyacetylene mechanism of conduction and applications. Bio-Degradable polymers - PolyGlycolicAcid (PGA), PolyLacticAcid (PLA). **COs-CO4**

Self Learning Topics: Differences between Thermo and Thermo Setting Plastics. Vulcanization of rubber.

UNIT- V: Instrumental Methods and Applications **10 Hours**

Electromagnetic spectrum. Absorption of radiation: Beer-Lambert's law. UV-Visible Spectroscopy, electronic transition, Instrumentation, IR spectroscopies, fundamental modes and selection rules, Instrumentation. Chromatography-Basic Principle, Classification-HPLC: Principle, Instrumentation and Applications. **COs-CO5**

Self Learning Topics: Intensity Shifts in UV-Spectroscopy, Gas Chromatography.

Board of Studies : Basic Sciences and Humanities-Chemistry
Approved in BOS No: 5th, August, 2024
Approved in ACM No: 01

Text Books:

1. Jain and Jain, Engineering Chemistry,16/e, DhanpatRai,2013.
2. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e, Oxford UniversityPress,2010

Reference Books:

1. Skoog and West, Principles of Instrumental Analysis,6/e,Thomson,2007.
2. J.D.Lee,Concise Inorganic Chemistry ,5thEdition,WileyPublications,Feb.2008
3. Text book of Polymer Science, FredW.BillmayerJr,3rdEdition

.Web References:

1. https://swayam.gov.in/nc_details/NPTEL
2. https://onlinecourses.nptel.ac.in/noc19_cy29
3. https://archive.nptel.ac.in/noc/courses/noc21/SEM2/noc21-cy50

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1(%)	Internal Assessment #2(%)
L1	20	20
L2	30	30
L3	30	30

L4	10	10
L5	10	10
Total (%)	**100**	**100**

Sample Short and Long Answers questions of Various Cognitive Level

UNIIT I: **Structure and Bonding models**

1. Write is the Significance of Ψ and Ψ2 (L1)
2. Derive Schrodinger Wave equation? (L4)
3. Explain about the Molecular orbital theory Give any two examples?(L2)
4. Draw the Energy level diagram of Homo diatomic molecules? (L2)

UNIT- II: Modern Engineering materials

1. Describe the Semiconductors and its Applications? (L1)
2. Explain about the Superconductors with examples? (L2)
3. Discuss the Super capacitors? Classification of Super capacitors? Mention the applications of Super capacitor? (L2)
4. Write a short note on Fullerenes, properties and Applications? (L1)
5. Importance of Graphene (L5)

UNIT III: Electrochemistry and Applications.

1. Write the Nernst equation and calculate the cell potential for single electrodes? (L1)
2. Discuss the Potentiometric titrations (redox titrations)? (L2)
3. Discuss the Conductometric titrations (acid-base titrations)? (L2)
4. Write the construction & working of Zinc-air battery? (L1)
5. Classify Primary and Secondary cells? (L3)

UNITIV: **Polymer chemistry**

1. Write the functionality of monomers? (L1)
2. Discuss the mechanism of Chain growth and coordination polymerization . (L2)
3. Comparison between the Thermo Plastics and Thermosetting plastics? (L3)
4. Explain about the Preparation, properties and applications (L2)
   a. Bakelite
   b. Nylon-6,6
5. Uses of Bio-Degradable polymers? (L3)

UNIT-V: Instrumental Methods and Applications

1. Explain the Beer-Lambert's law? (L4)
2. Discuss the Instrumentation of IR spectroscopy? (L2)
3. Write the fundamental modes and selection rules of IR spectroscopy? (L1)
4. Explain Instrumentation of HPLC? (L4)
5. Compare various Chromatographic techniques (L5)

Chairperson
Board of Studies (Chemistry)

R24ES02 **Problem Solving & Programming with C** **3 0 0 3**
(Common to all Branches)

Course Objectives:

1. To impart adequate knowledge on the need of programming languages and problem-solving techniques and develop programming skills.
2. To express algorithms and draw flowcharts in a language independent manner.
3. To enable effective usage of Operators &Control Structures.
4. To learn about the design concept of Arrays, Strings and Functions.
5. To understand Structures and Unions and their usage.
6. To assimilate about Pointers, Dynamic Memory Allocation and know the significance of Pre-processors, perform operations on files.

At the end of the course, students will be able to:

Course Code	Course Outcomes	Mapping with POs and PSOs					Dok
		PO1	PO2	PO3	PS01	PS02	
R24ES02.1	Illustrate the fundamental concepts of computers and basic computer programming and problem-solving approach.	3	3	2	3	2	L1, L2
R24ES02.2	Understand the Control structures, Branching and Looping.	3	3	3	3	2	L1, L2 L3
R24ES02.3	Make use of Arrays and Develop Programs on modular programming using functions and strings.	3	3	3	2	3	L1, L2, L3
R24ES02.4	Demonstrate the ability to write programs using Structures and Unions.	3	3	3	3	2	L4
R24ES02.5	Apply File handling operations.	3	3	3	3	3	L4, L5

SYLLABUS

UNIT-I: Introduction to Programming and Algorithm for Problem Solving: 10 Hours

Introduction to Programming: The Basic Model of Computation, Algorithms, Flow-charts, Programming Languages, Compilation, Linking and Loading, Testing and Debugging, Documentation,

Algorithm for Problem Solving: Exchanging values of two variables, summation of a set of numbers, Decimal Base to Binary Base conversion, Reversing digits of an integer, GCD (Greatest Common Division) of two numbers, Test whether a number is prime, Organize numbers in ascending order, Find square root of a number, factorial computation, Fibonacci sequence, Evaluate 'sin x' as sum of a series, Reverse order of elements of an array, Find largest number in an array, Print elements of upper triangular matrix, multiplication of two matrices, Evaluate a Polynomial

COs–CO1

Self-Learning Topics: Compilation and Interpretation

UNIT- II: Introduction to the 'C' Programming **15 Hours**

Introduction: Character set, Variables and Identifiers, Built-in Data Types, Input/output statements, Variable Definition, Arithmetic operators and Expressions, Constants and Literals, Simple assignment statement, Basic input/output statement, Type Casting and Type def Simple 'C' programs

Conditional Statements and Loops: Decision making within a program, Conditions, Relational Operators, Logical Connectives, if statement, if-else statement, Loops: while loop, do while, for loop, Nested loops, Infinite loops, Switch statement, Break statement, Go to statement. **COs-CO2**

Self-Learning Topics: Escape Sequences

UNIT – III: Arrays, Strings and Functions **15 Hours**

Arrays: One dimensional array: Array manipulation; Searching, Insertion, Deletion of an element from an array; Finding the largest/smallest element in an array; two dimensional arrays with examples.

Strings: Concepts, String Types, String Input / Output functions, String manipulation functions, Null terminated strings as array of characters, Standard library string functions.

Functions: Top-down approach of problem solving, Modular programming and functions, Standard Library of C functions, Prototype of a function: Formal parameter list, Return Type, Function call, Block structure, passing arguments to a Function: call by reference; call by value, Recursive Functions, arrays as function arguments. **COs–CO3**

Self-Learning Topics: String Pattern Matching

UNIT- IV: Structures and Unions **10 Hours**

Structures and Unions: Structure variables, initialization, structure assignment, nested structure, structures and functions, structures and arrays: arrays of structures, structures containing arrays, unions, Enumeration.

Storage Classes**:** Scope and extent, Storage Classes in a single source file: auto, extern and static, register, Storage Classes in multiple source files: extern and static **COs–CO4**

Self-Learning Topics: How do you pass a structure to a function?

UNIT-V: Pointers & File Processing **10 Hours**

Pointers: Address operators, pointer type declaration, pointer assignment, pointer initialization, pointer arithmetic, functions and pointers, Arrays and Pointers, pointer arrays, pointers and structures, dynamic memory allocation.

File Processing: Concept of a file, streams, text files and binary files, Differences between text and binary files, State of a file, Opening and Closing files, file input/output functions (standard library input/output functions for files), file status functions (error handling), Positioning functions

COs-CO5

Self-Learning Topics: Binary Files and operations on Binary files

Board of Studies : Computer Science and Engineering

Approved in BOS No: 01, 30th July, 2024

Approved in ACM No: 01, 30th July, 2024

Expert Talk (To be Delivered by SMEs from Industries)	**COs**	**POs / PSOs**
1. Logic Develop using C Programming	CO1–CO5,	PO1,PO2,PO3,PO12,PSO1,PSO2
2. Real Time Applications of C Programming	CO1–CO5,	PO1, PO2,PO3,PO12,PSO1,PSO2

TEXT BOOKS:

1. Byron S Gottfried "Programming with C" Second edition, Tata McGrawhill, 2007 (Paperback)
2. R.G. Dromey, "How to solve it by Computer", Pearson Education, 2008.
3. Kanetkar Y, "Let us C", BPB Publications, 2007.
4. 4. Hanly J R & Koffman E.B, "Problem Solving and Program design in C", Pearson Education, 2009.

REFERENCE BOOKS:

1. E. Balaguruswamy, "Programming with ANSI-C", Fourth Edition, 2008, Tata McGraw Hill.
2. Venugopal K. R and Prasad S. R, "Mastering 'C'", Third Edition, 2008, Tata McGraw Hill.
3. B.W. Kernighan & D. M. Ritchie, "The C Programming Language", Second Edition, 2001, Pearson Education
4. ISRD Group, "Programming and Problem-solving Using C", Tata McGraw Hill, 2008.
5. Pradip Dey, Manas Ghosh, "Programming in C", Oxford University Press, 2007.

Web References:

1. http://www.c4learn.com/
2. http://www.geeksforgeeks.org/c/
3. http://nptel.ac.in/courses/122104019/
4. http://www.learn-c.org/
5. https://www.tutorialspoint.com/c programming/

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1(%)	Internal Assessment #2(%)
L1	35	--
L2	40	--
L3	25	40
L4	--	35
L5	--	25
Total (%)	**100**	**100**

Sample Short and Long Answers questions of Various Cognitive Levels

L1: Remember

1. What are the five key features of the C programming language?
2. What are the top 5 applications of C programming language?
3. What do you mean by reserved words in C programming language?
4. What do you mean by library functions?
5. List the name of the tokens

6. What is static() function in C programming?
7. What is the difference between operators = and ==?
8. What are 3 main drawbacks of C language?
9. What is the difference between R-value and L-value?
10. How does const char*p differ from the char const* p

L2: Understand

1. What is the importance of function?
2. Explain the function prototype with an example.
3. What do you mean by error? Discuss types of errors() in C language.
4. What do you mean by function pointer?
5. What is a header file in the C programming language?
6. How can you implement decision-making processes in C language?
7. What are the 4 primary sections to define a function in C language?
8. What are modifiers? List the C programming modifiers?
9. What is an array, and why does it play a major role in C programming?
10. Is sizeof( ) a function or operator?

L3: Apply

1. Program to find Factorial of number?
2. Fibonacci Series Program?
3. Palindrome Program?
4. Program to reverse a String?
5. Find a given number is Armstrong Number?
6. Print first n Prime Numbers?
7. Find Largest among n Numbers?
8. LCM of Two Numbers?
9. GCD of Two Numbers?
10. Reverse a String?

L4: Analysing

1. Swapping Two Numbers using Bitwise operators?
2. Copy File to another File?
3. C program to get and set system current system date and time?
4. C program to run DOS command?

L5: Evaluating

1. C program to find two smallest elements in a one-dimensional array?
2. C program to find odd or even numbers using Bit masking?
3. Swapping two bits of byte using C program?

Chairperson
Board of Studies (CSE)

R24ES06 **ENGINEERING GRAPHICS** **1 0 4 3**

(Common To All Branches)

Course Objectives:

1. Understand the fundamentals of engineering drawing, including lines, lettering, and dimensioning.
2. Develop skills in geometrical constructions, including regular polygons and curves.
3. Learn orthographic projection techniques, including projections of points, lines, and planes.
4. Understand how to project solids in simple positions and create sectional views.
5. Develop skills in converting isometric views to orthographic views and vice versa.
6. Apply computer-aided design (CAD) techniques using AutoCAD to create 2D and 3D drawings.
7. Understand the importance of reference planes and reference lines in orthographic projection.
8. Develop problem-solving skills in engineering drawing, including creating and interpreting drawings.

Course Code	Course Outcomes	Mapping with POs and PSOs					Dok
		PO1	PO2	PO3	PO5	PO10	
R24ES06.1	Understand the basics of Engineering Graphics to construct the polygon, curves, and scales.	3	2	2	1	1	L1, L2, L3
R24ES06.2	Draw the orthographic projections of points and straight lines inclined to both the planes.	3	2	2	1	1	L2, L3
R24ES06.3	Draw the projections of planes in various conditions.	3	2	2	1	1	L2, L3
R24ES06.4	Draw the projections of regular solids, with its axis inclined to one plane and sections of solids.	3	2	2	1	1	L3,
R24ES06.5	Visualize the 3D isometric views from 2D orthographic views and vice versa along with basic introduction to CAD.	3	2	3	1	1	L2, L4

SYLLABUS

UNIT-1 **12 Hours**

Introduction: Lines, Lettering and Dimensioning, Geometrical Constructions and Constructing regular polygons by general method.

Curves: construction of ellipse, parabola, and hyperbola by general method, Normal and tangent to Curves.

Scales: Plain scales, diagonal scales and vernier scales. **COs: CO1**

UNIT-2 **16 Hours**

Orthographic Projections: Reference plane, importance of reference lines or Plane, Projections of a point situated in any one of the four quadrants.

Projections of Straight Lines: Projections of straight lines parallel to both reference planes, perpendicular to one reference plane and parallel to other reference plane, inclined to one reference plane and parallel to the other reference plane. Projections of Straight Line Inclined to both the reference planes. **COs: CO2**

UNIT-3 **10 Hours**

Projections of Planes: Regular planes Perpendicular to both reference planes, parallel to one reference plane and inclined to the other reference plane; plane inclined to both the reference planes. **COs: CO3**

UNIT-4 **16 Hours**

Projections of Solids: Types of solids: Polyhedra and Solids of revolution. Projections of solids in simple positions: Axis perpendicular to horizontal plane, Axis perpendicular to vertical plane and Axis parallel to both the reference planes, Projection of Solids with axis inclined to one reference plane and parallel to another plane.

Sections of Solids: Perpendicular and inclined section planes, Sectional views and True shape of sections for simple position only. **COs: CO4**

UNIT-5 **12 Hours**

Conversion of Views: Conversion of isometric views to orthographic views and Conversion of orthographic views to isometric views for simple objects only.

Computer graphics: Creating 2D&3D drawings of objects including PCB and Transformations using Auto CAD (Not for end examination). **COs: CO5**

Textbook:

1. N. D. Bhatt, Engineering Drawing, Charotar Publishing House.

Reference Books:

1. Engineering Drawing, K.L. Narayana and P. Kannaiah, Tata McGraw Hill.
2. Engineering Drawing, M.B.Shah and B.C. Rana, Pearson Education Inc.
3. Engineering Drawing with an Introduction to AutoCAD, DhananjayJolhe, Tata McGraw Hill.

Board of Studies: Mechanical Engineering
Approved in BOS No: 01, 31st July, 2024
Approved in ACM No: 01

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	30	20
L2	30	40
L3	40	40
Total (%)	**100**	**100**

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. Draw an octagon given the length of side 25mm.
2. Construct a regular hexagon of 40mm side. Using general method?
3. Construct a regular pentagon inscribed in a circle of diameter 80 mm?
4. Construct a pentagon of side 50mm with one side vertical. Attach a non-overlapping hexagon of same side length with common vertical side.

L2: Understand

1. A fixed-point F is 7.5cm from a fixed straight line. Draw the locus of a point P moving in such a way that its distance from the fixed straight line is 2/3 times its distance from F. Plot at least 9 points. Name the curves. Also draw a normal and a tangent to the curve at a point on it 6cm from F.
2. Construct a parabola whose focus is at a distance of 40mm from the directrix. Draw a tangent and a normal to the parabola at point 50mm away from the principal axis. Determine the double ordinate through a point 90mm from the directrix.
3. Construct an ellipse when the distance between the locus and the directrix is 30mm and the eccentricity is 3/4. Draw the tangent and normal at any point P on the curve using directrix.
4. Construct a hyperbola when the distance between the focus and the directrix is 40mm and the eccentricity is 4/3. Draw a tangent and normal at any point on the hyperbola.
5. Draw the involute of hexagon of side 25mm A disc is in the form of a square of side 30mm surmounted by a semi-circle on one of the sides of the square and a half hexagon on the opposite side. Draw the path of the end of a string which is unwound from the circumference of the disc.
6. Draw a vernier scale of R.F = 1/25 to read centimetres up to 4 metres and on it, show lengths representing 3.14m, 2.39 m and 0.91 m.
7. Construct a vernier scale to read distance correct to decimetre on a map in which the actual distances are reduced in the ratio of 1:40000. The scale should be long enough to measure up to 6km. Mark on the scale a length of 3034km and 0.59km.
8. The front view of a line, inclined at 30^0 to the VP is 65mm long. Draw the projections of the line, when it is parallel to and 40 mm above the HP, its one end being 30mm in front of the VP.
9. Mark the projections of the following points on a common reference line, keeping the projectors 35mm apart.
   (i) A, 25mm above H.P and 35mm in front of V.P
   (ii) B, 25mm above H.P and 40 mm behind V.P
   (iii) C, 30mm below H.P and 45 mm behind V.P
   (iv) D, 30 mm below H.P and 40 mm in front V.P
10. Draw the FV, TV of the following points:
    (i) Point P lies in the HP and 20mm behind the VP
    (ii)Point Q lies in the VP and 30mm below the HP
    (iii)Point R lies 35mm below the HP and 25mm behind the VP
11. Draw the involute of hexagon of side 25mm.
12. A 100 mm long line is parallel to and 40mm above the HP. Its two ends are 25 mm and 50 mm in front of the VP respectively. Draw the projections and find its inclination with the VP.
13. Draw the projections of a straight-line AB of 60mm long, in the following positions
    (i)Perpendicular to the HP and in the VP and one end on the HP
    (ii)Parallel to and 30 mm in front of the VP and on the HP

(iii)Inclined at 30^0 to the VP, in the HP and one end on the VP

14. Draw an involute of the circle of 40mm diameter. Also draw a normal and tangent at a point 100mm from the centre of the circle.
15. A rectangular plot of 100sq.km. is represented on a certain map by a similar rectangular area of 4sq.cm. Draw a scale to show km and mark a distance of 43km on it.

L3: Apply

1. A truck is moving at the rate of 1.2 km per min. Construct a diagonal scale with RF value of 1/25000, showing minutes and seconds. Mark the distance moved by the truck in 4 minutes and 27 seconds?
2. A tunnel on the Konkan railway route has a size of 640m × 10m × 10m. It is represented on a model by the volume of 27 cm^3 Find RF. Devise a diagonal scale of this RF to read up to 300 meters. Show the distances of 299 meters, 171 meters and 9 meters on it.
3. A car is running at a speed of 50 km/hour. Construct a diagonal scale to show 1 km by 3 cm and to measure up to 6 km. Mark also on the scale the distance covered by the car in 5 min 28 seconds.

L4: Analyze

1. Analyze the importance of orthographic projection in CAD and explain how it aids in the visualization of 3D objects from 2D views. Provide examples and diagrams to support your answer.
2. Compare and contrast 2D orthographic views and 3D isometric views. How do they differ in terms of representation and application? Explain with examples and illustrations.
3. Explain the process of creating a 3D isometric view from 2D orthographic views. Use a simple object (e.g., a cube or a cylinder) as an example and provide step-by-step diagrams to illustrate the process.
4. Discuss the advantages and limitations of using CAD software for creating 2D orthographic views and 3D isometric views. How does CAD improve the design process, and what are its limitations?
5. Analyze a given 2D orthographic view (front, top, and side views) and create a 3D isometric view from it. Explain the process and provide diagrams. Then, reverse-engineer the process by creating 2D orthographic views from the 3D isometric view.
6. Explain the concept of dimensioning and annotation in CAD. How are dimensions and annotations added to 2D orthographic views and 3D isometric views? Provide examples and illustrations.

Chairperson
Board of Studies (ME)

R24ES05 Basic Electrical and Electronics Engineering 3 0 0 3

Course Objectives:

1. To expose to the field of electrical & electronics engineering, laws and principles of electrical/ electronic engineering
2. To acquire fundamental knowledge in the relevant field.
3. To teach the fundamentals of semiconductor devices and its applications.
4. To teach the working process and analysis of different rectifying and Amplifying Circuits.
5. To teach the fundamental principles and rules of digital electronic circuits like gates, Sequential and Combinational Circuits.

At the end of the course, students will be able to:

Course Code	Course Outcomes	Mapping with POs and PSOs							
		PO1	PO2	PO3	PO6	PO7	PO8	PO12	Dok
R24ES05.1	Understand the problem-solving concepts associated to AC and DC circuits	2	2	1	-	-	-	1	L1, L2,L3
R24ES05.2	Remember the fundamental laws, construction and operation of AC and DC machines, instruments.	2	2	1	-	-	-	1	L2,L3
R24ES05.3	Understand different power generation mechanisms, Electricity billing concept and important safety measures related to electrical operations.	3	1	2	3	2	1	1	L1,L2
R24ES05.4	Understand the fundamental principles of electronic devices, analyzing the different rectifying and Amplifying Circuits.	1	2	3	-	-	-	1	L1, L2,L3
R24ES05.5	analyze and design different digital electronic circuits like gates, Sequential and Combinational Circuits	1	2	3	-	-	-	2	L1, L3,L4

SYLLABUS

Part A-Electrical Engineering

UNIT- I: DC & AC Circuits 10 Hours

DC Circuits: Electrical circuit elements (R, Land C), Ohm's Law and its limitations, KCL& KVL, series, parallel, series-parallel circuits, Super Position theorem, Simple numerical problems.

AC Circuits: A.C. Fundamentals: Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor, Voltage and current relationship with phasor diagrams in R, L, and C circuits, Concept of Impedance, Active power, reactive power and apparent power, Concept of power factor (Simple Numerical problems). **COs–CO1**

Self-Learning Topics: Circuit elements

UNIT-II: Machines and Measuring Instruments **10 Hours**

Machines: Construction, principle and operation of (i) DC Motor, (ii) DC Generator, (iii) Single Phase Transformer, (iv) Three Phase Induction Motor and (v) Alternator, Applications of electrical machines.

Measuring Instruments: Construction and working principle of Permanent Magnet Moving Coil (PMMC), Moving Iron (MI) Instruments and Wheat Stone bridge. **COs–CO2**

Self-Learning Topics: Magnetic materials

UNIT- III: Energy Resources, Electricity Bill & Safety Measures **10 Hours**

Energy Resources: Conventional and non-conventional energy resources; Layout and operation o various Power Generation systems: Hydal, Nuclear, Solar & Wind power generation.

Electricity bill: Power rating of household appliances including air conditioners, PCs, Laptops, Printers, etc. Definition of ―unit‖ used for consumption of electrical energy, two-part electricity tariff, calculation of electricity bill for domestic consumers.

Equipment Safety Measures: Working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits. Personal safety measures: Electric Shock, Earthing and its types, Safety Precautions to avoid shock. **COs– CO3**

Part B: Electronics Engineering

UNIT-IV: Semiconductor Devices and Basic Electronic Circuits **15 Hours**

Introduction - Evolution of electronics – Vacuum tubes to nano electronics - Characteristics of PN Junction Diode — Zener Effect — Zener Diode and its Characteristics. Bipolar Junction Transistor — CB, CE, CC Configurations and Characteristics — Elementary Treatment of Small Signal CE Amplifier. Rectifiers and power supplies: Block diagram description of a dc power supply, Half-Wave Rectifiers, Full-Wave Rectifiers, capacitor filter (no analysis). Amplifiers: Block diagram of Public Address system, Circuit diagram and working of common emitter (RC coupled) amplifier with its frequency response. **COs –CO4**

Self-Learning Topics: Electronic components and characteristics, Design Amplifier circuit at different R, C Values

UNIT -V: DIGITAL ELECTRONICS and INSTRUMENTTAION **15 Hours**

Overview of Number Systems, BCD codes, Excess-3 code, Gray code, Hamming code. Boolean Algebra, Basic Theorems and properties of Boolean Algebra, Truth Tables and Functionality of Logic Gates – NOT, OR, AND, NOR, NAND, XOR and XNOR. Simple combinational circuits– Half and Full Adders. Introduction to sequential circuits, Flip flops, Registers and counters (Elementary Treatment only), Electronic Instrumentation: Block diagram of an electronic instrumentation system **COs–CO5**

Self-Learning Topics: Develop digital circuits using minimum no. of gates, design principles of electronic instruments.

Board of Studies : Electrical and Electronics Engineering
Approved in BoS No: 01, 3rd August, 2024
Approved in ACM No: 01

Text Books: Electrical Engineering

1. Basic Electrical Engineering, D. C. Kulshreshtha, TataMcGrawHill,2019, First Edition
2. Power System Engineering, P.V. Gupta,M.L.Soni,U.S.BhatnagarandA.Chakrabarti,Dhanpat Rai & Co, 2013

3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, ThirdEdition

Text Books: Electronics Engineering

1. R. L. Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021.
2. R. P. Jain, Modern Digital Electronics, 4th Edition, Tata Mc Graw Hill, 2009

Reference Books: Electrical Engineering

1. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Mc Graw Hill, 2019,FourthEdition
2. Principles of Power Systems, V.K. Mehtha, S.Chand Technical Publishers, 2020
3. Basic Electrical Engineering, T. K. Nagsarkar and M. S.Sukhija, Oxford University Press,2017
4. Basic Electrical and Electronics Engineering, S. K. Bhatacharya, Pearson Publications, 2018,Second Edition.

Reference Books: Electronics Engineering

1. R. S. Sedha, A Textbook of Electronic Devices and Circuits, S. Chand & Co, 2010.
2. Santiram Kal, Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall,India, 2002.
3. R.T.Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version,Pearson Education,2009

Web References: (Electrical Engineering)

1. https://nptel.ac.in/courses/108105053
2. https://nptel.ac.in/courses/108108076

Web References: (Electronics Engineering)

1. https://archive.nptel.ac.in/courses/117/102/117102059
2. https://www.tutorialspoint.com/principles_of_communication
3. https://www.geeksforgeeks.org/electronics-and-communication-engineering

Internal Assessment Pattern (Electrical Engineering)

Cognitive Level	Internal Assessment #1(%)
L1	30
L2	30
L3	40
Total (%)	**100**

Internal Assessment Pattern (Electronics Engineering)

Cognitive Level	Internal Assessment #2(%)
L1	30
L2	30
L3	40
Total (%)	**100**

Sample Short and Long Answers questions of Various Cognitive Levels

Part-A: Electrical Engineering

L1: Remember

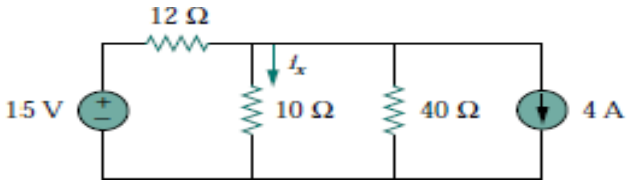
1. State Ohm's law?
2. Define Superposition theorem?
3. Define Active power?
4. Define Reactive power?
5. Define the term tariff?
6. Define form factor?
7. Define RMS value?

L2: Understand

1. Explain the principle and operation of DC Motor?
2. Explain the construction of Alternator?
3. Explain the principle and operation of Moving Iron instruments?
4. What is meant by Earthing and explain about process of earthing?
5. Draw the layout of wind power generating plant?

L3: Apply

1. For the circuit shown below in calculate Ix and the power dissipated by the 10-Ω resistor using superposition.



2. An alternating voltage is given by V=230sin314t.Calculate i)frequency, i)maximum value, iii)average value ,iv)RMS value
3. A Consumer has Maximum demand of 200 KW at 40% load factor. If the tariff is Rs.200per KW of maximum demand plus 10paise per KWH, find the annual charges?

Part-B: Electronics Engineering

L1: Remember

1. Draw the symbol of pn junction of diode
2. What is meant by BJT?
3. Define Avalanche and Zener break down voltages?
4. Draw the symbol of Zener diode.
5. Define Amplifier?
6. Define Rectifier?
7. What is the Zener voltage regulator?
8. Define latch and flip flop?
9. Symbol of JK flip flop?
10. Draw the logic symbols of OR, AND, NOT gate?

L2: Understand

1. Write the Differences between Avalanche and Zener break down voltages?
2. Draw the diagram and explain single input and dual input op-amps?
3. Compare BJT, CB, CE, CC transistor configuration characteristics?
4. Write the notes of PN junction diode?
5. Draw the block diagram of public address system and explain?
6. Discuss the working principal of zener voltage regulator?
7. Draw the block diagram of electronic instrumentation system and explain?

L3: Apply

1. What is doping? Describe P and N type semiconductors with Qualitative theory?
2. Draw the diagram and explain single input and dual input op-amps and design?
3. Design operational amplifier?
4. Explain the block diagram of DC power supply?
5. Explain the circuit diagram and working of RC coupled amplifier?
6. Operation of center tap full-wave rectifier?
7. Explain the operation of full –wave rectifier with capacitor?
8. Explain the JK, SR, D,T flip flops ?
9. Simplify the Boolean expressions to minimum number of literals i) A+B+A'B'C ii) AB + A (B +C) + B'(B+D).

Chairperson
Board of Studies (EEE& ECE)

R24BS06 **APPLIED CHEMISTRY LAB** **0 0 2 1**

(Common to EEE, ECE, CSE, CSE (AI&ML), CSE (DS))

Course Objectives:

1. Verify the fundamental concepts with experiments.
2. Learn and carry out some of the important experiments related to batteries and their properties.
3. Learn the preparation of engineering polymer materials like Bakelite
4. Know the fundamental principles of chemistry lab experiments which include volumetric Analysis, dichrometry, conductometry and potentiometry.

At the end of the course, students will be able to:

Course Code	Course Outcomes	Mapping with POs and PSOs		
		PO1	PO2	Dok
R24BS06.1	Determine the cell constant and conductance of solutions. Determine redox potentials.	1	3	L1, L2
R24BS06.2	Prepare advanced polymer Bakelite materials. Strength of Mn(II) and Ferrous Iron by dichrometry, Adsorption of acetic acid.	1	3	L1,L3
R24BS06.3	Measure the strength of an acid present in secondary batteries. Calculation of Hardness of Water.	1	3	L1, L4

Board of Studies : Basic Science Humanities (Chemistry)

Approved in BOS No: 01, 5th August, 2024

Approved in ACM No: 01

List of Experiments:

Week 1:

1. Conductometric titration of strong acid vs. strong base
2. Conductometric titration of weak acid vs. strong base
3. Determination of cell constant and conductance of solutions
4. Potentiometry - determination of redox potentials and emfs
5. PH metric titration – determination of Strength of Strong acid vs Strong base **COs:CO1**

Week 2:

1. Conductometric titration of strong acid vs. strong base
2. Conductometric titration of weak acid vs. strong base
3. Determination of cell constant and conductance of solutions
4. Potentiometry - determination of redox potentials and emfs
5. PH metric titration – determination of Strength of Strong acid vs Strong base **COs:CO2**

Week 3:

1. Conductometric titration of strong acid vs. strong base
2. Conductometric titration of weak acid vs. strong base
3. Determination of cell constant and conductance of solutions
4. Potentiometry - determination of redox potentials and emfs
5. PH metric titration – determination of Strength of Strong acid vs Strong base. **COs:CO1**

Week 4:

1. Conductometric titration of strong acid vs. strong base
2. Conductometric titration of weak acid vs. strong base
3. Determination of cell constant and conductance of solutions
4. Potentiometry - determination of redox potentials and emfs
5. PH metric titration – determination of Strength of Strong acid vs Strong base **COs:CO3**

Week 5:

1. Conductometric titration of strong acid vs. strong base
2. Conductometric titration of weak acid vs. strong base
3. Determination of cell constant and conductance of solutions
4. Potentiometry - determination of redox potentials and emfs
5. PH metric titration – determination of Strength of Strong acid vs Strong base **COs:CO1**

Week 6:

6. Determination of Strength of an acid in Pb-Acid battery **COs:CO3**

Week 7:

7. Determination of Hardness of Water **COs:CO3**

Week 8:

8. Determination of Mn (II) by using oxalic acid **COs:CO2**

Week 9:

9. Adsorption of acetic acid by charcoal **COs:CO2**

Week 10:

10. Estimation of Ferrous Iron by Dichrometry **COs:CO2**

Week 11:

11. Preparation of a Bakelite (Demo) **COs:CO4**

Week 12:

12. Preparation of nanomaterials by precipitation method. **COs: CO4**

Additional Experiments

1. Determination of Sodium carbonate by using Hydrochloric acid
2. Determination of Copper (II) using standard hypo solution. **COs:CO1**

Reference:

1."Vogel's Quantitative Chemical Analysis 6th Edition 6th Edition" Pearson Publications by J. Mendham, R.C.Denney, J.D.Barnes and B. Sivasankar
2. Practical Engineering Chemistry by K. Mukkanti, etal, B.S. Publications, Hyderabad.
3. Instrumental methods of chemical analysis, Chatwal, Anand, Himalaya Publications.

Chairperson
Board of Studies (Chemistry)

R24ES03 Problem Solving &Programming with C Lab 0 0 3 1.5
(Common to all Branches)

Course Objectives:

The course aims to give students hands – on experience and train them on the concepts of the C-programming language.

At the end of the course, students will be able to:

Course Code	Course Outcomes	Mapping with POs and PSOs			
		PO1	PO2	PO3	Dok
R24ES03.1	Read, understand, and trace the execution of programs written in C language.	2	2	2	L1, L2
R24ES03.2	Select the right control structure for solving the problems .and demonstrate the application of arrays functions and strings	3	3	3	L2,L3
R24ES03.3	Develop Debug and Execute programs to demonstrate the applications of Pointers, Structures& Unions, and Files.	3	3	3	L2, L3

Board of Studies : Computer Science and Engineering
Approved in BOS No: 01, 30th July, 2024
Approved in ACM No: 01, 30th July, 2024

Developing the following programs:

Week 1:

1. Write a C program using printf() and Scanf(). COs:CO1
2. Write a C program on swapping of two nos. COs:CO1
3. Write a C program using arithmetic Expressions. COs:CO1

Week 2:

4. Simple interest calculation COs:CO2
5. Finding compound interest COs:CO2
6. Area of a triangle using heron's formulae COs:CO2
7. Distance travelled by an object COs:CO2

Week 3:

8. Find the maximum of three numbers using conditional operator COs:CO2
9. Take marks of 5 subjects in integers, and find the total, average in float COs:CO2
10. Write a C program to shift/rotate using bit fields. COs:CO2
11. Finding the square root of a given number COs:CO2
12. Write a C program using if-else statement. COs:CO2

Week 4:

13. Write a C program to find the max and min of four numbers using if-else. COs:CO2
14. Write a C program to generate electricity bill. COs:CO2
15. Find the roots of the quadratic equation. ` COs:CO2

16. Write a C program to find the given year is a leap year or not. COs:CO2
17. Write a C program to simulate a calculator using switch case. COs:CO2

Week 5:

18. Find the factorial of given number using any loop. COs:CO2
19. Find the given number is a prime or not. COs:CO2
20. Compute sine and cos series. COs:CO2
21. Checking a number palindrome. COs:CO2
22. Construct a pyramid of numbers. COs:CO2

Week 6:

23. Write a C program on Linear Search. COs:CO3
24. Find the min and max of a 1-D integer array. COs:CO3
25. Perform linear search on1D array. COs:CO3
26. The reverse of a 1D integer array. COs:CO3

Week 7:

27. Find 2's complement of the given binary number. COs:CO3
28. Eliminate duplicate elements in an array. COs:CO3
29. Sort array elements using bubble sort. COs:CO3
30. Addition of two matrices. COs:CO3

Week 8:

31. Multiplication two matrices. COs:CO3
32. Write a C program using call by reference. COs:CO3
33. Write a C program to find factorial of n using recursion. COs:CO3
34. Write a C function to calculate NCR value COs:CO3
35. Concatenate two strings without built-in functions. COs:CO3

Week 9:

36. Write a C function to transpose of a matrix. COs:CO3
37. Write a C function to find the length of a string. COs:CO3
38. Reverse a string using built-in and without built-in string functions. COs:CO3
39. Write a C program to find the sum of a 1D array using malloc ( ). COs:CO3

Week 10:

40. Write a recursive function to find the lcm of two numbers. COs:CO3
41. Write a recursive function to find the sum of series. COs:CO3
42. Write a C program to swap two numbers using call by reference. COs:CO3
43. Write a C program using Pointers, Structures and Unions. COs:CO4
44. Write a C program to find the total, average of n students using structures. COs:CO4

Week 11:

45. Enter n students data using calloc() and display failed students list. COs:CO4
46. Read student name and marks from the command line and display the student details along with the total. COs:CO4
47. Write a C program to implement realloc(). COs:CO4
48. Write a C program to copy one structure variable to another structure of the same type. COs: CO4

Week 12:

49. Demonstrate Dangling pointer problem using a C program. COs: CO4
50. Write a C program to copy one string into another using pointer. COs: CO4

51. Write a C program to find no of lowercase, uppercase, digits and other characters using pointers. COs: CO4

Week 13:

52. Write a C program using Files operations. COs:CO5
    a. Sum and average of 3 numbers
    b. Conversion of Fahrenheit to Celsius and vice versa.
53. Write a C program to write and read text into a file. COs:CO5

Week 14:

54. Write a C program to write and read text into a binary file using fread() and fwrite() COs:CO5
55. Copy the contents of one file to another file. COs:CO5
56. Write a C program to merge two files into the third file using command-line arguments. COs: CO5

Week 15:

57. Find no. of lines, words and characters in a file. COs:CO5
58. Write a C program to print last n characters of a given file. COs:CO5

Textbooks:

1. Ajay Mittal, Programming in C: A practical approach, Pearson.
2. Byron Gottfried, Schaum' s Outline of Programming with C, McGraw Hill

Reference Books:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, PrenticeHall of India
2. C Programming, A Problem-Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE

Chairperson
Board of Studies (CSE)

R24ES07 Basic Electrical and Electronics Engineering Lab 0 0 3 1.5
(Common to all branches of Engineering)

Course Objectives:

To impart knowledge on the fundamental laws & theorems of electrical circuits, functions of electrical machines and energy calculations.

At the end of the course, students will be able to:

Course Code	Course Outcomes	Mapping with POs and PSOs							
		PO1	PO2	PO3	PO4	PO5	PO11	PS01	Dok
R24ES07.1	Apply the theoretical concepts and operating principles to derive mathematical models for circuits, Electrical machines and measuring instruments; calculations for the measurement of resistance, power and power factor.	1	1		3	1			L1, L2, L3
R24ES07.2	Apply the theoretical concepts to obtain calculations for the measurement of resistance, power and power factor and design suitable circuits for measurement of electrical parameters	1	1		3	1	2	2	L2, L3
R24ES07.3	Plot and discuss the characteristics of various electron devices/instruments.	1	1		3	1	2		L1, L2, L3

Board of Studies : Electrical and Electronics Engineering
Approved in BOS No: 01, 3rd August, 2024
Approved in ACM No: 01

Developing the following programs:

List of Experiments

1. Verification of KCL and KVL **COs: CO2**
2. Verification of Superposition theorem **COs: CO2**
3. Measurement of Resistance using Wheatstone bridge **COs: CO2**
4. Magnetization Characteristics of DC shunt Generator **COs: CO2**
5. Measurement of Power and Power factor using Single-phase wattmeter **COs: CO2**
6. Measurement of Earth Resistance using Megger **COs: CO2**
7. Calculation of Electrical Energy for Domestic Premises **COs: CO2**

Reference Books:

1. Basic Electrical Engineering, D.C.Kulshreshtha,TataMcGrawHill,2019, First Edition
2. Power System Engineering, P.V.Gupta, M.L.Soni, U.S.Bhatnagar and A. Chakrabarti,

DhanpatRai & Co, 2013
3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition.

Web References:

1. https://www.jntumaterials.co.in/2015/06/jntuk-btech-lab-manuals
2. www.jntumaterials.in

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1(%)	Internal Assessment #2(%)
L1	30	20
L2	30	40
L3	40	40
Total (%)	**100**	**100**

Sample Lab Experiments of Various Cognitive Levels:

Experiments

1. Verification of KCL and KVL **COs: CO2**
2. Verification of Superposition theorem **COs: CO2**
3. Measurement of Resistance using Wheatstone bridge **COs: CO2**
4. Magnetization Characteristics of DC shunt Generator **COs: CO2**
5. Measurement of Power and Power factor using Single-phase wattmeter **COs: CO2**
6. Measurement of Earth Resistance using Megger **COs: CO2**
7. Calculation of Electrical Energy for Domestic Premises **COs: CO2**

S. No.	Title	Cognitive Level
1	Verification of KCL and KVL	L1, L2,L3
2	Verification of Superposition theorem	L1, L2,L3
3	Measurement of Resistance using Wheatstone bridge	L2,L3,
4	Magnetization Characteristics of DC shunt Generator	L1, L2,L3
5	Measurement of Power and Power factor using Single-phase wattmeter	L1, L2,L3
6	Measurement of Earth Resistance using Megger	L1,L3
7	Calculation of Electrical Energy for Domestic Premises	L1, L2

Note: Minimum Six Experiments to be performed.

PART B: Electronics Engineering Workshop

Course Objectives:

To impart knowledge on the principles of digital electronics and fundamentals of electron devices & its applications.

List of Experiments:

1. Plot V-I characteristics of PN Junction diode A) Forward bias B) Reverse bias. **COs: CO3**
2. Plot V – I characteristics of Zener Diode and its application as voltage Regulator. **COs: CO3**
3. Implementation of half wave and full wave rectifiers **COs: CO3**
4. Plot Input & Output characteristics of BJT in CE and CB configurations **COs: CO3**
5. Frequency response of CE amplifier. **COs: CO3**
6. Simulation of RC coupled amplifier with the design supplied **COs: CO3**

7. Verification of Truth Table of AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR gates using ICs. **COs: CO2**
8. Verification of Truth Tables of S-R, J-K& D flip flops using respective ICs. **COs: CO2**

Tools / Equipment Required: DC Power supplies, Multi meters, DC Ammeters, DC Voltmeters, AC Voltmeters, CROs, all the required active devices.

Reference Books:

1. R. L. Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021.
2. R. P. Jain, Modern Digital Electronics, 4th Edition, Tata Mc Graw Hill, 2009
3. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education, 2009.

Note: Minimum Six Experiments to be performed. All the experiments shall be implemented using bothHardware and Software.

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1(%)	Internal Assessment #2(%)
L1	30	20
L2	30	40
L3	40	40
Total (%)	**100**	**100**

Web References:

1. https://www.jntumaterials.co.in/2015/06/jntuk-btech-lab-manuals
2. www.jntumaterials.in

Experiments of Various Cognitive Levels:

S. No.	Title	Cognitive Level
1	Plot V-I characteristics of PN Junction diode A)Forward bias B) Reverse bias.	L1, L2, L3
2	Plot V – I characteristics of Zener Diode and its application as voltage Regulator.	L1, L2, L3
3	Implementation of half wave and full waverectifiers	L2,L3,L4
4	Plot Input & Output characteristics of BJT in CEand CB configurations	L1, L2,L3
5	Frequency response of CE amplifier.	L1, L2,L3
6	Simulation of RC coupled amplifier with the designsupplied	L1,L3,L4
7	Verification of Truth Table of AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR gates	L1, L4
8	Verification of Truth Tables of S-R, J-K& D flip flops using respective ICs.	L1,L3,L4

Note: Minimum Six Experiments to be performed.

Chairperson
Board of Studies (EEE&ECE)

R24ES08 **ENGINEERING WORKSHOP** **0 0 3 1.5**
(Common to all Branches)

Course Objectives:

- Describe how different tools are used in home wiring, tin smiting, blacksmithing, carpentry, and fitting.

Course Code	Course Outcomes	Mapping with Pos					
		PO1	PO2	PO3	PO4	PO6	PO9
R24ES08.1	Identify workshop tools and their operational capabilities. Practice on manufacturing of components using workshop trades including carpentry, fitting, sheet metal	3	2	1	1	1	1
R24ES08.2	Practice on manufacturing of components using workshop trades including foundry and welding.	3	2	1	1	2	3
R24ES08.3	Apply fitting operations in various applications and engineering knowledge for Plumbing, House Wiring Practice, and Making square rod and L-bend from the round rod in black smithy	3	2	1	1	2	3

List of Experiments

1. **Wood Working:** **COs: CO1**
   a) Half – Lap joint
   b) Mortise and Tenon joint
   c) Corner Dovetail joint or Bridle joint
2. **Sheet Metal Working:** **COs: CO1**
   a) Tapered tray
   b) Conical funnel
   c) Elbow pipe
   d) Brazing
3. **Fitting:** **COs: CO1**
   a) V-fit
   b) Dovetail fit
   c) Semi-circular fit
   d) Bicycle tire puncture and change oftwo-wheeler tyre
4. **Foundry Trade:** Preparation of Green Sand Moulds **COs: CO2**
   a) Single piece pattern
   b) Double piece pattern
5. **Welding Shop: Arc welding Practice** **COs: CO2**
   a) Lap joint
   b) Butt joint

6. Electrical Wiring: **COs: CO3**

a) Parallel and series connection
b) Two-way switch connection
c) Tube light connection
d) Soldering of wires

7. Plumbing: **COs: CO3**

a) Prepare Pipe joint with coupling for 1 inch diameter
b) Prepare Pipe joint with coupling for 1.5 inch diameter

8. Black smithy: **COs: CO3**

a) Round rod to Square
b) Round rod to S-Hook

Textbooks:

1. Basic Workshop Technology: Manufacturing Process, Felix W.; Independently Published, 2019. Workshop Processes, Practices and Materials; Bruce J. Black, Routledge publishers, 5th Edn. 2015.
2. A Course in Workshop Technology Vol I. & II, B.S. Raghuwanshi, Dhanpath Rai & Co., 2015 &2017

Reference Books:

1. Elements of Workshop Technology, Vol. I by S. K. Hajra Choudhury & Others, Media Promoters and Publishers, Mumbai. 2007, 14th edition
2. Workshop Practice by H. S. Bawa, Tata-McGraw Hill, 2004.
3. Wiring Estimating, Costing and Contracting; Soni P.M. & Upadhyay P.A.; Atul Prakashan 2021-22

Board of Studies: Mechanical Engineering
Approved in BOS No: 01, 31st July, 2024
Approved in ACM No: 01

Sample Experiments

1. Prepare Half – Lap joint
2. Prepare Mortise and Tenon joint
3. Prepare Corner Dovetail joint or Bridle joint
4. Prepare Tapered tray
5. Prepare Conical funnel
6. Prepare Elbow pipe
7. Do Brazing operation
8. Prepare V-fit
9. Prepare Dovetail fit
10. Prepare Semi-circular fit
11. Do Bicycle tire puncture andchange of two-wheeler tyre
12. Prepare Parallel and series
13. Prepare Two-way switch
14. Prepare Tube light
15. Do Soldering of wires
16. Prepare Green Sand Moulds for single piece Pattern

17. Prepare Green Sand Moulds for double piece Patterns
18. Prepare Lap joint using arc welding
19. Prepare Butt joint using arc welding
20. Prepare Pipe joint with coupling for same diameter(10mm)
21. Prepare Pipe joint with coupling for same diameter(12mm)
22. Prepare Round rod to Square rod
23. Prepare Round rod to S-Hook

Chairperson
Board of Studies (ME)

R24MC01 Health and Wellness, Yoga and Sports 0 0 1 0.5
(Common to all Branches)

Course Objectives:

The main objective of introducing this course is to make the students maintain their mental and physical wellness by balancing emotions in their life. It mainly enhances the essential traits required for the development of the personality.

At the end of the course, students will be able:

Course Code	Course Outcomes	Mapping with POs				
		PO3	PO6	PO7	PO9	PO12
R24MC01.1	Understand the importance of yoga and sports for Physical fitness and sound health.	2	1	1	1	1
R24MC01.2	Demonstrate an understanding of health-related fitness components.	1	2	1	1	1
R24MC01.3	Compare and contrast various activities that help enhance their health	2	1	2	2	1
R24MC01.4	Assess current personal fitness levels.		1	1		1
R24MC01.5	Develop Positive Personality	1	1	2	1	1

SYLLABUS

UNIT-I: **3 Hours**

Concept of health and fitness, Nutrition and Balanced diet, basic concept of immunity Relationship between diet and fitness, Globalization and its impact on health, Body Mass Index (BMI) of all age groups.

Activities:

1. Organizing health awareness programmes in community.
2. Preparation of health profile.
3. Preparation of chart for balance diet for all age groups **COs-CO1**

UNIT- II: **3 Hours**

Concept of yoga, need for and importance of yoga, origin and history of yoga in Indian context, classification of yoga, Physiological effects of Asanas- Pranayama and meditation, stress management and yoga, Mental health and yoga practice.

Activities: Yoga practices – Asana, Kriya, Mudra, Bandha, Dhyana, Surya Namaskar. **COs-CO2**

UNIT–III: **3 Hours**

Concept of Sports and fitness, importance, fitness components, history of sports, Ancient and Modern Olympics, Asian games and Commonwealth games.

Activities:

1. Participation in one major game and one individual sport viz., Athletics, Volleyball, Basketball, Handball, Football, Badminton, Kabaddi, Kho-kho, Table tennis, Cricket etc.
2. Practicing general and specific warm up, aerobics
3. Practicing cardio respiratory fitness, treadmill, run test, 9 min walk, skipping and running.

COs-CO3

Board of Studies : BS&H
Approved in BoS No: 01, August, 2024
Approved in ACM No: 01

Text Books:

1. Gordon Edlin, Eric Golanty. Health and Wellness, 14th Edn. Jones & Bartlett Learning, 2022
2. T.K.V.Desikachar. The Heart of Yoga: Developing a Personal Practice
3. Archie J.Bahm. Yoga Sutras of Patanjali, Jain Publishing Company, 1993
4. Wiseman, John Lofty, SAS Survival Handbook: The Ultimate Guide to Surviving Anywhere Third Edition, William Morrow Paperbacks, 2014
5. The Sports Rules Book/ Human Kinetics with Thomas Hanlon. -- 3rd ed. Human Kinetics, Inc.2014

General Guidelines:

1. Institutes must assign slots in the Timetable for the activities of Health/Sports/Yoga.
2. Institutes must provide field/facility and offer the minimum of five choices of as many as Games/Sports.
3. Institutes are required to provide sports instructor / yoga teacher to mentor the students.

Assessment Pattern:

1. Evaluated for a total of 100 marks.
2. A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totaling to 90 marks.
3. A student shall be evaluated by the concerned teacher for 10 marks by conducting viva
4. voce on the subject.

Chairperson
Board of Studies (Mathematics)

24BS04 Differential Equations and Vector Calculus 3 0 0 3
(Common to all Branches)

Course Objectives:

1. To enlighten the learners in the concept of differential equations and multivariable calculus.
2. To furnish the learners with basic concept and techniques at plus two level to lead them in to advanced level by handling various real-world applications.

At the end of the course, students will be able to:

Course Code	Course Outcomes	Mapping with POs			Dok
		PO1	PO2	PO12	
R24BS04.1	Solve the first order differential equations related to various engineering fields.	3	2	1	L1,L2,L3
R24BS04.2	Model engineering problems as higher order differential equations and solve analytically.	3	2	1	L1,L2,L3
R24BS04.3	Identify solution methods for partial differential equations that model physical processes.	3	2	1	L1,L2,L3
R24BS04.4	Interpret the physical meaning of different operators such as gradient, curl and divergence.	3	2	1	L3,L4
R24BS04.5	Estimate the work done against a field, circulation and flux using vector calculus.	3	2	1	L4,L5

SYLLABUS

UNIT- I: Differential equations of first order and first degree **10 Hours**

Formation of differential equations, order, degree, separation of variables (only Review). Linear differential equations-Bernoulli's equations-Exact equations and equations reducible to exact form.

Applications: Newton's Law of cooling – Law of natural growth and decay, Electrical circuits (RL and LC). **COs-CO1**

Self-Learning Topic: Mixed tank problems

UNIT- II: Higher order Linear differential equations with Constant Coefficients **10 Hours**

Definitions, homogenous and non-homogenous, complimentary function, particular integral $\left(e^{ax}, \sin ax, \cos ax, \text{Polynomial in } x, e^{ax}V(x), xV(x)\right)$, general solution, Wronskian, method of variation of parameters. **COs-CO2**

Applications: L-C-R Circuit problems

Self-Learning Topic: Simple Harmonic motion

UNIT–III: Partial Differential Equations **10 Hours**

Introduction and formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions, solution of first order linear equations using Lagrange's method. Homogenous Linear Partial differential equations with constant coefficients. **COs-CO3**

Self-Learning Topic: Method of Separation of Variables

UNIT- IV: Vector differentiation **10 Hours**

Vector, Scalar, dot product, cross product, unit vector, equation of a line passing through two points (Review only)

Scalar and vector point functions, vector operator del, del applies to scalar point function-Gradient, del applied to vector point function – Divergence and Curl, Vector Identities **COs-CO4**

Application: Scalar Potential

Self-Learning Topic: Equation of tangent plane and Normal plane.

UNIT-V: Vector integration **10 Hour**

Line integral – circulation – work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof). **COs-CO5**

Self-Learning Topic: Application of above theorems.

Board of Studies: Basic Science and Humanities
Approved in BOS No: 01, 2nd August, 2024
Approved in ACM No: 01

Text Books:

1. B.S.Grewal, Higher Engineering Mathematics, 44/e, Khanna publishers, 2017.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2018.

Reference Books:

1. Dennis G. Zill and Warren S. Wright, Advanced Engineering Mathematics, Jones and Bartlett, 2018.
2. Michael Green berg, Advanced Engineering Mathematics, 9th edition, Pearson edn
3. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 14/e, Pearson Publishers, 2018.
4. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 5/e, Alpha Science
5. International Ltd., 2021 (9th reprint).
6. B.V. Ramana, Higher Engineering Mathematics, McGraw Hill Education, 2017.

Web References:

1. http://onlinecourses.nptel.ac.in
2. https://nptel.ac.in/courses/111105121
3. https://onlinecourses.nptel.ac.in/noc24_ma86/course

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1(%)	Internal Assessment #2(%)
L1	30	10
L2	30	10
L3	40	30
L4	--	25
L5	--	25
Total (%)	**100**	**100**

Sample Short and Long Answers questions of Various Cognitive Levels

UNIT-I

1. Define Leibnitz's linear differential equation(L1)
2. State Newton's law of cooling(L1)
3. Write differential equation of L-R series circuit (L1)
4. solve the differential equation $\left(1+x^2\right)\frac{dy}{dx}+2xy=4x^2$ (L2)
5. If the temperature of the air is 30^0C and the substance cools from 100^0C to 70^0C in 15 minutes, find when the temperature will be 40^0C (L3)
6. The rate at which bacteria multiply is proportional to the instantaneous number present. If the original number doubles in two hours, then it will triple after ….hours (L3)

UNIT-II

1. Define Wronskian (L1)
2. solve the differential equation $\frac{d^2y}{dx^2}-6\frac{dy}{dx}+13y=8e^{3x}\sin 2x$ (L2)
3. An inductance of 2 henries and a resistance of 20 ohms are connected in series with e.n.f. E volts. If the current is zero when $t=0$. Find the current at the end of 0.01 seconds if E=100 volts. (L3)

UNIT-III

1. State Lagrange's Linear equation (L1)
2. form a partial differential equation by eliminating the arbitrary function φ from $lx+my+nz=\varphi\left(x^2+y^2+z^2\right)$ (L2)
3. solve $\frac{\partial^3 z}{\partial x^3}-2\frac{\partial^3 z}{\partial x^2\partial y}=2e^{3x}+3x^2y$ (L2)
4. Solve $\left(mz-ny\right)\frac{\partial z}{\partial x}+\left(nx-lz\right)\frac{\partial z}{\partial y}=ly-mx$ (L3)

UNIT-IV

1. The temperature of points in space is given by $T\left(x,y,z\right)=x^2+y^2-z.$ A mosquito located at $\left(1,1,2\right)$ desires to fly in such a direction that it will get warm as soon as possible. In what direction should it move? (L3)
2. Show that $\nabla^2\left(r^n\right)=n\left(n+1\right)r^{n-2}$ (L4)

UNIT-V

1. Evaluate $\iiint_v \nabla.\vec{F}dV$, where $\vec{F}=4x\hat{i}-2y^2j+z^2k$ and V is bounded by $x^2+y^2=4, z=0$ and $z=3$ (L4)
2. Evaluate $\int_C\left(3x^2-8y^2\right)dx+\left(4y-6xy\right)dy$ where C is the curve bounded by $y=\sqrt{x}$ and $y=x^2$ (L5)

Chairperson
Board of Studies (Mathematics)

R24BS02 **Engineering Physics** **3 0 0 3**
(Common to all Branches)

Course Objectives:

1. To bridge the gap between the physics in school at 10+2 level and UG level engineering courses.
2. To identify the importance of the optical phenomenon i.e. interference and diffraction related to its engineering applications.
3. To understand the mechanism of emission of light, utilization of lasers as coherent light sources for low and high energy applications.
4. To enlightening the periodic arrangement of atoms in crystalline solids and classify various crystal systems.
5. To explain the significant concepts of dielectric and magnetic materials that leads to potential applications in the emerging micro devices.
6. To enlightenment of the concepts of quantum mechanics and to provide fundamentals of de-Broglie matter waves and the importance of free electron theory for metals.
7. To understand the physics of semiconductors and identify the type of semiconductor using Hall Effect.

At the end of the course, students will be able to:

Course Code	Course Outcomes	Mapping with Pos			Dok
		PO1	PO2	PO12	
R24BS02.1	Analyze the intensity variation of light due to interference, diffraction and classify various types of lasers.	3	2	1	L1 ,L2, L3
R24BS02.2	Identify various crystal systems and analyze the crystalline structure.	3	2	1	L1, L2, L3
R24BS02.3	Summarize various types of polarization of dielectrics and classify the magnetic materials.	2	2	1	L2, L3
R24BS02.4	Explain fundamentals of quantum mechanics and apply to one dimensional motion of particles.	3	2	2	L1, L4
R24BS02.5	Outline the properties of charge carriers in semiconductors	3	2	1	L2, L5

SYLLABUS

UNIT-I: Wave Optics and Lasers **14 Hours**

Interference: Introduction - Principle of superposition –Interference of light - Interference in thin films (Reflection Geometry) & applications - Colors in thin films- Newton's Rings- Determination of wavelength and refractive index.

Diffraction: Introduction - Fresnel and Fraunhofer diffractions - Fraunhofer diffraction due to single slit- Fraunhofer diffraction due to N-Slits -Diffraction Grating - Dispersive power and resolving power of Grating (Qualitative).

Lasers: Introduction - Characteristics of laser - Spontaneous and Stimulated emissions of radiation - Population inversion - Lasing action - Pumping mechanisms - Ruby laser - He-Ne laser- Applications of lasers. **COs–CO1**

Self-Learning Topics: Interference in thin films due to Transmission of light

UNIT-II: Crystallography and X-ray diffraction **10 Hours**

Crystallography: Space lattice, Basis, Unit Cell and lattice parameters - Bravais Lattices - crystal systems (3D) - coordination number - packing fraction of SC, BCC & FCC - Miller indices - separation between successive (hkl) planes.

X-ray diffraction: Bragg's law - X-ray Diffraction - Crystal structure determination by Laue's and Powder methods. **COs–CO2**

Self-Learning Topics: Effect of crystallite size on diffracted X-Ray intensity

UNIT-III: Magnetic and Dielectric Materials **12 Hours**

Magnetic Materials: Introduction - Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability - Atomic origin of magnetism - Classification of magnetic materials: Dia, para, Ferro, anti-ferro& Ferri magnetic materials - Domain concept for Ferromagnetism & Domain walls (Qualitative) - Hysteresis - soft and hard magnetic materials.

Dielectric Materials: Introduction - Dielectric polarization - Dielectric polarizability, Susceptibility, Dielectric constant and Displacement Vector - Relation between the electric vectors - Types of polarization- Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative) - Lorentz internal field - Clausius- Mossotti equation - dielectric loss. **COs–CO3**

Self-Learning Topics: Frequency dependence of polarization.

UNIT-IV: Quantum Mechanics and Free electron theory **12 Hours**

Quantum Mechanics: Dual nature of matter - Heisenberg's Uncertainty Principle - Significance and properties of wave function - Schrodinger's time independent and dependent wave equations - Particle in a one-dimensional infinite potential well.

Free Electron Theory: Classical free electron theory (Qualitative with discussion of merits and demerits) - Quantum free electron theory - electrical conductivity based on quantum free electron theory - Fermi-Dirac distribution - Fermi energy. **COs– CO4**

Self-Learning Topics: Density of states, Origin of energy bands in solids

UNIT-V: Semiconductors **8 Hours**

Semiconductors: Formation of energy bands - classification of crystalline solids - Intrinsic semiconductors: - Fermi level - Extrinsic semiconductors- P-Type semiconductors- N-Type semiconductors- Principle of operation and Characteristics of P-N Junction diode - Drift and diffusion currents - Einstein's equation - Hall Effect and its applications. **COs-CO5**

Self-Learning Topics: Zener diode, Solar cells

Board of Studies : Department of Physics
Approved in BOS No: 01, 5th August, 2024
Approved in ACM No: 01

Textbooks:

1. A Text book of Engineering Physics - M. N. Avadhanulu, P.G. Kshirsagar& TVS Arun Murthy, S. Chand Publications, 11th Edition 2019.
2. Introduction to Quantum Mechanics, David J. Griffiths, Pearson Education India Learning Private Limited (2015).
3. Laser Fundamentals, William T. Silfvast, 2nd edn, Cambridge University press, New York (2004).
4. Introduction to Solid State Physics, 8 th Edition, Charles Kittel, John Wiley & Sons, NJ,

USA (2005).
5. Engineering Physics - D.K. Bhattacharya and Poonam Tandon, Oxford press (2015).
6. Semiconductor Physics and Devices:Basic principle, Donald A. Neamen 4th ed,, McGraw-Hill, New York (2012).

Reference Books:

1. Engineering Physics - B.K. Pandey and S. Chaturvedi, Cengage Learning.
2. The Principles of Quantum Mechanics, P. A. M. Dirac, fourth Edition (Oxford University Press, Oxford, 1958).
3. Physics-Resnick, Halliday, Krane, Fifth edison, Volume-1, Wiley student edition.
4. Engineering Physics - Dr.R. Swapna, Scientific International Publishing House.
5. Concepts of Modern Physics. Arthur Beiser, Tata McGraw-Hill, New Delhi (2010).
6. Engineering Physics" - Sanjay D. Jain, D. Sahasrabudhe and Girish, University Press.
7. Engineering Physics - M.R. Srinivasan, New Age international publishers (2009).

Web References:

1. https://www.ebooksdirectory.com/
2. http://www.sciencedirect.com/Science
3. https://onlinecourses.nptel.ac.in/
4. https://www.link.springer.com/physics/
5. https://www.loc.gov/rr/scitech/selected-internet/physics.html

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1(%)	Internal Assessment #2(%)
L1	40	20
L2	30	30
L3	30	--
L4	--	30
L5	--	20
Total (%)	**100**	**100**

Sample Short and Long Answers questions of Various Cognitive Levels

UNIT-1

1. Define interference? What are the necessary conditions for obtaining interference of light? (L1)
2. Explain interference in thin films due to reflected light. What are the conditions to obtain the maximum and minimum intensities in the reflected light? (L2)
3. Describe the principle and formation of Newton's rings and give a method to determine the radius of nth dark ring, radius of curvature (R) of plano convex lens and radius of nth dark ring. (L1,L3)
4. What is meant by diffraction? Distinguish between Fresnel and Fraunhofer diffraction. (L1)
5. Discuss Fraunhofer diffraction due to single slit and derive an expression for width of the central maxima? (L2,L3)
6. What is meant by stimulated emission. Describe Lasing action. (L1,L2)
7. Describe the construction and working of He-Ne Laser. (L1)

UNIT-2

1. Define the terms space lattice, basis, unit Cell, lattice parameters, bravais Lattice, atomic radius and coordination number. (L1)

2. Illustrate the SC, BCC and FCC crystal structures. (L3).
3. Explain body centered cubic (BCC) and determine the packing fraction of BCC. (L2,L3)
4. Explain body centered cubic (FCC) and determine the packing fraction of FCC. (L2,L3)
5. Classify the seven crystal systems and write the relationship between lattice parameters in various crystal systems. (L2)
6. What are the Miller indices? How are they obtained? (L1)
7. What are the important features of Miller indices? Draw the planes (100), (101) (110) (010) and (111), (123). (L1)
8. State and explain Bragg's law. (L2)
9. Describe the LAUE method for determination of crystal structure. (L2)

.UNIT-3

1. Define the terms magnetic dipole moment and magnetic susceptibility, magnetization, permeability, dielectric flux density and magnetic field intensity. (L1)
2. Summarize various types of polarization of dielectrics. (L2)
3. Show that $\mu r = 1 + \chi$. (L3)
4. Describe the origin of magnetic moment of an atom. (L1)
5. Explain the domain concept of ferromagnetism based on Hysteresis loop (B-H Curve). (L2)
6. Describe soft and hard magnetic materials? (L1)
7. What is meant by internal field or local field or Lorentz field? Derive an expression for internal field. (L1, L3)
8. Derive Clausius-Mosotti relation in dielectrics subjected to static fields. (L3)

UNIT-4

1. Discuss the de-Broglie's hypothesis. Show that $\lambda = h / \sqrt{2mE}$ (L1, L4)
2. Show that the wavelength of an electron accelerated by potential differences $\lambda = \frac{1.227}{\sqrt{V}} nm$. (L3)
3. What are the matter waves? Explain the properties of matter waves. (L1)
4. What is the physical significance of wave function ψ.(L4)
5. Derive the time independent and dependent Schrodinger wave equation. (L4)
6. Describe the particle in 1 dimensional infinite potential box. (L1)
7. Explain Heisenberg uncertainty principle? (L4)
8. Find the energy required to jump an electron from ground state to the second excited state in a metal.(L1),
9. Define the terms (i) mean free path (ii) drift velocity (iii) relaxation time. (L1)
10. What are the success and draw backs of classical free electron theory of metals. (L1)
11. Derive an expression for electrical conductivity on the basis of quantum free electron theory of metals. (L3)
12. What is Fermi level? Explain Fermi-Dirac distribution function (FDD) of the electrons. (L1, L4)

UNIT-5

1. Explain the classification of solids (conductors, semiconductors and insulators (L5).
2. What are the differences between intrinsic and extrinsic semiconductors? (L2)
3. Explain N-Type and P-Type semiconductors. Indicate on an energy level diagram the donor and acceptor level for intrinsic and extrinsic semiconductors. (L5)
4. Explain the characteristics of P-N Junction diode. (L5)

5. Describe the diffusion current and drift current in a semiconductor. (L2)
6. Derive an expression for Einstein's equation by using drift and diffusion currents. (L5)

7. What is Hall Effect? Identify the type of semiconductor using Hall effect and derive an expression for Hall coefficient. (L2, L3).
8. Write the applications of Hall Effect. (L1)

Chairperson
Board of studies (Physics)

R24HS01 COMMUNICATIVE ENGLISH 2 0 0 2

(Common to CSE, CSE-AI & ML, CSD Branches in Semester-I)

(Common to EEE, MECH & ECE in Semester-II)

Course Objectives:

1. To identify the English Communication Skills among the first year B.Tech students and to initiate measures to bridge the gap.
2. To enlighten the students on the necessity of cultivating good language habits through practising LSRW skills.
3 To explain them various topics of grammar and the importance of being grammatically correct in speech and writing.
4 To make them practise Phonetics and impart the nuances of fine speech.
5 To instruct them about the various types of format related to writing letters, paragraph, emails, essays and reports.
6 To make them appreciate English text and deepen their comprehension through reading of textual and non-detailed topics.

At the end of the course, students will be able:

Course Code	Course Outcomes	Mapping with POs			Dok
		PO9	PO10	PO12	
R24HS01.1	To utilize the text, online resources, and other social, and real time situations with an aim to practice Communicative English	1	3	2	L2, L4
R24HS01.2	To apply grammatical knowledge for speaking, and writing purposes	2	3	1	L3, L6
R24HS01.3	To analyze and practice various devices of speech for effective conversation and presentations	2	3	1	L4, L6
R24HS01.4	Appraising the language competence of the learners and suggesting remedial action	2	3	1	L3,L5
R24HS01.5	To make the learners practice writing tasks which are relevant for job training and academic purposes.	1	2	3	L3,L6

SYLLABUS

UNIT-I **12 Hours**

Lesson: HUMAN VALUES: A Power of a Plate of Rice by Ifeoma Okoye (Short story)

Listening: Identifying the topic, the context and specific pieces of information

By listening to short audio texts and answering a series of questions.

Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.

Reading: Skimming to get the main idea of a text; scanning to look for specific pieces of information.

Writing: Mechanics of Writing-Capitalization, Spellings, Punctuation-Parts of Sentences.

Grammar: Parts of Speech, Basic Sentence Structures-forming questions

Vocabulary: Synonyms, Antonyms, Affixes (Prefixes/Suffixes), Root words. **COs-C01**

Self learning topics : The Great Indian Scientists-Biography of CV Raman

UNIT-II **10 Hours**

Lesson: NATURE: Night of the Scorpion by Nissim Ezekiel (Indian and contemporary)

Listening: Answering a series of questions about main ideas and supporting ideas after listening to audio texts.

Speaking: Discussion in pairs/small groups on specific topics followed by short structure talks.

Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.

Writing: Structure of a paragraph - Paragraph writing (specific topics)

Grammar: Cohesive devices-linkers, use of articles and zero article prepositions.

Vocabulary: Homonyms, Homophones, Homographs. **COs-C02**

Self learning Topics : Seven Ages of Man by William Shakespeare.

UNIT-III **12 Hours**

Lesson: BIOGRAPHY: Steve Jobs

Listening: Listening for global comprehension and summarizing what is listened to.

Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed

Reading: Reading a text in detail by making basic inferences-recognizing and interpreting specific context clues; strategies to use text clues for comprehension.

Writing: Summarizing, Note-making, paraphrasing

Grammar: Verbs-tenses; Subject-verb agreement; Compound words, Collocations

Vocabulary: Compound words, Collocations **COs-C03**

Self learning topics: Elon Musk

UNIT-IV **8 Hours**

Lesson: INSPIRATION: The Knowledge Society by APJ Abdul Kalam (Ignited minds)

Listening: Making predictions while listening to conversations/ transactional dialogues without video; listening with video.

Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.

Reading: Studying the use of graphic elements in texts to convey information, reveal trends/ patterns / relationships, communicate processes or display complicated data.

Writing: Letter Writing: Official Letters and Resumes

Grammar: Reporting verbs, Direct & Indirect speech, Active & Passive Voice

Vocabulary: Words often confused, Jargons **COs-C04**

Self learning Topics: The writings of Sudha Murthy- "The day I stopped drinking milk"

UNIT-V **10 Hours**

Lesson: MOTIVATION: The Power of Intra personal Communication (An Essay)

Listening: Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension.

Speaking: Formal Oral Presentation topics from academic contexts

Reading: Reading comprehension.

Writing: Writings structured essays on specific topics.

Grammar: Editing short texts –identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject-verb agreement)

Vocabulary: Technical Jargons **COs-C05**

Self learning Topics: Body Language (Allan Pease)

Board of Studies : ENGLISH
Approved in BOS No: 6th August, 2024
Approved in ACM No: 01

Textbooks:

1. Pathfinder: Communicative English for Undergraduate Students, 1stEdition,Orient BlackSwan, 2023 (Units 1,2,3 &5)
2. Empowering English by Cengage Publications, 2023
3. The Great Indian Scientists-Cengage Publications
4. English Essentials- Maruthi Publications.(Unit 4)

Reference Books:

1. P. Elian : A Hand book of English for Engineers and Technologists,
2. Bailey, Stephen. Academic writing: A Handbook for International Students. Routledge, 2014.
3. Murphy Raymond English Grammar in Use, Fourth Edition, Cambridge University Press, 2019.
4. English for Engineers by Shyam Ji Dubey- Vikas Publishing House

Web References:

1. www.bbc.co.uk/learningenglish
2. https://dictionary.cambridge.org/grammar/british-grammar/
3. www.eslpod.com/index.html
4. https://www.learngrammar.net/
5. https://english4today.com/english-grammar-online-with-quizzes/
6. https://www.talkenglish.com/grammar/grammar.aspx
7. https://www.youtube.com/c/DailyVideoVocabulary/videos
8. https://www.youtube.com/channel/UC4cmBAit8i_NJZE8qK8sfpA

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1(%)	Internal Assessment #2(%)
L1	25	25
L2	25	25
L3	15	15
L4	15	15
L5	10	10
L6	10	10
Total (%)	**100**	**100**

Sample Short and Long Answers questions of various cognitive levels

UNIT-I

1. List the major characters in the story.
2. How did the family financial circumstances affect narrator's behaviour and relationship with her family and students?
3. What are the different types of reading?
4. How to avoid errors in spellings and enlist few steps for vocabulary development?
5. What are the different parts of speech?

UNIT-II

1. Write the summary of the poem Night of the Scorpion?
2. How does the ruler setting serve as a perfect background for the programme?
3. Describe the superstitious beliefs and practices mentioned by writer Nissim Ezekiel in his poem.
4. Write a paragraph on Artificial intelligence
5. Write about Definite and In-definite articles with examples?

UNIT-III

1. How did informal jobs and formal education influence his career?
2. Sketch the biography of Elon Musk.
3. List three steps to effective note making.
4. Can technological advancements address the pressing human problems like climate change and disease prevention?
5. Can you come up with creative ideas to match the technological vision of Elon Musk for our humanity?

UNIT-IV

1. What are the various resources of knowledge that Abdul Kalam points out in the knowledge society?
2. What are three main objectives which need to be realized for India to become a Super Power?
3. How ancient Indian knowledge systems have informed the world over centuries?
4. What does it take according to Dr.Kalam for India to become a Knowledge Society?
5. What message can students import from Knowledge Society?

UNIT-V

1. Write the difference between Inter personal communication and Intra personal communication?
2. Mention the different ways through which Intra personal communication helps to improve every day's life.
3. What do you mean by non-verbal communication? Discuss the various types of non-verbal communication.
4. What is the most important type of non-verbal communication, justify your answer?
5. How to make an effective presentation?

Chairperson
Board of Studies (English)

R24ES01 BASIC CIVIL AND MECHANICAL ENGINEERING 3 0 0 3
(COMMON TO ALL BRANCHES)

Course Objectives:

1. **Understand the Role of Civil Engineers**: Familiarize students with the roles and responsibilities of civil engineers in society and the various sub-disciplines within civil engineering.
2. **Construction Materials**: Provide knowledge about different construction materials such as cement, aggregates, bricks, concrete, steel, soil, stones and their applications in building construction.
3. **Transportation Engineering**: Offer insights into the importance of transportation engineering for national economic development and the fundamentals of highway pavements, harbor, tunnel airport and railway engineering.
4. **Water Resources and Environmental Engineering**: Cover the basics of water sources, water quality specifications, hydrology, rainwater harvesting, and water storage structures, emphasizing their importance in environmental sustainability.
5. **Scope and Importance of Mechanical Engineering**: Familiarize students with the scope and significance of mechanical engineering in various sectors, including energy, manufacturing, automotive, aerospace and marine industries.
6. **Engineering Materials and Manufacturing Processes**: Explain different engineering materials and various manufacturing processes and computational manufacturing.
7. **Thermal Engineering**: Provide an overview of thermal engineering principles, including the working of boilers, IC engines, and power plants, and introduce concepts related to electric and hybrid vehicles.
8. **Mechanical Power Transmission Systems**: Describe different mechanical power transmission systems such as belt drives, chain drives, gear drives, and their applications.
9. **Basics of Robotics**: Introduce the basics of robotics, including joints, links, configurations, and applications, along with advancements in robotics technology.

Course Code	Course Outcomes	Mapping with POs and PSOs						Dok
		PO1	PO2	PO3	PO5	PO9	PO12	
R24ES01.1	Understand the role of civil engineers in various disciplines, the scope of each discipline, and the materials used in building construction and principles of surveying.	3	-	1	-	2	1	L1
R24ES01.2	Describe the fundamentals of transportation engineering, water resources, and environmental engineering, including highway pavements, water quality, hydrology, and water storage structures.	3	1	1	1	1	-	L2, L3
R24ES01.3	Understand and apply different manufacturing processes and engineering materials, including	3	2	1	2	2	2	L1

	their applications, and basic mechanical design principles.							
R24ES01.4	Explain the basics of thermal engineering, including working principles of engines, power plants, and related thermal cycles, along with their applications.	3	1	1	2	2	2	L1,L2
R24ES01.5	Describe the working of different mechanical power transmission systems and the basics of robotics and their applications.	3	1	1	2	1	2	L2, L3

SYLLABUS

UNIT I **10 Hours**

Role of Civil Engineers in Society, Various Disciplines of Civil Engineering, Structural Engineering, Geo-technical Engineering, Transportation Engineering, Hydraulics and Water Resources Engineering, Environmental Engineering, Scope of Each Discipline, Building Construction and Planning, Construction Materials Cement, Aggregate, Bricks, Cement Concrete-Steel, soils and stones. Introduction to Prefabricated construction Techniques.

Surveying: Objectives of Surveying, Horizontal Measurements, Angular Measurements, Introduction to Bearings Simple problems on bearings-Contour mapping.

Self-Learning Topic: Advancements in Prefabricated Construction Techniques **COs: CO1**

UNIT II **15 Hours**

Transportation Engineering: Importance of Transportation in Nation's economic development, Types of Highway Pavements, Flexible Pavements and Rigid Pavements, Simple Differences. Basics of Harbor, Tunnel, Airport, and Railway Engineering

Water Resources and Environmental Engineering: Introduction, Sources of water, Quality of water, Specifications, Introduction to Hydrology, Rainwater Harvesting, Water Storage and Conveyance Structures (Simple introduction to Dams and Reservoirs).

Self-Learning Topic: Sustainable Transportation Engineering **COs: CO2**

UNIT-III: **12 Hours**

Introduction to Mechanical Engineering: Role of Mechanical Engineering in Industries and Society Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors.

Basic Mechanical Design Principles: Fundamentals of Mechanical Design- Introduction to the design process, understanding design requirements, and conceptual design, Design of Simple Machine Components - Design considerations for basic machine components like shafts, bearings, gears, and fasteners.

Engineering Materials – Metals - Ferrous and Non-ferrous, Ceramics, Composites, Smart materials**.**

Self-Learning Topics: Sustainable Engineering Practices, Advancements in Smart Materials.

COs: CO3

UNIT- IV: **12 Hours**

Thermal Engineering– Working principle of Boilers

Cycles- Otto cycle, Diesel cycle, Refrigeration and air conditioning cycles,

Engines- IC engines, 2-Stroke and 4-Stroke engines, SI/CI Engines,

Power plants – Working principle of Steam, Diesel, Hydro, Nuclear power plants, Introduction to Electric and Hybrid Vehicles.

Self-Learning Topics: Advanced Engine Technologies, Thermodynamics in Renewable Energy Systems. **COs: CO4**

UNIT – V: 12 Hours

Manufacturing Processes: Principles of Casting, Forming, joining processes,

Computational Manufacturing: Introduction to CNC machines, 3D printing, and Smart manufacturing.

Machining – Conventional & Non-Conventional,

Mechanical Power Transmission - Belt Drives, Chain, Rope drives, Gear Drives and their applications.

Introduction to Robotics - Joints & links, configurations, and applications of robotics.

Self-Learning Topics: Additive Manufacturing Technologies, Innovations in Mechanical Power Transmission **COs: CO5**

Text Books:

1. Basic Civil and Mechanical Engineering, by Ommi Srikanth, M. Sreenivasa Reddy S. Chand Publications
2. Internal Combustion Engines by V.Ganesan, By Tata McGraw Hill publications (India) Pvt. Ltd.
3. A Tear book of Theory of Machines by S.S. Rattan, Tata McGraw Hill Publications, (India) Pvt. Ltd.
4. An introduction to Mechanical Engg by Jonathan Wicker and Kemper Lewis, cengage learning India pvt. Ltd.

Reference Books:

1. AppuuKuttan KK, Robotics, I.K. International Publishing House Pvt. Ltd. Volume-I
2. 3D printing & Additive Manufacturing Technology- L. Jyothish Kumar, Pulak M Pandey, Springer publications
3. Thermal Engineering by Mahesh M Rathore Tata Mcgraw Hill publications (India) Pvt. Ltd.
4. G. Shanmugam and M.S.Palanisamy, Basic Civil and the Mechanical Engineering, Tata Mcgraw Hill publications (India) Pvt. Ltd.

Board of Studies: Mechanical Engineering
Approved in BOS No: 01, 31st July, 2024
Approved in ACM No: 01

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	50	30
L2	30	50
L3	20	20
Total (%)	**100**	**100**

Sample Short and Long Answers questions of Various Cognitive Levels

Basic Civil Engineering

L1: Remember

1. List out components of building.
2. Steps in preparation of bricks cement.
3. Explain various requirements of building
4. Write various principles in building planning
5. Write qualities of goods bricks
6. Write uses of concrete
7. What are types in soils.
8. Write about pre-fabricated structures.
9. What are the uses of surveying
10. What are types in surveying
11. Write about closed traverse and open traverse
12. Write about bearings and meridian.
13. What is contour mapping.
14. Write about flexible and rigid pavements.
15. What is runway
16. Write about dams and reservoirs
17. Write the sources of water

1. What are the main roles of mechanical engineering in different industries?
2. Define basic mechanical design principles.
3. List the types of engineering materials covered in this unit.
4. What are the key differences between ferrous and non-ferrous metals?
5. Name three applications of smart materials.
6. What is the working principle of a boiler?
7. Define the Otto cycle and Diesel cycle.
8. What are the key differences between 2-Stroke and 4-Stroke engines?
9. List the types of power plants covered in this unit.
10. Name a major advantage of electric vehicles over conventional vehicles.
11. What are the basic principles of casting in manufacturing processes?
12. Define CNC machining and its basic applications.
13. List the types of mechanical power transmission systems discussed in this unit.
14. What are the key differences between conventional and non-conventional machining?
15. Name the main components of a robotic system.

L2: Understand

1. Explain the process of designing a simple machine component like a shaft.
2. Describe the role of mechanical engineering in the aerospace sector.
3. Compare the properties of ceramics and composites used in engineering.
4. Discuss the importance of understanding material properties in mechanical design.
5. Summarize the technological advancements in smart materials.
6. Explain the basic operation of an IC engine.
7. Describe the differences between refrigeration and air conditioning cycles.
8. Compare the working principles of steam and hydro power plants.
9. Discuss the role of hybrid vehicles in reducing energy consumption.

10. Summarize the working principles of the Diesel cycle and its applications.
11. Explain the process of CNC machining and its advantages.
12. Describe the principles of gear drives and their applications in mechanical systems.

L3: Apply

1. Analyze the role of civil engineering in society.
2. Understanding the various disciplines of civil engineering.
3. Evaluate the use of materials in construction.
4. Create a case study on a recent innovation in civil engineering like prefabricated structures.
5. Apply the principles of the surveying to determine different measurements.
6. Solve problems related to bearings
7. Compare the flexible pavement and rigid pavements.
8. Evaluate the benefits water supply system.
9. Evaluate the benefits of dams.
10. Design a rain water harvesting.
11. Apply the basic mechanical design principles to design a simple gear system.
12. Using the properties of different engineering materials, suggest a suitable material for a specific mechanical component.
13. Design a basic component considering the design requirements and material properties.
14. Analyze how advancements in smart materials can impact the design of mechanical components.
15. Apply knowledge of engineering materials to solve a problem in a real-world mechanical system.
16. Apply the principles of thermal engineering to analyze the efficiency of a steam power plant.
17. Using the Otto cycle, calculate the performance parameters for a given engine setup.
18. Design a basic model of a hybrid vehicle considering its power source and energy efficiency.
19. Apply the knowledge of refrigeration cycles to improve the efficiency of a cooling system.
20. Analyze the impact of different thermal cycles on the performance of an IC engine.
21. Apply the principles of CNC machining to design a simple component.
22. Design a mechanical power transmission system for a specific application, considering the required drives and components.

Chairperson
Board of Studies (ME)

R24ECPC01 **NETWORK ANALYSIS** **3 0 0 3**

Course Objectives:

1. To introduce basic laws, mesh & nodal analysis techniques for solving electrical circuits
2. To impart knowledge on applying appropriate theorem for electrical circuit analysis
3. To explain transient behavior of circuits in time and frequency domains
4. To teach concepts of resonance & to know Basic Concepts of Filters
5. To introduce open circuit, short circuit, transmission, hybrid parameters and their inter relationship

Course Code	Course Outcomes	Mapping with POs and PSOs							DoK
		PO1	PO2	PO4	PO6	PO8	P012	PS02	
R24ECPC01.1	Understand basic electrical circuits with nodal and mesh analysis	3	3	3	1	1	1	1	L1, L2
R24ECPC01.2	To impart Knowledge on applying appropriate theorem for electrical circuit analysis	3	3	3	1	1	1	1	L2,L3
R24ECPC01.3	Explain phasor diagrams for R, R-L, R-C and R-L-C circuits and Teach Concept of Resonance	2	3	2	1	1	1	1	L4
R24ECPC01.4	Find Transient response and steady response of a network	2	3	2	1	1	1	-	L2, L4
R24ECPC01.5	Analyze the behavior of magnetically coupled circuits, two port network and calculate various parameters of two port network	3	2	1	1	1	1	-	L1,L5

SYLLABUS

UNIT-I: Introduction to Electrical Circuits **12 Hours**

Electric Charge, Electric current, Voltage, Ohm's law, Classification of circuit elements, Current and Voltage division rules, Network Reduction Techniques in both Series and Parallel Combination of Elements, Source Transformation Techniques, Nodal Analysis and Mesh Analysis in both A.C. and D.C. Networks with Dependent and Independent Sources, Problem **COs – CO1**

Self-Learning Topics: Basic Components of R, L, C, KCL & KVL laws

UNIT-II: Network Theorems **10 Hours**

Superposition Theorem, The venin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem, Reciprocity Theorem, Millliman's Theorem and Compensation Theorem., Problem Solving. **COs – CO2**

Self-Learning Topics: Tellegen's Theorem

UNIT-III: Steady State Analysis of AC Circuits & Resonance **12 Hours**

AC circuit analysis for R, L, C, series R-L, R-C, and R-L-C circuits and their respective phasor diagrams, Active, Reactive, Apparent and complex powers, power factor, Average, Effective values, Peak factor, and Form factor of various AC waveforms and functions ,Impedance concept, phase angle, series R-L, R-C, R-L-C circuits problem solving.

Resonance: Series Resonance: Q-factor, selectivity and bandwidth, expression for half power frequencies; Parallel resonance: Q-factor, selectivity and bandwidth, Basic Types of Active & Passive Filters. **COs – CO3**

Self-Learning Topics: Realization of RLC Networks & Practical applications of Resonance

UNIT-IV: Transients **12 Hours**

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. **COs –CO4**

Self-Learning Topics: Complex and Polar Form of Representation, Transient Response of RC Circuit for Impulse Input

UNIT-V: Coupled Circuits **14 Hours**

Analysis of Magnetically coupled circuits, Series aiding, series opposing, parallel aiding and parallel opposing, and Dot convention

TWO-PORT NETWORKS - Z, Y, h, ABCD parameters of two port networks, Parallel Connection of Two Port Networks, Cascading of Two Port Networks, Series Connection of Two Port Networks, Problem Solving **COs – CO5**

Self-Learning Topics: Inverse Transmission and Inverse Hybrid Parameters

Board of Studies : Electrical and Electronics Engineering

Approved in BOS No: 01, 1st Aug 2024

Approved in ACM No: 01

Text Books:

1. Network Analysis – ME Van Valkenburg, Prentice Hall of India, revised 3rd Edition, 2019.
2. Engineering Circuit Analysis by William H. Hayt, Jack Kemmerly, Jamie Phillips, Steven M. Durbin, 9th Edition 2020.
3. Network lines and Fields by John. D. Ryder 2nd Edition, PHI

Reference Books:

1. D. Roy Choudhury, Networks and Systems, New Age International Publications, 2013.
2. Joseph Edminister and Mahmood Nahvi, Electric Circuits, Schaum's Outline Series, 7thEdition, Tata McGraw Hill Publishing Company, New Delhi, 2017
3. Fundamentals of Electric Circuits by Charles K. Alexander and Matthew N. O. Sadiku, McGraw-Hill Education.

Web Resources:

1. https://nptel.ac.in/courses/108105053
2. https://nptel.ac.in/courses/108108076

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1(%)	Internal Assessment #2(%)
L1 L2	50	50
L3 L4	30	30
L5 L6	20	20

Total (%)	100	100

Sample Short and Long Answers questions of Various Cognitive Levels

L1: Remember

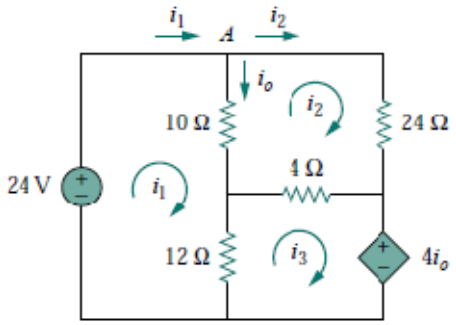
1. Define KCL and KVL?
2. State Super position Theorem and Thevenins Theorem and Nortons Theorem?
3. Define Time Constant of RL and RC circuits?
4. Define Impedance of a RL, RC, and RLC Circuits?
5. Define Resonance and Quality factor and Bandwidth?

L2: Understand

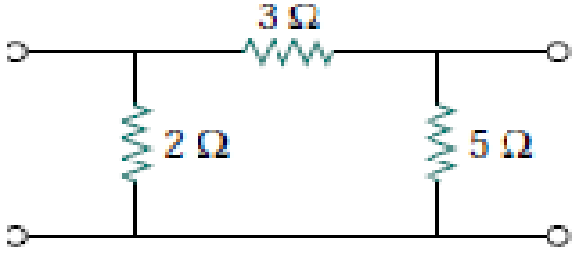
1. Explain the concept of Impedance and Power Factor
2. Explain the Source Transformation?
3. Explain the coefficient of coupling in Magnetic circuits?
4. Explain Self Inductance and Mutual Inductance?
5. State and Explain Z & Y parameters?

L3: Apply

1.Use mesh analysis to find the current i_o in the circuit shown below.



2. A coil of inductance 318.3mH and negligible resistance is connected in series witha 200 Ω resistor to a 240 V, 50 Hz supply. Calculate (i) the inductive reactance ofthe coil (ii) the impedance of the circuit (iii) the current in the circuit (iv)the voltage across each component and (v) the circuit phase angle.
3. When one coil of a magnetically coupled pair has a current 5.0 A the resulting fluxes Φ_{11} and Φ_{12} are 0.2 mWb and 0.4 mWb, respectively. If the turns are N_1= 500 and N_2= 1500, find L_1, L_2, M, and the coefficient of coupling k.
4. Design a series RLC circuit that will have an impedance of 10 **Ω** & at the resonant frequency of ω_0 = 100 rad/s and a quality factor of 80. Find the bandwidth
5. Determine the Z &Y parameters for the circuit shown below



Chairperson
Board of Studies (EEE)

R24HS02 COMMUNICATIVE ENGLISH LAB 0 0 2 1
(Common to CSE, CSE-AI & ML, CSD Branches in Semester-I)
(Common to EEE, MECH & ECE in Semester-II)

Course Objectives:

The main objective of introducing this course, Communicative English Laboratory, is to expose the students to a variety of self-instructional, learner friendly modes of language learning. Students undergo training in basic communication skills to make them into confident communicators in all situations.

At the end of the course, students will be able:

Course Code	Course Outcomes	Mapping with POs			
		PO9	PO10	PO12	Dok
R24HS02.1	Understand and recognize the various facets of English language ability with a focus on the four basic skills- namely -LSRW abilities.	1	3	2	L1
R24HS02.2	Implement various activities for language learners to practise communication skills.	1	2	3	L2
R24HS02.3	To enhance listening and speaking comprehension, analyze the sounds, stress, rhythm, intonation, and syllable division of English speech.	1	3	2	L3
R24HS02.4	Assess the professionalism of students when taking part in group discussions, debates, JAM sessions, Presentations and Interviews.	3	1	2	L4
R24HS02.5	Equipping oneself with Interview Skills and a range of Soft Skills for life and career.	1	3	2	L5

Board of Studies : BS&H- English

Approved in BOS No: 6th August, 2024

Approved in ACM No: 01

SYLLABUS

Week1:

1. To explain and guide the students in decoding the sounds of English.
2. List all the consonant sounds and vowel sounds in English

Week2:

1. What is a syllable and describe the syllable structure.
2. Define stress, functional stress and various rules of stress.
3. What is connected speech?

Week3:

1. What is Intonation and mention the various pitch movements like rise, fall, fall-rise or rise-fall?
2. What is connected speech?

Week4:

1. To equip students to speak in English language confidently without any inhibitions.
2. Why are majority of the companies conducting JAM session as a preliminary interview?

3. What are the key skills tested in JAM round?

Week5:

1. To help students learn and understand different functions of language like greeting, asking
2. For information, giving information, meetings, requests, exchanging dialogues in formal and informal contexts.
3. Introduce yourself and others, give instructions and directions

Week 6:

1. To help the students understand and work on the digital age connector for personal correspondence, business communication, etc.
2. Write about email etiquette.
3. Draft an email to the HR Manager of Wipro Technologies requesting to consider your application for the post of Software Engineer.

Week 7:

1. To update students about the importance of Resume, the various types and the essentials of an effective resume
2. Draft a resume for a software post in reputed organization.

Week 8:

1. To educate students about the various styles of writing formal letters.
2. What is a cover letter? What are the different types of cover letters?
3. Write a job application letter for any post of your choice in a reputed company?

Week 9:

1. To help students know the importance of an SOP in their professional advancements?
2. What is an SOP and what are the different kinds and parts of an SOP?
3. Prepare an SOP to apply for a Master's Programme in any University of your choice.

Week 10:

1. To educate and guide the students about presentation skills and its importance in the technical evolving world.
2. To inform explain students about the importance of body language in various personal and professional forums
3. To help students to present papers, PPT's in seminars, workshops, conferences, research projects, interviews, etc.

Week 11:

1. To help students to give effective PPT's in various academic and professional platforms.
2. Describe various aspects that make PPT more effective.
3. Make a PPT on any topic of your choice and present it to the class.

Week 12:

1. To foster, creative, critical thinking skills, analytical skills and problem solving skills.
2. Suggest a few tips for preparing a poster.
3. Prepare posters from or outside your curriculum.

List of Activities:

1. Sounds of English (Vowels and Consonants) **COs: CO1,CO2**
2. Neutralization and Accent Rules **COs: CO1,CO2**
3. Improving communication skills /JAM. **COs: CO3,CO4**

4. Letter Writing and E-mail Writing **COs: CO1,CO2**
5. Cover letters and Resume Writing **COs: CO1,CO2**
6. Statement of Purpose. **COs: CO1,CO2**
7. Debates **COs: CO4:CO5**
8. Presentation skills- PPT and Poster **COs: CO4:CO5**
9. Group Discussions , types and practice **COs: CO4,CO5**
10. Interview skills – Mock interviews **COs: CO4,CO5**

Reference Books:

1. Prof. M. Hari Prasad, Prof. Vijaya Babu, Prof. Padmaja Kalapala, Skill Craft – A Communicative English Laboratory Workbook, Maruthi Publications first Edition, 2023
2. Meenakshi Ramana, Sangeeta-Sharma, 4thEdition, Technical Communication, Oxford Press, 2022.
3. Grant Taylor: English Conversation Practice, 1st Edition, Tata ,Mc Graw-Hill Education India, 2001.
4. Hewing,s, Martin, Cambridge Academic English(B2), Cambridge University Press,2012.
5. T. Balasubramanyam, A Textbook of English Phonetics for Indian Students, 3rd Edition, Trinity, 2022.
6. Dr. ShaliniSharma's Body Language Your Success Mantra, S. Chand publications 2010.
7. Sunitha Mishra and C.Murali Krishna's Communication Skills for Engineers Pearson Education Edition 2009.

Suggested software:

- English Wordsworth –Language Lab- Wordsworth Software

Web References for:

Spoken English

1. www.esl-lab.com
2. www.englishmedialab.com
3. www.englishinteractive.net
4. https://www.britishcouncil.in/english/online
5. http://www.letstalkpodcast.com/
6. . https://www.youtube.com/c/ArnelsEverydayEnglish/featured
7. https://www.youtube.com/c/engvidAdam/featured
8. . https://www.youtube.com/c/EnglishClass101/featured
9. https://www.ted.com/watch/ted-ed
10. http://www.edest.org/

Voice & Accent:

1. https://www.youtube.com/user/letstalkaccent/videos
2. https://www.youtube.com/c/EngLanguageClub/featured
3. https://www.youtube.com/channel/UC_OskgZBoS4dAnVUgJVexc
4. https://www.youtube.com/channel/UCNfm92h83W2i2ijc5Xwp_IA

Chairperson
Board of Studies (English)

R24BS03 **Engineering Physics Lab** **0 0 2 1**
(Common to all Branches)

Course Objectives:

1. To study the concepts of optical phenomenon like interference, diffraction etc.,
2. To recognize the importance of energy gap in the study of conductivity and Hall effect in semiconductors
3. To study the parameters and applications of dielectric and magnetic materials by conducting experiments.

At the end of the course, students will be able to:

Course Code	Course Outcomes	Mapping with POs					Dok
		PO1	P02	P04	PO9	PO12	
R24BS03.1	Demonstrate the modern engineering physics techniques and tools in real times applications in engineering studies.	3	1	2	1	2	L1
R24BS03.2	Develop the laboratory skills in handling of electrical and optical instruments.	2	1	1	2	1	L3
R24BS03.3	Conduct experiment independently and in team to record the measurements	2	1	2	2	1	L2

Board of Studies : Department of Physics
Approved in BOS No: 01, 5th August, 2024
Approved in ACM No: 01

Developing the following programs:

List of Experiments

1. Determination of radius of curvature of a given plano convex lens by Newton's rings.
2. Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration.
3. Determination of thickness of thin object by air wedge method.
4. Determination of wavelength of Laser Source by diffraction grating.
5. Determination of rigidity modulus of the material of the given wire using Torsional Pendulum.
6. Magnetic field along the axis of a current carrying circular coil by Stewart & Gee's Method.
7. Determination of dispersive power of the prism.
8. Determination of acceleration due to gravity and radius of Gyration by using Compound Pendulum.
9. Determination of energy gap of a semiconductor using p-n junction diode.
10. Determination of dielectric constant using charging and discharging method.
11. Sonometer: Verification of laws of stretched string.
12. Estimation of Planck's constant using photoelectric effect.
13. Study the variation of B versus H by magnetization of the magnetic material (B-H curve).
14. Determination of frequency of electrically maintained tuning fork by Melde's experiment.
15. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall

effect.

16. Determination of the resistivity of semiconductor by four probe method.
17. Determination of young's modulus for the given material of wooden scale by non- uniform bending (or double cantilever) method.
18. Determination of velocity of sound by Kundt's tube method.

Note: Any **TEN** of the listed experiments are to be conducted. Out of which any **TWO** experiments may be conducted in virtual mode.

Week 1:

1. What is the basic principle of newton's rings experiment?
2. Define Interference phenomena?.
3. Why the rings are circular?
4. What are Newton's Rings?
5. Why it is necessary for the light to fall normally on plano convex lens?
6. What is constructive interference and destructive interference?
7. What is the purpose of glass plate incline at 450 in this experiment?
8. Why the centre of the rings is dark?
9. Which light does u use in this experiment?
10. What will happen if we use White light in this experiment?
11. If u replace yellow light with green light, is there any difference in the formation of rings ?

Week 2:

1. What is diode?
2. What is energy gap?
3. What is valency band?
4. What is conduction band?
5. How many types of solid materials are there and what are those materials?
6. What is a conductor?
7. What is insulator?
8. What are Semi conductors?
9. What are the types of semi conductors are there?
10. What is intrinsic and extrinsic semi conductor?
11. What u meant by Fermi energy level?

Week 3:

1. What is the full form of laser?
2. How laser light is different from the ordinary light?
3. What is population inversion?
4. What is pumping?
5. What is laser?
6. What is meant by the term coherency?
7. What is diffraction?
8. Define Grating
9. What is active medium?
10. What is the action of the optical resonator?

Week 4:

1. What is the magnetic induction formula at a point x, away from the center of the circular

coil?

2. What will be the Magnetic field value at the center of a current-carrying coil?
3. Does earth's horizontal magnetic field value remain the same everywhere or it fluctuates?
4. What is Commutator and what its role in an experiment?
5. What is the relation between Gauss and Tesla?
6. Why do you put apparatus (Wooden Frame along with circular coil) in East-West Direction?
7. What are Tan A and Tan B Positions?
8. What is the unit of magnetic field intensity H?
9. Can you perform the experiment by using the Alternating Current?
10. What are the magnetic elements?

Week 5:

1. What is the purpose of Capacitors ?
2. What the resistor will do ?
3. What is the purpose of Inductors?
4. What is Time constant?
5. What you meant by capacity of a conductor.
6. Define potential.
7. What is capacitance.
8. Define dielectric Constant?
9. What is the significance of finding the dielectric strength of a material?
10. Give some examples of dielectric materials used in electric devices?

Week 6:

1. What is plane transmission diffraction grating?
2. In our experiment, what type of diffraction does occur and how?
3. What is meant by dispersive power of grating?
4. How the commercial gratings can be made?
5. Define grating element
6. Among Prism and grating which gives more intense spectrum and why?
7. Define diffraction grating?
8. What are the essential parts of the spectrometer?
9. Which colour in the spectrum is having more refractive index?
10. How many types of spectra are available?
11. Define grating element.

Week 7:

1. What is the significance of the beam splitter in this experiment?
2. How do you form a wedge shaped air film?
3. Why the fringes are straight?
4. Why the fringes are formed equally spaced?
5. What type of light source is required for this experiment?
6. Why the fringes are formed parallel and why not circular like Newton Ring's experiment?
7. What is the principle involved in this experiment?
8. What is meant by constructive and destructive interference?

Week 8:

1. What is prism?
2. What u meant by Angular Dispersion?

3. Dispersive power of the prism?
4. What is Refractive index?
5. What is Spectrometer?
6. What is the function of Collimator?
7. What u meant by Angle of Prism?
8. What is Dispersion of Light?
9. What is the main optical action of the prism?
10. What type of prism do u use in this experiment?
11. What are the units of Dispersive power?
12. What type of light do u use in this experiment?
13. Which colour in the spectrum is having more refractive index?

Week 9:

1. .Define Rigidity of modulus?
2. Define Moment Of Inertia?
3. What is the meaning in calling this a pendulum?
4. Difference between simple pendulum and torsional pendulum?
5. What is S.H.M ?
6. What is Young's modulus?
7. Define Time Period?
8. Mention the factors on which the rigidity modulus of a material depends?
9. What is meant by mechanical deformation?
10. Define restoring force?
11. Define stress and mention its units?
12. Define strain and mention its units?
13. If we increase the diameter of the wire, what happened to rigidity modulus?
14. Differentiate simple pendulum and torsional pendulum?

Week 10:

1. What does u mean by Frequency?
2. Define Resonance?
3. What u meant by Progressive wave?
4. How many types of progressive waves are there?
5. Difference between transverse wave and longitudinal wave?
6. What u meant by standing wave?
7. In our experiment which type of wave passing along the thread?
8. In our experiment which type of wave passing along the thread?

Week 11:

1. What is the purpose of Capacitors ?
2. What the resistor will do?
3. What is the purpose of Inductors?
4. What is Time constant?
5. What is capacitance?
6. Define potential?
7. What u meant by capacity of a conductor?
8. What is the relation between charge "Q" and capacitor?

References:

1. S. Balasubramanian, M.N.Srinivasan "A Text Book of Practical Physics"-S Chand Publishers, 2017.
2. R.K. Shukla, Anchal Srivastava, Practical Physics, New age international (2011).
3. H.G.Jerrad and D.B. Mc Neil -Theoretical and Experimental Physics.
4. Roman Kezerashvili, Physics laboratory experiments: electricity, magnetism, optics, New York: Gurami Pub., (2003).
5. Y. Aparna and K. Venkateswararao, Engineering Physics–I and II, VGS Techno series.
6. J.R.G. Patnaik, "Physics Laboratory Manual, "Paramount book distributors.
7. S. Panigrahi and B. Mallick, Engineering Practical Physics, Cengage leaning, Delhi, 2015.

Weblinks:

1. https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype
2. http:/www./iitk.vlab.co.in

Chairperson
Board of studies (Physics)

R24ES04 **IT Workshop Lab** **0 0 2 1**

(Common to All Branches)

Course Objectives:

1. To assemble and disassemble a computer.
2. To solve hardware and software problems.
3. To learn about Networking of computers and use Internet facility for Browsing and Searching.
4. To develop project documentation using MS word
5. To work with various productivity tools including Excel, PowerPoint.
6. To work with different online repositories such as GITHUB, AI CHATBOT.

At the end of the course, students will be able to:

Course Code	Course Outcomes	Mapping with POs and PSOs					Dok
		PO1	PO2	PO3	PS01	PS02	
R24ES04.1	Perform Hardware troubleshooting and Perform Hardware troubleshooting	2	3	3	3	2	L2, L3
R24ES04.2	Apply different way of hooking the PC on to the internet from home and Workplace.	3	2	2	2	3	L1, L2 L3
R24ES04.3	Design word documents by learning word processing and Create presentations by using different styles and using AI Tools-Chat GPT and GITHUB	2	3	3	2	3	L2, L3, L4

SYLLABUS

PC Hardware & Software Installation **9 Hours**

Task 1: Identify the peripherals of a computer, components in a CPU and its functions. Draw the Block diagram of the CPU along with the configuration of each peripheral and submit it to your Instructor.

Task 2: Every student should disassemble and assemble the PC back to working condition. Lab Instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.

Task 3: Every student should individually install MS windows on the personal computer. Lab Instructor should verify the installation and follow it up with a Viva.

Task 4: Every student should install Linux on the computer. Lab instructor should verify the installation and follow it up with a Viva. **COs-CO1**

Internet &World Wide Web **6 Hours**

Task1: Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally, students Should demonstrate to the instructor, how to access the websites and email. If there is no internet Connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

Task 2: Web Browsers, Surfing the Web: Students customize their web browsers with the LAN Proxy settings, bookmarks, search toolbars and pop-up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

Task 3: Search Engines & Netiquette: Students should know what search engines are and how to Use the search engines. A few topics would be given to the students for which they need to search On Google. This should be demonstrated to the instructors by the student. **COs-CO2**

MS WORD **6 Hours**

Task 1: 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.

Task 2: Creating a Newsletter: Features to be covered: - Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

EXCEL **6 Hours**

Excel Orientation: The mentor needs to tell the importance of MS office or equivalent (FOSS) tool Excel as a Spreadsheet tool; give the details of the four tasks and features that would be covered in Each. Using Excel – Accessing, overview of toolbars, saving excel files, using help and resources.

Task 1: Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, and auto Fill, Formatting Text**.**

Task 2: Calculating GPA -. Features to be covered: - Cell Referencing, Formulae in excel – Average, std. deviation, Charts, Renaming and Inserting worksheets, hyper linking, Count Function

POWER POINT **6 Hours**

Task 1: Students will be working on basic power point utilities and tools which help them create basic power point presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint.

Task 2: Interactive presentations - Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.

Task 3: Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), and Inserting – Background, textures, Design Templates, Hidden slides.**COs-CO3**

AI TOOLS – Chat GPT **6 Hours**

Task 1: Prompt Engineering: Experiment with different types of prompts to see how the model Responds. Try asking questions, starting conversations, or even providing incomplete sentences to See how the model completes them. Ex: Prompt: "You are a knowledgeable AI. Please answer the following question: What is the capital of France?"

Task 2: Creative Writing: Use the model as a writing assistant. Provide the beginning of a story or a description of a scene, and let the model generate the rest of the content. This can be a fun way to Brainstorm creative ideas Ex: Prompt: "In a world where gravity suddenly stopped working, people started floating upwards. Write a story about how society adapted to this new reality."

Explore – GITHUB **6 Hours**

Task 1: Students should understand GITHUB and should possess accounts in it.

Task 2: Students should explore different repositories available in GITHUB and student should Create his/ her own simple repositories.

Task 3: Students should take simple experiments /presentations and upload them in their GITHUB Account.

Task 4: Students should understand how GITHUB Enterprise Cloud is used and also explore the GIT and GIT HUB resources. **COs-CO3**

Reference Books:

1. Comdex Information Technology course tool kit, Vikas Gupta, WILEY Dream tech, 2003
2. The Complete Computer upgrade and repair book, Cheryl A Schmidt, WILEY Dream tech, 2013, 3rd edition

3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education, 2012, 2nd edition
4. PC Hardware - A Handbook, Kate J. Chase, PHI (Microsoft)
5. IT Essentials PC Hardware and Software Companion Guide, David Anfins on and Ken Quamme. – CISCO Press, Pearson Education, 3rd edition
6. IT Essentials PC Hardware and Software Labs and Study Guide, Patrick Regan– CISCOPress, Pearson Education, 3rd edition
7. "Microsoft Word 2021: A Beginner's Guide"by Steve Lambert.
8. "Excel 2021: A Comprehensive Guide"by Chris Benham.
9. "Microsoft PowerPoint 2021: A Beginner's Guide" by Steve Lambert
10. GITHUB Quick Start Tutorials

WEB REFERENCES:

1. https://en.wikipedia.org/wiki/Main_Page
2. https://edu.gcfglobal.org/en/office2007
3. https://www.w3schools.com

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1(%)
L1	30
L2	20
L3	30
L4	20
Total (%)	**100**

Sample Short and Long Answers questions of Various Cognitive Levels

L1: Remember

1. Identify Peripherals of a computer
2. Draw a Block Diagram of the CPU and explain the components along with the functions.
3. Explain the various steps in assembling and dissembling of the CPU.
4. Write the basic utilities used while creating a PowerPoint presentation.

L2: Understand

1. How to install windows operating system.
2. What are search engines and brief the advantages of search engines.
3. Explain the process of creating a project abstract.
4. Explain how to explore GITHUB resources

L3: Apply

1. Explain the process orientation and connectivity boot camp
2. Write the different formulae used while calculating GPA
3. Explain the insertion of various templates while creating power point presentations.
4. Discuss the format for customization your browser for effective searching and online etiquette

L4: Analysing

1. Analyze a structured approach to experiment with prompts.

2. Explore different repositories available in GITHUB.
3. "Imagine a world where every person is born with a unique, magical ability that reflects their deepest desire or fear. Describe a day in the life of a character who discovers that their ability is far more powerful and dangerous than they ever imagined. How does this revelation affect their relationships, their view of themselves, and their place in society?"

Chairperson
Board of Studies (CSE)

R24ECPC02 NETWORK ANALYSIS & SIMULATION LAB 0 0 3 1.5

Course Objectives:

1. To gain hands on experience in verifying Kirchhoff's laws and network theorems
2. To analyze transient behavior of circuits
3. To study resonance characteristics

Course Code	Course Outcomes	Mapping with POs and PSOs										DOK
		PO1	PO2	PO3	PO4	PO6	PO8	PO11	PO12	PSO1	PSO2	
R24ECPC02.1	Demonstrate fundamental circuit laws, network theorems, and node and mesh analysis of electrical circuits.	2	2	2	2	1	-	-	-	1	1	LI L2
R24ECPC02.2	Design resonance circuit for given specifications.	3	2	2	1	1	-	-	-	-	1	L1 L2
R24ECPC02.3	Measure time constants of RL & RC circuits.	2	2	2	1	1	-	-	-	2	-	L2 L3

List of Experiments

1. Study of components of a circuit and Verification of KCL and KVL. COs: CO1
2. Verification of mesh analysis for AC circuits. COs: CO1
3. Verification of nodal analysis for AC circuits. COs: CO1
4. Verification of Superposition theorem. COs: CO1
5. Verification of maximum power transfer theorem for AC circuits. COs: CO1
6. Verification of Thevenin's & Norton theorems for AC circuits. COs: CO1
7. Verification of reciprocity theorem. COs: CO1
8. Find the Q Factor and Bandwidth of a Series Resonance circuit COs: CO2
9. Find the Q Factor and Bandwidth of a Parallel Resonance circuit. COs: CO2
10. To Study of DC transients in RL circuit. COs: CO3
11. To Study of DC transients in RC circuits. COs: CO3
12. To Study of DC transients in RLC circuit. COs: CO3
13. Determination of open circuit (Z) and short circuit (Y) parameters. COs: CO1
14. Determination of hybrid (H) and transmission (ABCD) parameters. COs: CO1

Any 10 experiments are to be conducted

Hardware Requirements:

Ammeters (Analog or Digital), Voltmeters (Analog or Digital), Active & Passive Electronic Components, Variac, connecting wires.

Software Requirements:

Multisim/Pspice /Equivalent simulation software tool, Computer Systems with required specifications

Reference Books:

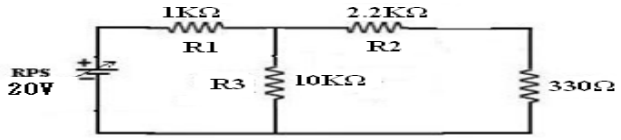
1. Network Analysis – ME Van Valkenburg, Prentice Hall of India, revised 3rd Edition,

2019.

2. Engineering Circuit Analysis by William H. Hayt, Jack Kemmerly, Jamie Phillips, Steven M. Durbin, and 9th Edition 2020.

L1: Remember

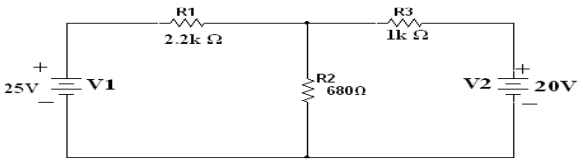
1. Determine the Thevenin‟s voltage, Thevenin‟s resistance?



2. Draw the Theveni's equivalent circuit for the above circuit?
3. State Norto's theorem and Norton's current?
4. Draw the Norton's equivalent circuit?

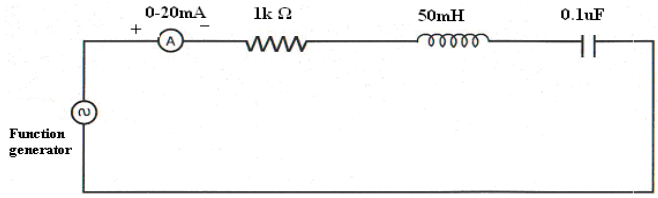
L2: Understand

1. Determination of self, mutual inductances and coefficient of coupling
2. Determination of Impedance (Z) and Admittance (Y) Parameters for a two port network



L3: Apply

1.To find the resonant frequency, quality factor and band width of a given series and parallel resonant circuits



2. Determination of self, mutual inductances and coefficient of coupling
3. Measure the active power for the given star and delta networks

Chairperson
Board of Studies (EEE)

Code: R24MC02 NSS /NCC/ SCOUTS & GUIDES / COMMUNITY SERVICE 0 0 1 0.5

(Common to All branches of Engineering)

Course Objectives:

The objective of introducing this course is to impart discipline, character, fraternity, teamwork, social consciousness among the students and engaging them in selfless service.

SYLLABUS

UNIT I: Orientation

General Orientation on NSS/NCC/ Scouts & Guides/ Community Service activities, career guidance.

Activities:

i) Conducting –ice breaking sessions-expectations from the course-knowing personal talents and skills
ii) Conducting orientations programs for the students –future plans-activities-releasing road map etc.
iii) Displaying success stories-motivational biopics- award winning movies on societal issues etc.
iv) Conducting talent show in singing patriotic songs-paintings- any other contribution.

UNIT II: Nature & Care

Activities:

i) Best out of waste competition.
ii) Poster and signs making competition to spread environmental awareness.
iii) Recycling and environmental pollution article writing competition.
iv) Organising Zero-waste day.
v) Digital Environmental awareness activity via various social media platforms.
vi) Virtual demonstration of different eco-friendly approaches for sustainable living.

UNIT III: Community Service

Activities:

i) Conducting One Day Special Camp in a village contacting village-area leaders- Survey in the village, identification of problems- helping them to solve via media- authorities- experts-etc.
ii) Conducting awareness programs on Health-related issues such as General Health, Mental health, Spiritual Health, HIV/AIDS,
iii) Conducting consumer Awareness. Explaining various legal provisions etc.
iv) Women Empowerment Programmes- Sexual Abuse, Adolescent Health and Population Education.
v) Any other programmes in collaboration with local charities, NGOs etc.

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Board of Studies : BS&H (Mathematics)
Approved in BoS No : 01, August, 2024
Approved in ACM No: 01

Reference Books:

1. Nirmalya Kumar Sinha & Surajit Majumder, A Text Book of National Service Scheme Vol;.I, Vidya Kutir Publication, 2021 (ISBN 978-81-952368-8-6)
2. Red Book - National Cadet Corps – Standing Instructions Vol I & II, Directorate General of NCC, Ministry of Defence, New Delhi
3. Davis M. L. and Cornwell D. A., ―Introduction to Environmental Engineering‖, McGraw Hill, New York 4/e 2008
4. Masters G. M., Joseph K. and Nagendran R ―Introduction to Environmental Engineering and Science‖, Pearson Education, New Delhi. 2/e 2007
5. Ram Ahuja. Social Problems in India, Rawat Publications, New Delhi.

Chairperson
Board of Studies (Mathematics)

R24ECPC03 **Random Variables and Stochastic Processes** **3 0 0 3**
(Electronics and Communication Engineering)

Course Objectives:

The main objectives of the course are to:

- To give students an introduction to elementary probability theory, in preparation to learn the concepts of 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 understand the concepts of stochastic process and its temporal characteristics.
- To analyze the LTI systems with stationary random process as input and To introduce the types of noise and modeling noise sources.

Course Outcomes:

At the end of the course, students will be able to:

Course Code	Course Outcomes	Mapping with POs								Do K
		PO1	PO2	PO3	PO4	PO5	PO6	PS01	PS02	
24ECPC03.1	Mathematically model the random phenomena and solve simple probabilistic problems.	3	3	2	1	-	-	2	1	L1, L2
24ECPC03.2	Identify different types of random variables and com-pute statistical averages of single random variable.	3	3	2	1	-	-	2	1	L1, L2
24ECPC03.3	Understand multiple random variable concepts, com- pute statically average of multiple random variables	3	3	2	1	-	-	2	1	L2, L3
24ECPC03.4	Characterize the random processes in the time	3	2	2	1	-	-	2	1	L4, L5
24ECPC03.5	Characterization in frequency domain and analyze the LTI systems with random inputs..	3	2	2	1	-	-	1	1	L4, L5

SYLLABUS

Unit I **14 Hours**

The Random Variable: Probability introduced through Sets and Relative Frequency: Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Joint Probability, Conditional Probability, Total Probability, Bay's Theorem, Independent Events. 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. **CO's–CO1**

Self Learning Topic: Conditional Distribution, Conditional Density

Unit II **14 Hours**

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, Standard Deviation and Skew, Chebyshev's Inequality, Characteristic Function, Moment Generating Function, Transformations of a Random Variable **CO's-CO2**

Self Learning Topic: Transformation of Gaussian Random Variable

Unit III **14 Hours**

Multiple Random Variables: Vector Random Variables, Joint Distribution Function, Properties of Joint Distribution, Marginal Distribution Functions, Conditional Distribution and Density, Statistical Independence, Central Limit Theorem.

Operations On Multiple Random Variables: Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables. **CO's-CO3**

Self Learning Topic: Properties of Jointly Gaussian Random Variables

Unit IV **14 Hours**

Random Processes–Temporal Characteristics: The Random Process Concept, Classification of Processes, Deterministic and Non deterministic Processes, Distribution and Density Functions, Concept of Stationarity and Statistical Independence. First-Order Stationary Processes, Second-order and Wide-Sense Stationarity, Nth-order and Strict Sense Stationarity, Autocorrelation Function and its Properties, Cross-Correlation Function and its Properties, Covariance Functions, Gaussian Random Processes. **CO's- CO4**

Self Learning Topic: Time Averages and Ergodicity

Unit V **14 Hours**

Random Processes-Spectral characteristics: The Power Density Spectrum: Properties, Relation- ship between Power Density Spectrum and Auto correlation Function, The Cross-Power Density Spectrum, Properties, Relationship between Cross-Power Density Spectrum and Cross-Correlation Function.

Linear Systems with Random Inputs Random Signal Response of Linear Systems: System Response–Convolution, Mean and Mean- squared Value of System Response. **CO's – CO5**

Self Learning Topic: System Response: Auto correlation Function of Response, Power Density Spectrum of Response

Board of Studies: Electronics and Communication Engineering

Approved in BOS No: 02, 30th May, 2025

Approved in ACM No: 02

Text books:

1. Probability Random Variables & Random Signal Principles, Peyton Z.Peebles, Tata Mac Graw Hill, 4th Edition, 2001.
2. Probability Random Variables and Stochastic Processes Athanasios Papoulis and S.Unnikrisha, Prentice Hall of India,4th Edition,2002.
3. Probability and Random Processes with Applications to Signal Processing Henry Stark and John W.Woods, Pearson Education, 3rd Edition, 2001.

Reference books:

1. Schaum's Outline of Probability Random Variables and Random Processes, 1997.
2. An Introduction to Random Signals and Communication Theory, B.P.Lathi, International Textbook, 1968.
3. Probability Theory and Random Processes P.Ramesh Babu, McGrawHill, 2015.

Web References:

1. https://onlinecourses.nptel.ac.in/noc21_ma66/preview
2. https://ocw.mit.edu/courses/res-6-012-introduction-to-probability-spring 2018/resources/stochastic-processes/
3. https://www.youtube.com/watch?v=zqLjwDAXiKE&list=PLBH9ZHwfJyk_bTAEyAxnn9m8uMSjtFfyY

Internal Assessment Pattern

Cognitive Level	Internal Assessment # 1 (%)	Internal Assessment # 2 (%)
L1	30	--
L2	40	--
L3	30	30
L4	--	40
L5	--	30
Total (%)	100	100

Sample Short and Long Answers Questions of Various Cognitive Levels:

L1: Remember

1. Define: (i) Sample Spaces
   (ii) Events
   (iii) Conditional Probability
2. Define and sketch the exponential functions, Gaussian functions and binomial functions?
3. Define and sketch the uniform functions, Rayleigh functions and Poisson functions?

4. What is the mean value of Rayleigh density function?
5. Define joint distribution function and write their properties?
6. Define joint density function and write their properties?

L2: Understand

1. Explain the following: (i) Gaussian random processes ;
   (ii) Ergodicity.
2. Explain the stationary processes.
3. Find the mean value of uniform density function?
4. Find the mean value of Rayleigh density function?
5. Find the moment generating function, mean and variance, If a pdf of a random variable X is given by $f_x(x) = be^{-|ax|}$ where a and b are real constant.
6. Find $f_x(x/v), f_y(y/x)$.The joint pdf of two random variable X and Y is given by $f_{xy}(x,y) = 10\ e^{-2x}\ e^{-3y}\ 0 \leq y \leq x < \infty$.
7. Explain the Moment generating function? State and prove the properties of Moment generating function.
8. Fide the expected value of a function of a random variable E[g(X)].Where g(X) = 4x+3.Let X be a random variable with density function $f_x(x) = x^3/3\ -1<x<2$.
9. Explain the relationship between cross power density spectrum and cross correlation function.

L3: Apply

1. State and prove any three properties of spectral density function?
2. Construct the auto correlation and auto covariance of X(t).Consider a random process X(t) = A cosωt, where ω is a constant and A is a random variable uniformly distributed over (0,1).
3. State and prove the properties of joint distribution function.
4. State and prove cross correlation functions properties?
5. Construct the Gaussian random variable function and Normalized Gaussian random variable.
6. State and prove power density spectrum properties?.
7. State and prove total probability theorem.

L4: Analysing

1. Differentiate between Random variable and Random processes..
2. Obtain the output random process of an LTI system is also WSS process, when the input random process is a WSS process.
3. Determine the Bandpass process, Narrow band process, Band limited process.

4. Obtain the mean and mean square values of output y(t) of an LTI system with input x(t). Assume that X(t) is a WSS process.
5. Analyze the joint characteristic function. Explain how joint moment are obtained from joint characteristic function
6. Determine power spectral density and average power of X(t) with $R_{xx}(\tau)=\exp(-\tau)$.

L5: Evaluating

1. Critique that any characteristic function $\Phi X(\omega)$ satisfies $\Phi X(\omega)\leq\Phi X(0)=1$.
2. Assess the performance of an LTI system based on its stability and impulse response.

Chairperson
Board of Studies (ECE)

R24HS03 Universal Human Values-Understanding Harmony & Human Ethical Conduct

(Common to CSE, CSE (DS), CSE (AI&ML), ECE, EEE, ME) **2 0 0 2**

Course Objectives:

The main objectives of the course are to:

- To enable students to recognize the vital connection between **values and skills**, emphasizing how their integration leads to lasting happiness and prosperity core aspirations shared by all human beings.
- To guide students in developing a **holistic outlook on life and profession** grounded in a deep understanding of human nature and existence. This perspective supports the cultivation of **Universal Human Values** and encourages a natural transition toward **value-based living**.
- To illustrate the practical outcomes of a holistic understanding, particularly in fostering **ethical behavior**, **trust-based and fulfilling relationships**, and **harmonious interaction with nature**.

At the end of the course, students will be able to:

Course Code	Course Outcomes	Mapping with POs & PSOs											DoK
		PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	
R24HS03.1	Develop an understanding of human values.	2	2	-	-	2	3	3	2	2	-	3	L1, L2
R24HS03.2	Achieve harmony within self and body.	2	-	-	-	-	3	3	2	-	-	3	L2, L3
R24HS03.3	Build trustful and respectful relationships.	2	-	-	2	3	2	3	3	3	-	3	L3, L4
R24HS03.4	Understand harmony in nature.	2	2	-	-	-	3	3	2	2	-	3	L4, L5
R24HS03.5	Practice ethical and value-based living.	2	2	-	-	2	2	3	2	2	-	3	L5, L6

SYLLABUS

Unit I: Introduction to Value Education (6 lectures and three tutorials for practice session)

Lecture 1: Introduction to Human Development – Physical, Emotional, and Intellectual Dimensions

Lecture 2: Core Concepts of Value Education in Contemporary Society

Tutorial 1: Practice Session PS1 – Reflective Sharing on Life Values and Personal Experiences

Lecture 3: Self-awareness and Self-exploration: Tools for Inner Clarity

Lecture 4: Aspirations of the Human Being – Joy, Fulfillment, and Meaning

Tutorial 2: Practice Session PS2 – Exploring Self-awareness and Emotional Intelligence

Lecture 5: Challenges to Human Fulfillment in Modern Life

Lecture 6: Mindfulness and Ethical Decision-Making as a Path to Human Aspiration Fulfillment

Tutorial 3: Practice Session PS3 – Identifying Personal Ethical Dilemmas and Responses **CO's CO1**

Self-Learning Concepts: Explore how education influences the development of core human values, the significance of emotional intelligence in personal growth, the role of mindfulness in enhancing self-awareness, the impact of consumerism and modern lifestyle on ethical choices, and reflect on one's own aspirations and value system – all of which build a foundation for inner development.

Unit II: Harmony in the Human Being (6 lectures and three tutorials for practice session)

Lecture 7: Human Being: Alignment of Thoughts, Emotions, and Actions

Lecture 8: Needs and Desires: Distinguishing Between Essentials and Superfluous

Tutorial 4: Practice Session PS4 – Mind Mapping Personal Needs and Desires

Lecture 9: The Role of Body, Mind, and Consciousness in Well-being

Lecture 10: Cultivating Harmony within the Self – Practices and Techniques

Tutorial 5: Practice Session PS5 – Journaling: Tracking Inner Conflicts and Clarity

Lecture 11: Body Awareness and Physical Well-being Practices (Yoga/Meditation)

Lecture 12: Sustainable Self-Regulation and Lifestyle Choices for Health

Tutorial 6: Practice Session PS6 – Wellness and Lifestyle Assessment Activity **CO's-CO2**

Self-Learning Concepts: Understand the benefits of journaling for emotional and mental clarity, examine the relationship between diet, exercise, and mental well-being, explore how to identify and manage sources of stress, study the scientific basis of meditation and mindfulness, and create a personalized routine for achieving physical and emotional balance – fostering harmony within the self.

Unit III: Harmony in the Family and Society (6 lectures and three tutorials for practice session)

Lecture 13: Foundations of Healthy Relationships – Emotional and Ethical Dimensions

Lecture 14: Cultivating Trust and Empathy in Family and Social Contexts

Tutorial 7: Practice Session PS7 – Role-play on Building Trust in Relationships

Lecture 15: Respect and Empathy – Cornerstones of Human Interaction

Tutorial 8: Practice Session PS8 – Group Activity: Expressing Respect in Conversations

Lecture 16: Conflict Resolution and Emotional Safety in Social Interaction

Lecture 17: Principles of Ethical Leadership and Community Engagement

Lecture 18: Global Citizenship and Social Justice in the Modern World

Tutorial 9: Practice Session PS9 – Simulation: Creating a Model Ethical Society **CO's-CO3**

Self-Learning Concepts: Learn how to practice active listening and empathy, recognize and overcome personal biases in relationships, analyze inspiring examples of ethical leadership and community service, understand the concept of emotional safety in interpersonal dynamics, and explore the role of volunteerism in building a responsible and connected society – enhancing harmony in relationships and the social fabric.

Unit IV: Harmony in the Nature/Existence (4 lectures and two tutorials for practice session)

Lecture 19: Ecological Intelligence and Human-Nature Relationship

Lecture 20: Sustainability and Resource Responsibility – A Human Imperative

Tutorial 10: Practice Session PS10 – Case Study: Local Environmental Issue & Action Plan

Lecture 21: Systems Thinking – Viewing Nature as an Interconnected Whole

Lecture 22: Eco-Spirituality and the Harmony of Existence

Tutorial 11: Practice Session PS11 – Nature Walk + Reflection on Human-Nature Coexistence

CO's-CO4

Self-Learning Concepts: Study the principles of minimalism as a lifestyle for environmental consciousness, calculate and reduce your carbon footprint, compare environmental issues in urban and rural areas, explore sustainable agriculture and local food movements, and research the involvement of youth in global climate action – deepening your understanding of harmony with nature.

Unit V: Implications of the Holistic Understanding – a Look at Professional Ethics (6 lectures and tutorials for practice session)

Lecture 23: Personal Integrity and Professional Ethics – Building the Link

Lecture 24: Ethics in the Digital Age – Responsibility and Cyber Citizenship

Tutorial 12: Practice Session PS12 – Case Analysis: Ethical Dilemma in Technology Use

Lecture 25: Humanistic Leadership and Social Entrepreneurship

Lecture 26: Corporate Social Responsibility and Sustainable Business Models

Tutorial 13: Practice Session PS13 – Designing a Value-based Startup Idea

Lecture 27: Innovation with Purpose: Case Studies in Ethical Innovation

Lecture 28: Life Planning and Career Pathways Anchored in Values

Tutorial 14: Practice Session PS14 – Action Plan: Aligning Career with Core Human Values

CO's-CO5

Self-Learning Concepts: Explore ethical concerns in the digital age such as data privacy and responsible AI use, understand the concept of human-centered design in business, study successful examples of green and socially responsible enterprises, formulate your own personal code of ethics, and analyze real-life ethical dilemmas encountered in the workplace – promoting value-based professionalism and ethical living.

Practice Sessions for UNIT I – Introduction to Value Education

PS1 Sharing about Oneself

PS2 Exploring Human Consciousness

PS3 Exploring Natural Acceptance

Practice Sessions for UNIT II – Harmony in the Human Being

PS4 Exploring the difference between the Needs of the self and body

PS5 Exploring Sources of Imagination in the Self

PS6 Exploring Harmony of self with the body

Practice Sessions for UNIT III – Harmony in the Family and Society

PS7 Exploring the Feeling of Trust

PS8 Exploring the Feeling of Respect

PS9 Exploring Systems to Fulfill Human Goals

Practice Sessions for UNIT IV – Harmony in the Nature (Existence)

PS10 Exploring the Four Orders of Nature

PS11 Exploring Co-existence in Existence

Practice Sessions for UNIT V – Implications of the Holistic Understanding – a Look at Professional Ethics

PS12 Exploring Ethical Human Conduct

PS13 Exploring Humanistic Models in Education

PS14 Exploring Steps of Transition towards Universal Human Order

Board of Studies: Master of Business Administration
Approved in BoS No: 02, 13th May, 2025
Approved in ACM No: 02

Text Book and Teachers Manual

1. **R R Gaur, R Asthana, G P Bagaria**, A Foundation Course in Human Values and Professional
2. Ethics, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1 **R R Gaur, R Asthana, G P Bagaria**, Teachers' Manual for A Foundation Course in Human
3. Values and Professional Ethics, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

Reference Books:

1. **JeevanVidya: EkParichaya**, A Nagaraj, JeevanVidyaPrakashan, Amarkantak, 1999.
2. **Human Values, A.N. Tripathi**, New Age Intl. Publishers, New Delhi, 2004.
3. **The Story of Stuff** (Book).
4. **The Story of My Experiments with Truth** - by Mohandas Karamchand Gandhi
5. **Small is Beautiful** - E. F Schumacher.
6. **Slow is Beautiful** - Cecile Andrews
7. **Economy of Permanence** - J C Kumarappa
8. **Bharat Mein Angreji Raj** – PanditSunderlal
9. **Rediscovering India** - by Dharampal
10. **Hind Swaraj or Indian Home Rule** - by Mohandas K. Gandhi
11. **India Wins Freedom** - Maulana Abdul Kalam Azad
12. **Vivekananda** - Romain Rolland (English)
13. **Gandhi** - Romain Rolland (English)

Web References:

1. **https://www.uhv.org.in/uhve**

2. https://fdp-si.aicte-india.org/UHVII.php
3. https://www.aicte-india.org/sites/default/files/Model_Curriculum/Minor%20Degree%20in%20UHV.pdf

Mode of Conduct:

1. Lecture hours are to be used for interactive discussion, where proposals about the topics are to be made and students are to be motivated to reflect, explore, and verify them.
2. Tutorial hours are to be used for practice sessions.
3. While analyzing and discussing the topic, the faculty mentor's role is to point to essential elements to help sort them out from the surface elements. In other words, it allows the students to explore the critical components.
4. In the discussions, particularly during practice sessions (tutorials), the mentor encourages the student to connect with oneself and do self-observation, self-reflection, and self-exploration.
5. Scenarios may be used to initiate discussion. The student is encouraged to take up" ordinary" rather than" extraordinary" situations. Such observations and their analyses are shared and discussed with other students and faculty mentors in a group setting.
6. Tutorials (experiments or practical) are essential for the course. The difference is that the laboratory is part of everyday life; it is helpful in how you behave and work in real life. Worksheets, home assignments, and/or activities are included depending on the nature of the topics.
7. The practice sessions (tutorials) would also support student in performing actions commensurate to their beliefs. It is intended that this would lead to the development of commitment, namely behaving and working based on fundamental human values.
8. It is recommended that this content be placed before the student as it is, in the form of an introductory foundation course, without including anything else or excluding any part of this content. Additional content maybe offered in separate, higher courses. This course is to be taught by faculty from every teaching department, not exclusively by any one department.

Internal Assessment Pattern

Cognitive Level	Internal Assessment # 1 (%)	Internal Assessment # 2 (%)
L1	15	-
L2	34	-
L3	34	15
L4	17	34
L5	-	34
L6	-	17
Total (%)	**100**	**100**

Sample Short and Long Answers to Questions of Various Cognitive Levels

L1: Remember

1. What is meant by Natural Acceptance?
2. Define Right Understanding.
3. List the four orders of nature.
4. What are the basic human aspirations?
5. State the meaning of Sanyam (self-regulation).
6. What is meant by prosperity?
7. Name the two parts of a human being.
8. What is the role of the body according to Value Education?
9. List the feelings essential in human-to-human relationships.
10. What is meant by co-existence?

L2: Understand

1. Explain the relationship between Right Understanding and Relationship.
2. Describe the harmony between the self and the body.
3. Interpret the concept of continuous happiness and prosperity.
4. Discuss the difference between the needs of the self and the body.
5. Explain the meaning of justice in relationships.
6. Describe the importance of self-exploration.
7. Clarify the concept of mutual fulfillment in nature.
8. Discuss how education helps in holistic development.
9. Explain the vision of a universal human order.
10. Describe what is meant by 'respect' as the right evaluation.

L3: Apply

1. Apply the concept of Natural Acceptance in making ethical decisions.
2. Illustrate harmony in the family with an example from your own life.
3. Demonstrate how you can practice self-regulation in your daily routine.
4. Use the idea of mutual fulfillment in a plan for an eco-friendly campus.
5. Apply the idea of Right Understanding to resolve a conflict.
6. Show how holistic development can be integrated into your lifestyle.
7. Implement practices that promote harmony in your social group.
8. Use the concept of the body as an instrument to improve physical health.
9. Plan a group activity that promotes trust and respect.
10. Apply the principles of co-existence in managing natural resources.

L4: Analysing

1. Differentiate between happiness and prosperity with examples.
2. Analyze the role of the self and body in human behavior.
3. Compare trust and respect in family relationships.
4. Examine how lack of Right Understanding leads to disharmony.
5. Distinguish between self-regulation and external regulation.
6. Investigate the root causes of conflict in society.
7. Analyze the systems in nature that demonstrate harmony.
8. Examine how justice arises from mutual fulfillment.

9. Break down the structure of a universal human order.
10. Explore the interconnection between individual values and societal peace.

L5: Evaluating

1. Evaluate the relevance of Value Education in modern society.
2. Assess the impact of materialism on human happiness.
3. Judge the effectiveness of education in achieving holistic development.
4. Critique current societal systems in light of natural co-existence.
5. Appraise the role of mutual trust in building strong relationships.
6. Defend the need for harmony at all levels of human existence.
7. Evaluate the importance of distinguishing between self and body.
8. Justify the inclusion of Value Education in professional courses.
9. Compare the traditional vs. modern views on personal success.
10. Argue whether self-exploration is sufficient for understanding human values.

L6: Create and Develop

1. Design a value-based weekly routine for students.
2. Construct a model society based on mutual trust and justice.
3. Formulate strategies to integrate value education into school curricula.
4. Develop a plan for promoting harmony in a multicultural community.
5. Compose an essay on the role of harmony in personal and professional life.
6. Create a campaign to raise awareness on sustainable coexistence with nature.
7. Design a self-assessment tool for personal value alignment.
8. Develop a short workshop on self-exploration for college students.
9. Write a story that illustrates the principles of Right Understanding.
10. Create a visual mind map connecting harmony at the individual, family, and societal levels.

Chairperson
Board of Studies (MBA)

R24ECPC04 **SIGNALS AND SYSTEMS** **3 0 0 3**

(Electronics and Communication Engineering)

Course Objectives:

The course is designed with the objective to:

1. Understand mathematical representations of continuous-time (CT) and discrete-time (DT) signals and systems
2. Analyze LTI systems in time/frequency domains.
3. Apply Laplace and Z-transforms to analyze CT/DT systems.
4. Development of the mathematical skills to solve problems involving convolution, correlation.
5. Design and evaluate signal processing systems (e.g., filters, samplers)

Course Outcomes:

At the end of the course, students will be able to:

Course Code	Course Outcomes (COs)	Mapping with POs						
		PO1	PO2	PO4	PO5	PSO1	PSO2	DoK
R24ECPC04.1	Understand the mathematical description and representation of continuous-time and discrete time signals and systems.	3	2	-	-	3	2	L1, L2
R24ECPC04.2	Classify systems based on their properties and determine the response of LTI system using convolution.	3	2	1	-	3	2	L1, L2, L3
R24ECPC04.3	Analyze the frequency spectra of various continuous-time signals using fourier analysis.	3	3	1	-	3	3	L3, L4
R24ECPC04.4	Apply the Laplace transform and Z- transform for analysing of continuous-time and discrete-time signals and systems.	3	3	-	-	3	3	L3, L4
R24ECPC04.5	Apply sampling theorem to convert continuous-time signals to discrete-time signals and reconstruct back, different transform techniques to solve signals and system related problems.	3	3	2	1	3	3	L3, L5

SYLLABUS

Unit I **16 Hours**

Signals & Systems: Definition of signal & system, basic operations on signals, classification of signals, basic continuous time signals and continuous time systems, classification of discrete time signals and systems. Analogy between vectors and signals, orthogonality, mean square error, complete set of orthogonal functions. Parseval's relations. **CO's – CO1**

Self learning topics: Classification of system based on properties

Unit II **18 Hours**

Linear Time Invariant (LTI) Systems: Time-Domain representation & Characterization of LTI systems, Impulse response representation, Convolution integral & Convolution sum, properties of LTI systems, Stability criteria for LTI systems, Elements of Continuous time. Circular Convolution. Concepts of Correlation of signals, properties, applications. Relation between Convolution and Correlation**.** **CO's–CO2**

Self learning topics: Difference between difference and differential equations

Unit III **15 Hours**

Fourier Representation of Signals: Fourier series: Representation of Fourier series, Continuous time periodic signals, Properties of Fourier Series, Dirichlet's conditions, Trigonometric Fourier Series and Exponential Fourier Series. Fourier Transforms: Deriving Fourier Transform from Fourier series, Fourier Transform of arbitrary and standard signals, Fourier Transform of Periodic Signals, Properties of Fourier Transform, Fourier Transforms involving Impulse function and Signum function. **CO's– CO3**

Self learning topics: Hilbert transform and its properties

Unit IV **15 Hours**

Laplace Transform: Introduction & Definition, Region-of- convergence, Properties of Laplace transform, Inverse Laplace Transform, Applications of Laplace Transform in analysis of LTI systems, Unilateral Laplace transform & its applications to solve differential equations, Analysis of Electric circuits.

Z-Transform: The Z-Transform, Region-of-convergence, properties of Z-Transform, Inverse Z-Transform **CO's–CO4**

Self learning topics: Solve differential and difference equations using transforms

Unit V **16 Hours**

Sampling: Sampling Theorem and its Graphical & Analytical proof of sampling for Band-limited signals, impulse sampling, Natural and flat top Sampling, reconstruction of signal from its samples, Aliasing, Anti-aliasing filter, Illustrative Problems. **CO's – CO5**

Self learning topics: Analyze the frequency spectra of sampled signals for different sampling rates.

Board of Studies: Electronics and Communication Engineering

Approved in BOS No: 02, 30th, May, 2025

Approved in ACM No: 02

Text Books:

1. A.V. Oppenheim, A.S. Willsky and S.H. Nawab, "Signals and Systems", 2nd Edition, PHI, 2009.
2. Signals, Systems & Communications - B.P. Lathi, B S Publications, 2003.
3. S.Haykin and B.VanVeen "Signals and Systems, Wiley, 1998.

Reference Books:

1. Signals and Systems – K Deergha Rao, Springer International Edition, 2018.
2. Principles of Linear Systems and Signals – BP Lathi, Oxford University Press, 2015
3. Hwei Hsu, "Schaum's Outline of Signals and Systems", 4thEdition, TMH, 2019.
4. Fundamentals of Signals and Systems- Michel J. Robert, MGH International Edition, 2008.

Web References:

1. https://onlinecourses.nptel.ac.in/noc21_ee28/preview
2. https://ocw.mit.edu/courses/res-6-007-signals-and-systems-spring-2011/video_galleries/video-lectures

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1(%)	Internal Assessment #2(%)
L1	30	--
L2	40	--
L3	30	30
L4	--	40
L5	--	30
Total (%)	100	100

Sample Short and Long Answers Questions of Various Cognitive Levels:

L1: Remember

1. Define and sketch the following signals:
   (i) Signum Function
   (ii) Impulse function
   (iii) Unit step function
2. List the basic operations that can be performed on a continuous-time signal.
3. What is the impulse response of a continuous-time LTI system?
4. What are Dirichlet's conditions for the existence of a Fourier series?
5. What is the Significance of Hilbert Transform? Explain in detail.

L2: Understand

1. Explain the concept of causality in a system.
2. Illustrate the duality property of the Fourier transform.
3. Obtain the Fourier transform of the following functions.
   (i) Unit step function,
   (ii) Unit impulse function..
   (iii) Signum Function
4. Explain the properties of unit impulse function

5. Explain the significance of the ROC in Laplace and Z-transforms.
6. Explain about Poly-Wiener criterion
7. Explain the graphical and analytical proof of band-limited signals.
8. Explain the difference between Impulse, Natural and Top Sampling
9. Find whether the following signals are even or odd?
   (i) e^{4t} ;
   (ii) u(t+2)-u(t-2) ;
   (iii) u(-n+2) u(n+2).

L3: Apply

1. Determine the signal x[n]=nu[n] is energy or power signal.
2. Calculate the energy of the signal $x(t)=e^{-2t}$ u(t).
3. Find the complex exponential Fourier series coefficient of the signal x(t)= sin 3πt+ 2 cos 4πt
4. What is Impulse response? Show that the response of LTI System is convolution integral of its impulse response with input signal
5. Given the impulse response $h(t)=e^{-t}u(t)$ and input x(t)=u(t), find the output y(t).
6. State and prove the time-convolution and Integration properties of Fourier transform.
7. Find the Laplace transform of the following signal and its ROC $x(t)= e^{-5t}$ [u(t)-u(t-5)]
8. Calculate the Z-transform of $x[n]=(1/3)^n u[n]$.

L4: Analysing

1. Differentiate between linear and nonlinear systems using examples.
2. Obtain the Z-transform of $x(n) = -a^n$ u(-n-1) and find its ROC.
3. Determine the Laplace transform of the following signal: $x(t) = te^{-t}$ u(t).
4. Compare and contrast the Fourier transform of energy and power signals.
5. Analyze the effects of different sampling rates on the reconstructed signal.
6. Determine z-transform, ROC and pole-zero locations of $x[n] = e^{jwn}$ u[n].

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Board of Studies (ECE)

R24ECPC05 ELECTRONIC DEVICES AND CIRCUITS 3 0 0 3

(Electronics and Communication Engineering)

Course Objectives:

The course is designed with the objective to:

- To understand the basic principles and characteristics of semiconductor devices like Diode, BJT, JFET and MOSFET.
- To understand the physical phenomenon such as conduction, transport mechanism, and electrical characteristics of different diodes.
- To learn and understand the applications of diodes as rectifiers with their operation and characteristics using with and without filters
- Acquire knowledge about the principle of working and operation of BJT, FET and their characteristics
- To learn and understand the purpose of transistor biasing and its significance.
- Small signal equivalent circuit analysis of BJT and FET transistor amplifiers and compare different configurations

Course Outcomes:

At the end of the course, students will be able to:

Course Code	Course Outcomes (COs)	Mapping with POs								
		PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	DoK
24ECPC05.1	Understand the fundamental operation and characteristics of semiconductor diodes and their applications.	3	3	1	2	-	-	2	1	L1, L2
24ECPC05.2	Understand the behavior of FETs and MOSFETs.	3	3	2	2	-	-	2	1	L1, L2
24ECPC05.3	Design biasing circuits for BJTs and FETs with thermal stability	3	3	2	2	-	-	2	1	L3
24ECPC05.4	Analyze the frequency response of transistor amplifier circuits, for small signal frequencies	3	2	2	3	-	-	2	2	L4, L5
24ECPC05.5	Analyze the frequency response of transistor amplifier circuits, for high frequency applications	3	2	2	3	-	-	1	3	L4, L5

Syllabus

UNIT-I: 16 Hours

P-N Junction Diode and Optoelectronic Devices: Qualitative theory of the p-n junction, open circuited p-n Junction, the p-n junction as a Diode, Construction and characteristics- PN Junction

diode, Zener diode, Tunnel diode, Photo diode, light emitting diode, **Varactor diode,** UJT and SCR, V-I characteristics and its temperature dependence, the current components in a p-n junction Diode, Diode Resistance and Diode Capacitance. piece-wise linear model, Diode current equation, Diode applications-Diode act as Half-wave and Full-wave Rectifiers with and without filters, clippers, clampers. Breakdown mechanisms in Zener diode and Avalanche breakdown. Zener diode as a voltage Regulator, Zener breakdown vs Avalanche breakdown**,** Photodiodes and their applications in communication**.** **CO's- CO1**

Self Learning Topic: Diode behavior in AC to DC conversion in power supplies

UNIT-II: **16 Hours**

Bipolar Junction Transistor (BJT) Characteristics: The junction transistor-construction, symbols and operation, transistor current components, transistor current equation, the early effect, punch through/reach through, transistor as an amplifier, Ebers-Moll model of a transistor, large signal, dc and small signal CE values of current gain, analytical expressions for transistor characteristics**,** Bipolar Junction transistors - Transistor current components, Transistor as an amplifier, Input and Output Characteristics of Common Base and Common Emitter configurations, , typical transistor-junction voltages, transistor as a switch, transistor switching times, maximum voltage rating, photo transistor.

FET: The Junction Field-effect Transistor (JFET)-types, construction and operation, Characteristics of JFET, MOSFET, characteristics- Enhancement mode and depletion mode.

CO's- CO2

Self Learning Topics: Characteristics of BJT

UNIT-III **16 hours**

Transistor Biasing and Thermal Stabilization: Need for biasing, BJT biasing - Criteria for fixing operating point, Self-bias, Fixed bias, Voltage devider bias, bias compensation, thermal runaway, thermal stability, Biasing of FETs, Introduction to two-port network, transistor hybrid model, determination of h- parameters, conversion of h-parameters, generalized analysis of transistor amplifier using h- parameters (exact analysis & approximate analysis). **CO's- CO3**

Self Learning Topics: Need of biasing

UNIT-IV: **16 Hours**

Small Signal Transistor Amplifier Circuits: h-parameter representation of a transistor, Analysis of single stage transistor amplifier using h-parameters - Voltage gain, Current gain, Input impedance and Output impedance of CE, CB, and CC amplifiers using exact and approximate analysis. Analysis of single stage FET amplifiers - voltage gain, input impedance and output impedance of CS and CD amplifiers. **CO's-CO4**

Self Learning Topics: BJT and FET operations at low frequency

UNIT-V: **16 Hours**

High Frequency BJT & FET Amplifier Circuits: Transistor at high frequencies, Hybrid- π, T model, Hybrid-π,T model conductance's, Hybrid-π, T model capacitances, Hybrid-π, T model parameters in terms of h- parameters, CE short circuit current gain, current gain with resistive load, high frequency analysis of FET common source and common drain amplifier circuits. **CO's- CO5**

Self Learning Topics: BJT and FET operations at high frequency

Board of Studies: Electronics and Communication Engineering

Approved in BOS No: 02, 30th May, 2025

Approved in ACM No: 02

Text Books:

1. Integrated Electronics – JacobMillman, C. Halkias, C.D.Parikh , Tata Mc-Graw Hill Education (India) Private Limited, Second Edition, 2011.
2. Electronic Devices and Circuits-J.Millman,C.Halkias,Mc-Graw Hill Education (India) Private Limited, Fourth Edition, 2015.

References:

1. Electronic Devices and Circuits - SSalivahanan, N Suresh Kumar, Tata McGraw Hill, Third Edition, 2012.
2. Electronic Devices and Circuit Theory-R.L. Boylestad and LouisNashelsky, Pearson Publications, Tenth Edition.

Internal Assessment Pattern

Cognitive Level	Internal Assessment # 1 (%)	Internal Assessment # 2 (%)
L1	40	--
L2	40	--
L3	20	20
L4	--	40
L5	--	40
Total (%)	100	100

Sample Short and Long Answers Questions of Various Cognitive Levels:

Level 1: Remember

1. Define the terms “depletion region” and “built-in potential” in a P-N junction.
2. List the applications of Zener diodes and photodiodes.
3. What is the function of a rectifier?
4. State the current components in a BJT.
5. Define early effect and Punch through.
6. Define operating point (Q-point) and biasing.
7. What are the stability factors S, S′,S″S, S', S"S,S′,S″?
8. Define hybrid-π parameters.
9. What is the Miller effect?

Level 2: Understand

1. Explain the V-I characteristics of a P-N junction diode with a neat sketch.
2. Describe the working principle of a Light Emitting Diode (LED).

3. Distinguish between Zener breakdown and avalanche breakdown.
4. Explain the operation of a BJT in CE configuration.
5. Describe how a transistor acts as a switch.
6. Explain the need for transistor biasing and thermal stabilization.
7. Describe the concept of thermal runaway.
8. Explain the operation of CE amplifier using h-parameter model.
9. Describe the working of CG, CS, and CD FET amplifier circuits.

Level 3: Apply

1. Calculate the DC output voltage of a full-wave rectifier with a given input.
2. Show how a clipper circuit modifies an AC waveform using a diode.
3. Derive the transistor current equation using base and collector currents.
4. Use the Ebers-Moll model to determine the collector current.
5. Calculate the operating point for a given self-bias circuit.
6. Apply the concept of bias compensation to stabilize a circuit.
7. Calculate bandwidth using time constant method.
8. Use the hybrid-π model to determine gain at high frequencies.

Level 4:Analyzing

1. Analyze the effect of temperature on the diode V-I characteristics.
2. Compare the construction and applications of Schottky diode vs Varactor diode.
3. Compare the input and output characteristics of CB, CE, and CC configurations.
4. Analyze the effect of β variation on collector current.
5. Compare the performance of FET and BJT amplifiers.
6. Analyze the differences between D-MOSFET and E-MOSFET operations.
7. Compare fixed bias, collector-to-base bias, and self-bias configurations.
8. Analyze the frequency response of a common source FET amplifier.
9. Compare the performance of BJT and FET amplifiers at low and high frequencies.

Level 5: Evaluating

1. Justify the use of filters in rectifier circuits.
2. Evaluate the advantages of using tunnel diodes in high-frequency applications.
3. Evaluate the suitability of transistor configurations for amplifier applications.
4. Justify the use of phototransistors in optoelectronic circuits.
5. Evaluate the thermal stability of a transistor biasing circuit.
6. Justify the selection of a particular biasing method for amplifier design.
7. Evaluate the impact of inter-electrode capacitances on high-frequency amplifier performance.

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Board of Studies (ECE)

R24ECPC06 **DIGITAL CIRCUIT DESIGN** **3 0 0 3**

(Electronics and Communication Engineering)

Course Objectives:

The course is designed with the objective to:

- Understand the properties of Boolean algebra, logic operations, and minimization of Boolean functions.
- Analyze the design concepts of combinational circuits
- Analyze the concepts of sequential logic circuits.
- Understand the concepts of FSM and compare various Programmable logic devices.
- Apply VHDL & Verilog on implementing Combinational and Sequential circuits.

Course Outcomes:

At the end of the course, students will be able to:

Course Code	Course Outcomes (COs)	Mapping with POs and PSOs								
		PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	Do K
R24ECPC06.1	Understand the properties of Boolean algebra, logic operations, and minimization of the Boolean functions	3	3	1	1	-	2	3	3	L1, L2
R24ECPC06.2	Design combinational circuits	3	3	2	2	-	2	3	3	L3,
R24ECPC06.3	Design sequential circuits	3	3	2	2	-	2	3	3	L3
R24ECPC06.4	Analyze the concepts of finite state machines and Compare various Programmable logic devices.	3	2	2	2	-	2	3	3	L3, L4
R24ECPC06.5	Design and Model combinational and sequential circuits using HDLs.	3	2	1	1	1	3	3	3	L4, L5

SYLLABUS

Unit I **14 Hours**

Boolean algebra, logic operations, and minimization of Boolean functions:

Number Systems and Codes, Representation of unsigned and signed integers, Floating Point representation of real numbers, Laws of Boolean Algebra, Theorems of Boolean Algebra, Realization of functions using logic gates, Canonical forms of Boolean Functions, Minimization of Functions using Karnaugh Maps, QM algorithm. **CO's– CO1**

Self Learning Topic: Binary Coded Decimal (BCD), Gray Code, Excess-3 Code

Unit II **14 Hours**

Combinational Logic Circuits :

Design with basic logic gates, adders, subtractors, Applications of full adders; 4-bit binary adder/ subtractor circuit, BCD adder, Excess 3 adder circuit and carry look- a-head adder, comparator, multiplexers, de-multiplexers, decoders, encoders and priority encoders. **CO's –CO**2

Self Learning Topic: Implementation using full adders and XOR gates for subtraction,

Unit III , 14 Hours

Sequential Logic Circuits:

Basic architectural distinction between combinational and sequential circuits, ,timing and triggering consideration, latches, flip-flops, truth tables and excitation tables, conversion of flip- flops, registers, shift registers, universal shift register, Design of asynchronous counter: 5 bit Up/Down counters, Design of Synchronous counters- Johnson counter, ring counter. **CO's – CO3**

Self Learning Topic: Edge-triggered vs level-triggered, Setup time, hold time

Unit IV 14 Hours

Programmable Logic Devices and Finite State Machines: Types of PLD's: PROM, PAL, PLA, basic structure of PROM, PAL, and PLA.

Finite state machine; state diagrams, state tables, reduction of state tables using partition technique, Mealy to Moore conversion and vice-versa. **CO's– CO4**

Self Learning Topic: CPLD architecture (blocks and interconnects), FPGA architecture (CLBs, LUTs, IOBs), Differences between CPLD and FPGA

Unit V 14 Hours

Hardware Description Language:

VHDL: Compare VHDL and Verilog HDL, Design flow using VHDL, Program structure, Elements of VHDL, Operators, VHDL Programming using Modelling techniques, Introduction to Verilog- gate level, behavioral level and structural level modeling of logic circuits. **CO's– CO5**

Self Learning Topic: History and purpose of HDLs, Key differences between VHDL and Verilog.

Board of Studies: Electronics and Communication Engineering

Approved in BOS No: 02, 30th, May, 2025

Approved in ACM No: 02

Text Books:

1. M. Morris Mano, "Digital Design", 3rd Edition, PHI. (Unit I to IV)
2. Stephen Brown and ZvonkoVranesic, "Fundamentals of Digital Logic with Verilog Design", 3rd Edition, McGraw-Hill (Unit V)
3. Stephen Brown and ZvonkoVranesic, "Fundamentals of Digital Logic with VHDL Design",

3rd Edition, McGraw-Hill (Unit V)
4. VHDL Primer 3rd Edition by J. Bhasker

Reference Books:

1. Charles H. Roth, Jr, "Fundamentals of Logic Design", 4th Edition, Jaico Publishers.
2. ZviKohavi and NirajK.Jha, "Switching and Finite Automata Theory, 3rd Edition, Cambridge University Press, 2010.
3. Samir Palnitkar, "Verilog HDL &VHDL: A Guide to Digital Design and Synthesis", 2ndEdition, Prentice Hall PTR.
4. D.P. Leach, A.P. Malvino, "Digital Principles and Applications", TMH, 7th Edition.

Web References:

1. https://nptel.ac.in/courses/106108099
2. https://nptel.ac.in/courses/108105132

Internal Assessment Pattern

Cognitive Level	Internal Assessment # 1 (%)	Internal Assessment # 2 (%)
L1	30	--
L2	30	--
L3	40	30
L4	--	40
L5	--	30
Total (%)	100	100

Sample Short and Long Answers Questions of Various Cognitive Levels:

L1: Remember

1. Write notes on different types of Number systems with examples?
2. Explain and prove De Morgan's theorem?
3. Draw the logic symbols, construct the truth tables, with the help of circuit diagram explain the working of following gates: a. AND b. OR c. NOT d. NAND e. NOR
4. The binary numbers listed have a sign bit in the left most position and, if negative numbers are in 2's complement form. Find the arithmetic operations indicated and verify the answers (i) 101011 + 111000 (ii) 001110 + 110010 (iii) 111001 – 001010 (iv) 101011 – 100110
5. Find the minimal sum of products for the Boolean expression,

a. $f=\sum m(1,2,3,5,7,8,9,10,12,14,15)$ using the K-Map.

6. Write the differences between sequential and combinational circuits with an example.
7. What is VHDL?

L2: Understand

1. Convert the given expression in standard SOP form f (A,B,C) = AC+BA+BC.
2. Draw and explain the operation of a full adder circuit using two half adder circuits.
3. Briefly explain about PLDs.
4. What is a flip-flop? Design the basic flip-flop using NOR gates and explain.

5. Draw and explain the operation of 4 bit ring counter.
6. Briefly explain about Operators?

L3: Apply

1. Solve the following expression Y=(A+B)(A+C')(B'+C') and implement using NAND gates.
2. Solve the following functions using a PROM i) F(w,x,y,z)=∑(1,9,12,15) ii) G(w,x,y,z)= ∑(0,1,2,3,4,5,7,8,10,11,12,13,14,15)
3. Write a VHDL program for a 2-input AND gate using behavioral modeling.

L4: Analyzing

1. Given the Boolean function F(A,B,C)=A′BC+AB′C+ABC′+ABCF(A, B, C) = A'BC + AB'C + ABC' + ABCF(A,B,C)=A′BC+AB′C+ABC′+ABC, express it in canonical form and simplify it using Boolean laws.
2. Identify the critical steps involved in minimizing Boolean functions using Karnaugh Maps.
3. Explain and prove (a) commutative (b) associative (c) distributive laws of Boolean algebra
4. Compare the three combinational PLDs – PROM, PLA and PAL.

L5: Evaluating

1. Assess the importance of priority encoders in digital circuits.
2. Evaluate which HDL is better suited for large-scale digital design and why.

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Board of Studies (ECE)

R24ECPC07 **Electronic Devices & Circuits Lab** **0 0 3 1.5**

(Electronics and Communication Engineering)

Course Objectives:

- Verify the theoretical concepts of semiconductor diodes like p-n junction diode and Zener diode by conduct suitable experiment using necessary hardware components.
- Study and analysis of self-biasing method using BJT and FET to determine the operating point and obtain load line analysis using necessary hardware components.
- Design a small signal low frequency amplifier circuits using BJT and FET with the specifications to obtain the performance parameters by conducting suitable experiment.
- Simulate the basic electronic devices and circuits mentioned using EDA tools like PSPICE/Multisim or equivalent and verify with the results with theoretical concepts.

Course Outcomes:

At the end of the course, students will be able to:

Course Code	Course Outcomes	Mapping with POs and PSOs								Do K
		PO1	PO2	PO3	PO4	PO5	PO6	PS01	PS02	
R24ECPC07.1	Verify the theoretical concepts of semiconductor diodes like p-n junction diode & Zener diode by determine the necessary parameters.	3	2	2	1	-	-	1	-	L1, L2
R24ECPC07.2	Design BJT and FET small signal low frequency amplifier circuits using the characteristics, operating point, load line analysis and stability factor.	3	2	3	1	-	-	1	-	L3, L4
R24ECPC07.3	Simulate basic electronic devices and circuits using necessary EDA tools.	3	-	-	1	-	-	3	2	L4, L5

Board of Studies: Electronics and Communication Engineering

Approved in BOS No: 2,30th, May, 2025

Approved in ACM No: 2

PART A: Electronic Workshop Practice

1. Identification, Specifications, Testing of R, L, C Components (Colour Codes), Potentiometers, Coils, Gang Condensers, Relays, Bread Boards. **COs–CO1**
2. Identification, Specifications and Testing of active devices like Diode, LED, BJT, FET and MOSFET. **COs–CO1**
3. Study and operation of Ammeters, Voltmeters, Transformers, Analog and Digital Multimeter, Function Generator, Regulated Power Supply and CRO. **CO's–CO1**

PART B: List of Experiments: (Minimum Twelve Experiments has to be performed)

1. P-N Junction Diode Characteristics **CO's–CO1**
   Part A: Germanium Diode (Forward bias& Reverse bias)
   Part B: Silicon Diode (Forward Bias only)
2. Zener Diode Characteristics **CO's–CO1**
   Part A: V-I Characteristics
   Part B: Zener Diode as Voltage Regulator
3. Clipper & clamping circuit using diode **CO's–CO1**
4. Rectifiers (without and with filter) **CO's–CO1**
   Part A: Half-wave Rectifier
   Part B: Full-wave Rectifier
5. BJT Characteristics (CE Configuration) **CO's–CO2**
   Part A: Input Characteristics
   Part B: Output Characteristics
6. FET Characteristics (CS Configuration) **CO's–CO2**
   Part A: Drain Characteristics
   Part B: Transfer Characteristics
7. Design and analysis of voltage- divider bias/self-bias circuit using BJT. **CO's–CO2**
8. CRO Operation and its Measurements
9. Determination of h-parameters of a given BJT using hybrid model. **CO's–CO2**
10. Frequency response of BJT-CE Amplifier **CO's–CO3**
11. Frequency response of Emitter Follower-CC Amplifier **CO's–CO3**
12. Frequency response of FET-CS Amplifier Characteristics **CO's–CO3**
13. Characteristics of SCR **CO's–CO3**
14. Characteristics of UJT **CO's–CO3**

Hardware Required:

Regulated Power supplies, Analog/Digital Storage Oscilloscopes, Analog/Digital Function Generators, Digital Multimeters, Decade Résistance Boxes/Rheostats, Decade Capacitance Boxes, Ammeters (Analog or Digital), Voltmeters (Analog or Digital), Active & Passive Electronic Components

Software Required:

Software like Multisim / PSPICE or Equivalent EDA Tool

References:

1. Integrated Electronics- Jacob Millman, C.Halkies & C.D.Parikh, TMH, 2nd Edition,2010.
2. Electronic Devicesand Circuits-S.Salivahanan&N.SureshKumar,TMH,3rd Edition.
3. Electronic Devices and Circuits – A.K.Maini & V.Agarawal, Wiley India Pvt.Ltd.

Web References:

WWW.edclabs.co.in

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Board of Studies (ECE)

R24ECPC08 DIGITAL CIRCUIT DESIGN AND SIMULATION LAB 0 0 3 1.5

(Electronics and Communication Engineering)

Course Objectives:

- Verify the truth tables of various logic circuits.
- Design sequential/combinational circuit using Hardware Description Language and verify their functionality.

Course Outcomes:

At the end of the course, students will be able to:

Course Code	Course Outcomes (COs)	Mapping with POs and PSOs								
		PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	DoK
R24ECPC08.1	Understand the fundamental concepts of digital logic gates and their applications.	3	3	2	2	3	2	3	2	L1, L2, L3
R24ECPC08.2	Design and analyze combinational logic circuits using various techniques and components.	3	3	3	3	3	3	3	2	L3, L4
R24ECPC08.3	Design and implement sequential logic circuits, including flip-flops, counters, and registers, and apply them in digital systems.	3	3	3	3	3	2	3	3	L4, L5

Board of Studies: Electronics and Communication Engineering

Approved in BOS No: 02, 30th May, 2025

Approved in ACM No: 02

LIST OF EXPERIMENTS:

Any Eight experiments has to be performed by using Trainer kit and any six experiments has to be performed by using VHDL.

1. Verification of truth tables of Logic gates **CO's:CO1**

   Two input (i) OR (ii) AND (iii) NOR (iv) NAND (v) Exclusive OR (vi) Exclusive NOR

2. Design a simple combinational circuit with four variables and obtain minimal SOP expression and verify the truth table. **CO's:CO2**

3. Verify the of functionality of 3 to 8-line Decoder **CO's:CO2**

4. 4 variable logic function verification using 8 to1 multiplexer. **CO's:CO2**

5. Design and verify the functionality of full adder circuit, full subtractor. **CO's:CO2**

6. Draw the circuit diagram of a single bit comparator and verify the output. **CO's:CO2**

7. Design and verify the functionality of different flipflops. **CO's:CO3**

8. Design and verify the operation of 4-bit Universal Shift Register for different Modes of operation. **CO's:CO3**

9. Design up counter and down counters **CO's:CO3**

10. Design MOD–8 synchronous counter /asynchronous counters **CO's:CO3**

11. Design a four bit ring counter using D Flip - Flops / JK Flip Flop and verify output. **CO's:CO3**

12. Design a four bit Johnson's counter using D Flip-Flops / JK Flip Flops and verify. **COs:CO3**

13. Construct 7 Segment Display Circuit Using Decoder and 7 Segment LED and test it. **COs:CO3**

Reference Books:

1. Charles H. Roth, Jr, "Fundamentals of Logic Design", 4th Edition, Jaico Publishers.
2. Kohavi and NirajK.Jha, "Switching and Finite Automata Theory, 3rd Edition, Cambridge University Press, 2010. 3. Samir Palnitkar, "Verilog HDL: A Guide to Digital Design and Synthesis", 2ndEdition, Prentice Hall PTR. 4. D.P. Leach, A.P. Malvino, "Digital Principles and Applications", TMH, 7th Edition.

Web References:

http://nptel.ac.in/courses/106108099

Chairperson
Board of Studies (ECE)

R24CSSC03 **COMPUTING SKILLS USING C** **0 1 2 2**

(Electronics & Communications Engineering)

Course Objectives:

- To develop proficiency in using arrays and strings in C, including performing operations such as sorting, searching, insertion, and transformation based on logical conditions.
- To understand and implement linear data structures like stacks, queues, and linked lists using arrays and pointers, and apply them to solve structured programming problems.
- To enhance analytical and problem-solving skills by designing modular functions to handle real-world logical scenarios involving numeric operations, character manipulations, and validations.
- To apply control structures, functions, and user-defined logic in building efficient and modular C programs for various computational tasks.

At the end of the course, students will be able to:

Course Code	Course Outcomes	Mapping with POs and PSOs											
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	Do K
R24CSSC03.1	Understand and implement basic array operations using C and sorting techniques in arrays.	3	2	1	1	2	0	0	0	1	1	1	L1, L2
R24CSSC03.2	Apply searching techniques on arrays and implement stack data structures using arrays.	3	3	2	2	2	0	0	0	1	1	1	L3
R24CSSC03.3	Implement queue data structures using arrays. Develop and manipulate singly linked lists. Implementation of queue, stack, arrays applications.	3	3	3	2	2	0	0	0	2	2	1	L3, L4

Board of Studies: Computer Science and Engineering

Approved in BOS No: 02, 9th May, 2025

Approved in ACM No: 02

Developing the following programs **Arrays with functions** **6 Hours**

In C you can pass single-dimensional arrays in two ways. You can either pass it directly to a function.

Week 1:

1. Write a program in C to read n number of values in an array and display them in reverse order. **CO's-CO1**
2. Write a program in C to find the sum of all elements of the array. **CO's-CO1**

Week 2:

1. Write a program in C to count the total number of duplicate elements in an array. **CO's-CO1**
2. Write a program in C to count the frequency of each element of an array. **CO's-CO1**

Week 3:

1. Write a program in C to separate odd and even integers into separate arrays. **CO's-CO1**

Sorting and Searching **6 Hours**

Week 4:

1. Write a program in C to sort elements of an array in ascending order. **CO's-CO1**
2. Write a program in C to sort the elements of the array in descending order. . **CO's-CO1**

Week 5:

1. Write a program in C to implement Linear Search **CO's-CO2**
2. Write a program in C to implement Binary Search **CO's-CO2**

Week 6:

1. Write a program in C to find the missing number in a given array. **CO's-CO2**

Stacks implementation **6 Hours**

Week 7:

1. Write a C program to check a stack is full or not using an array with push and pop operations. **CO's-CO2**
2. Write a C program to sort a given stack using another stack. **CO's-CO2**

Week 8:

1. Write a C program that reverses a stack using only stack operations push & pop. **CO's-CO2**

Queues implementation **6 Hours**

Week 9:

1. Write a C program to implement a queue using an array. Programs should contain functions for inserting elements into the queue, displaying queue elements, and checking whether the queue is empty or not. **CO's-CO3**
2. Write a C program to implement a queue using an array. Create a function that removes an element from the queue. **CO's-CO3**

Week 10:

1. Write a C program to count the number of elements in a queue. **CO's-CO3**

Linked list implementation **6 Hours**

1. Write a program in C to create and display a Singly Linked List. **CO's-CO3**

Week 11:

1. Write a program in C to create a singly linked list of n nodes and display it in reverse order. **CO's-CO3**
2. Write a program in C to create a singly linked list of n nodes and count the number of nodes. **CO's-CO3**

Problem solving **6 Hours**

Week 12:

1. The function accepts an integers arr of size 'length' as its arguments you are required to return the sum of second largest element from the even positions and second smallest from the odd position of given 'arr' **CO's-CO3**

Assumption:

- All array elements are unique
- Treat the 0th position as even

NOTE

- Return 0 if array is empty
- Return 0, if array length is 3 or less than 3

Example

Input

arr:3 2 1 7 5 4

Output

7

Explanation

- Second largest among even position elements(1 3 5) is 3
- Second smallest among odd position element is 4
- Thus output is 3+4 = 7

Sample Input

arr:1 8 0 2 3 5 6

Sample Output

8

2. The function accepts an integers sum and an integer array arr of size n. Implement the function to find the pair, (arr[j], arr[k]) where j!=k, Such that arr[j] and arr[k] are the least two elements of array (arr[j] + arr[k] <= sum) and return the product of element of this pair **CO's-CO3**

NOTE

- Return -1 if array is empty or if n<2
- Return 0, if no such pairs found
- All computed values lie within integer range

Example

Input

sum:9

size of Arr = 7

Arr:5 2 4 3 9 7 1

Output

2

Explanation

Pair of least two element is (2, 1) 2 + 1 = 3 < 9, Product of (2, 1) 2*1 = 2. Thus, output is 2

Sample Input

sum:4

size of Arr = 6

Arr: 9 8 3 -7 3 9

Sample Output

-21

3. The function accepts string str of size n as an argument. Implement the function which returns 1 if given string str is valid password else 0. **CO's-CO3**

   str is a valid password if it satisfies the below conditions.

- – At least 4 characters
- – At least one numeric digit
- – At Least one Capital Letter
- – Must not have space or slash (/)
- – Starting character must not be a number

Assumption:

Input string will not be empty.

Example:

Input 1: aA1_67

Input2:

a987 abC012

Output1:

1

Output2:

0

Week 13:

1. The function accepts an integer array 'arr', its length and two integer variables 'num' and 'diff'. Implement this function to find and return the number of elements of 'arr' having an absolute difference of less than or equal to 'diff' with 'num'. Note: In case there is no element in 'arr' whose absolute difference with 'num' is less than or equal to 'diff', return -1. **CO's-CO3**

Example:

Input:

- arr: 12 3 14 56 77 13
- num: 13
- diff: 2

Output: 3

Explanation:

Elements of 'arr' having absolute difference of less than or equal to 'diff' i.e. 2 with 'num' i.e. 13 are 12, 13 and 14.

2. The function accepts two integers n, m as arguments Find the sum of all numbers in range from 1 to m(both inclusive) that are not divisible by n. Return difference between sum of integers not divisible by n with sum of numbers divisible by n. C**O's-CO3**

Assumption:

- n>0 and m>0
- Sum lies between integral range

Example

Input
n:4
m:20
Output: 90
Explanation

- Sum of numbers divisible by 4 are 4 + 8 + 12 + 16 + 20 = 60
- Sum of numbers not divisible by 4 are 1 +2 + 3 + 5 + 6 + 7 + 9 + 10 + 11 + 13 + 14 + 15 + 17 + 18 + 19 = 150
- Difference 150 – 60 = 90

Sample Input n:3
m:10
Sample Output: 19

3. Implement the following function

char*MoveHyphen(char str[],int n);
The function accepts a string "str" of length 'n' that contains alphabets and hyphens (-). Implement the function to move all hyphens (-) in the string to the front of the given string. **CO's-CO3**
NOTE: - Return null if str is null.
Example:-

- **Input**:
  - str.Move-Hyphens-to-Front
- **Output:**
  - —MoveHyphenstoFront

Explanation:-
The string "Move-Hyphens -to-front" has 3 hyphens (-), which are moved to the front of the string, this output is "— MoveHyphen"
Sample Input

- Str: String-Compare

Sample Output-

- -StringCompare

Week 14:

4. **Problem Statement**

You are given a function,
Void *ReplaceCharacter(Char str[], int n, char ch1, char ch2);
The function accepts a string 'str' of length n and two characters 'ch1' and 'ch2' as its arguments . Implement the function to modify and return the string ' str' in such a way that all occurrences of 'ch1' in original string are replaced by 'ch2' and all occurrences of 'ch2' in original string are replaced by 'ch1'.
Assumption: String contains only lower-case alphabetical letters.
Note:

- Return null if string is null.
- If both characters are not present in string or both of them are same , then return the string unchanged.

Example:

- **Input:**
  - Str: apples

- ch1:a
- ch2:p

- **Output:**
  - paales

Explanation:

'A' in original string is replaced with 'p' and 'p' in original string is replaced with 'a', thus output is paales.

5. Problem Statement

You are required to implement the following function.

Int Operation Choices(int c, int n, int a , int b)

The function accepts 3 positive integers 'a' , 'b' and 'c ' as its arguments. Implement the function to return.

- (a+ b) , if c=1
- (a – b) , if c=2
- (a * b) , if c=3
- (a / b) , if c =4

Assumption: All operations will result in integer output. **CO's-CO3**

Example:

- **Input**
  - c :1
  - a:12
  - b:16
- **Output:**
  - Since 'c'=1 , (12+16) is performed which is equal to 28 , hence 28 is returned.

Sample Input

c : 2
a : 16
b : 20

Sample Output -4

Text Books:

1. Data structures Using C Second Edition,Reema Thareja.
2. Programming Problem Solving, Reema Thareja..

Reference Books:

1. Lets Us C,Yeswanth Kanethkar.
2. Data Structures,S.Chand And Company Limited,Dr.KV Sambasivarao.

Chairperson
Board of Studies (CSE)

R24HS04 **Logical Reasoning and Corporate Skills** **0 0 2 1**
(Common to all UG programmes)

Course Objectives:

1. **Develop Logical thinking skills:** Students will be able to analyze information, identify patterns, and make informed decisions.
2. **Enhance analytical skills:** Students will be able to break down complex information into its component parts, analyze each part, and draw conclusions.
3. **Understand corporate culture and etiquette:** Students will be able to understand and demonstrate corporate culture and etiquette, including professional behaviour and networking.
4. **Develop effective communication skills:** Students will be able to communicate effectively in a corporate setting, including verbal and written communication.
5. **Develop negotiation and conflict resolution skills:** Students will be able to negotiate effectively and resolve conflicts in a corporate setting.
6. **Improve teamwork and collaboration skills:** Students will be able to work effectively in teams, build strong relationships, and manage conflicts.

At the end of the course, students will be able to:

Course Code	Course Outcome	PO1	PO7	PO9	P011	Dok
R24HS04.1	Use their logical thinking and analytical abilities to solve reasoning questions from number analogy and series and letter and coding and decoding based aptitude questions company specific and other competitive tests.	2	---	---	---	L4,L5
R24HS04.2	Solve questions related to Blood Relations clock and calendar, etc. From company specific and other competitive tests.	1	---	---	---	L4,L5
R24HS04.3	Enforce corporate etiquette, and precise usage of English grammar to enhance their professional communication.	---	2	3	1	L1,L3
R24HS04.4	Master negotiation skills and telephone etiquette with emotional intelligence for corporate interactions.	---	2	3	1	L3
R24HS04.5	Enhance email writing skills by incorporating vocabulary acquired from storytelling, situational dialogues and reading activities by using various digital tools.	2	---	3	1	L2,L3

SYLLABUS

UNIT I **15 Hours**

Number Series, Letter Series, Number analogy, letter analogy, word analogy. Coding Decoding-Letter to letter, letter to digit, letter to number and symbol, Word to word coding, odd man out. Directions-Finding distance, Direction and Shadow based problem, Blood Relations-Mixed Blood Relations, Puzzle-Based Blood Relation, Single-Person Blood Relation, Symbol based Blood Relations.

Self Learning Topic: Number Puzzles

UNIT II **15 Hours**

Clocks–finding Angle, Time, Mirror image, Faulty clock, Calendars – Finding day of the week, Number of odd days, Repetition of same calendar, Seating Arrangement-Circular arrangement, linear arrangement, Order Sequence and Ranking

Self Learning Topic: Arrangement puzzles

UNIT III **10 Hours**

Corporate Etiquette – Work Place Etiquette and Conflict Resolution – Grammar Revision, Leadership and Management skills. Verbal Ability: Prepositions, Articles, tenses and conjunction

Self Learning Topic: Successful Team Leadership

UNIT IV **10 Hours**

EQ – Negotiation Skills – Telephone Etiquette – MNCs Paper Model Introduction, Situational Dialogue Practice – Team Activities Related to Spoken
English Verbal Ability: Fill in the blanks (Based on the given appropriate words)

Self Learning Topic: Group Discussion Skills

UNIT V **10 Hours**

E Mail Writing–Vocabulary, Story Telling Activity, Functional English–IELTS Vocabulary News Paper Reading.
Verbal Ability: Sentence arrangements

Self Learning Topic: Sentence Construction

Board of Studies: MBA
Approved in BOS No: 02, 13th, April, 2025
Approved in ACM No: 02

Text Books:

1. A Modern Approach to Logical Reasoning R.S Aggarwal – S.chand publications.
2. Personality Development and Soft Skills by Barun K.mitra

Reference Books:

1. Shortcuts in Reasoning (Verbal, Non-Verbal, Analytical & Critical) for Competitive Exams Disha's publications
2. Communication by C.S.G Krishnamacharyulu & Lalitha Ramakrishnan–Himalaya publishing house

Web References:

1. https://faceprep.in/ logical reasoning
2. www.sawaal.com
3. http://nptel.ac.in/courses
4. www.prepinsta.com

Model Questions of Logical Reasoning & Corporate Skills

L1: Remember

1. What is the proper way to greet a client or colleague in a professional setting?
2. The book is _____ the table.
3. I'm going _____ the store to buy some milk.
4. If I _____ (know) the answer, I would tell you.
5. By next year, I _____ (study) English for five years.
6. If it _____ (rain), we would have stayed home.
7. I _____ (finish) my homework before I went to bed.

L2: Understand

1. What is your favorite childhood story? Why do you enjoy it?
2. Tell a story about a memorable experience from your life.
3. If you could tell a story to inspire others, what would it be about?
4. Rearrange the following sentences to form a coherent paragraph:
   A. The sun was setting over the ocean.
   B. The sound of the waves was soothing.
   C. We walked along the beach, enjoying the peaceful atmosphere.
   D. The smell of saltwater filled the air.
5. Put the following sentences in the correct order to tell a story:
   A. She packed her bags and said goodbye to her family.
   B. After a few months, she returned home with new experiences and stories.
   C. Emily had always wanted to travel abroad.
   D. She boarded a plane and took off for a new adventure.
6. Rearrange the following sentences to form a logical argument:
   A. Therefore, we should prioritize renewable energy sources.
   B. Fossil fuels are a finite resource and contribute to climate change.
   C. In conclusion, our reliance on fossil fuels is unsustainable.
   D. Renewable energy sources, on the other hand, are sustainable and environmentally friendly.

L3: Apply

1. What qualities do you think are essential for a good leader?
2. How would you motivate a team member who is struggling with their work?
3. Describe a time when you had to make a difficult decision as a leader.
4. The new policy aims to _____ the gap between the rich and the poor.
5. The company's _____ in the market has increased significantly over the past year.
6. The teacher asked the students to _____ their essays before submitting them.
7. The _____ of the new smart phone is its advanced camera system.
8. The company will _____ a new product line next quarter.

9. By the time I arrived, they _____ (eat) dinner.

L4: Analyzing

1. Complete the series: 2, 4, 8, and 16?
2. Find the next number: 1, 2, 4, 7, 11,?
3. Identify the pattern: 3, 6, 9, 12, ?
4. Complete the sequence: 5, 10, 15, 20, ?
5. Determine the next number: 2, 6, 12, 20, ?
6. Identify the pattern: B, D, F, H, ?
7. Complete the sequence: M, O, Q, S, ?
8. Determine the next letter: T, S, R, Q, ?
9. Complete the series: Monday, Tuesday, Wednesday, ?
10. Find the next word: January, February, March, ?
11. Determine the next word: Book, Magazine, Newspaper, ?
12. Find the odd one out: Apple, Banana, Carrot, Mango
13. Identify the odd one out: Football, Basketball, Tennis, Piano
14. Determine the odd one out: Car, Bus, Train, Book
15. Find the odd one out: Red, Blue, Green, Chair
16. Identify the odd one out: Dog, Cat, Elephant, House
17. What is the angle between the hour and minute hands of a clock at 3:15?
18. 1. What is the mirror image of the time 3:45?
19. 2. A person sees their mirror image and notices that their watch shows 9:30. What is the actual time?

L5: Evaluating

1. Five friends - A, B, C, D, and E - are sitting in a row. If A is at one end, B is next to A, and C is in the middle, who is sitting at the other end?
2. Seven people - A, B, C, D, E, F, and G - are sitting in a circle. If A is between B and C, and D is opposite A, who is sitting next to D?
3. If today is Monday, what day of the week will it be 30 days from now?
4. A meeting is scheduled for the 15th of March, which falls on a Wednesday. What day of the week will the 22nd of March be?
5. If you are facing north and turn 90 degrees to your right, which direction are you facing?
6. A person walks 5 km east and then 3 km west. How far is he from his starting point?
7. If you are facing south and walk 2 km, then turn left and walk 1 km, which direction are you facing?
8. A is the brother of B. C is the sister of A. How is B related to C?
9. A woman introduces a man as the son of her brother's father. How is the man related to the woman?
10. A man points to a woman and says, "She is the daughter of my mother's only child." How is the woman related to the man?

R24 MC03 **Environmental Science** **2 0 0 0**

(Common to all branches)

Course Objectives:

1. To make the students to get awareness on environment.
2. To understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day to day activities of human life
3. To save earth from the inventions by the engineers.

SYLLABUS

UNIT I **6 Hours**

Multidisciplinary Nature of Environmental Studies: – Definition, Scope and Importance – Need for Public Awareness.

Natural Resources : Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – 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 , Energy resources:

Self-Learning Topics: Food resources, World Food Problems.

UNIT II **7 Hours**

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 the following ecosystem: a. Forest ecosystem. b. Aquatic ecosystem

Biodiversity and its Conservation : Introduction ,Definition, Values of biodiversity– India as a mega-diversity nation – Hot-sports of biodiversity – Threats to biodiversity, Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Self-Learning Topics: Desert Ecosystem, Bio-Geographical Classification of India.

UNIT III **6 Hours**

Environmental Pollution: Definition, Cause, effects and control measures of:

a. Air Pollution.
b. Water pollution
c. Soil pollution

Solid Waste Management: Causes**,** effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

Self-Learning Topics : Cause, effects and control measures of :Marine Pollution,Thermal Pollution.

UNIT IV **6 Hours**

Social Issues and the Environment: From Unsustainable to Sustainable development Water conservation, rain water harvesting, – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate Changes: global warming, acid rain, ozone layer depletion. Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Wildlife Protection Act – Forest Conservation Act .

Self-Learning Topics: Water Shed Management, Water (Prevention and control of Pollution) Act

UNIT V **7 Hours**

Human Population and the Environment: Population growth, variation among nations. Population explosion – Family Welfare Programmes. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information

Technology in Environment and human health – Case studies.

Field Work: Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc.

Board of Studies : Basic Science and Humanities Chemistry
Approved in BOS No: 05th, August, 2024
Approved in ACM No: 01

Text Books:

1. Textbook of Environmental Studies for Undergraduate Courses Erach Bharucha for University Grants Commission, Universities Press.
2. Palaniswamy, "Environmental Studies", Pearson education
3. S.Azeem Unnisa, "Environmental Studies" Academic Publishing Company
4. K.Raghavan Nambiar, "Text book of Environmental Studies for Undergraduate Courses as per UGC model syllabus", Scitech Publications (India), Pvt. Ltd.

References:

1. Deeksha Dave and E.Sai Baba Reddy, "Textbook of Environmental Science", Cengage Publications.
2. M.Anji Reddy, "Text book of Environmental Sciences and Technology", BS Publication.
3. J.P.Sharma, Comprehensive Environmental studies, Laxmi publications.
4. J. Glynn Henry and Gary W. Heinke, "Environmental Sciences and Engineering", Prentice Hall of India Private limited
5. G.R.Chatwal, "A Text Book of Environmental Studies" Himalaya Publishing House
6. Gilbert M. Masters and Wendell P. Ela, "Introduction to Environmental Engineering and Science, Prentice Hall of India Private limited.

Sample Questions

Unit –I

1. Environmental Science is Multidisciplinary in nature .Justify?
2. Explain the difference between renewable and non-renewable resources.
3. Why forests are considered a critical natural resource?
4. Discuss the positive & negative impacts of Big Dams.
5. Explain the Scope and importance of Environmental Science.
6. Apply the idea of conservation to suggest ways a community can reduce its reliance on fossil fuels.

Unit-II

1. Explain how energy flows through an ecosystem.
2. Describe the role of producers, consumers, and decomposers in an ecosystem
3. Apply the concept of ecological succession to explain how a forest might develop after a wildfire.
4. Explain the Values of Bio-Diversity
5. Evaluate the effectiveness of protected areas in conserving biodiversity.

Unit-III

1. Explain how air pollution can impact human health.
2. Examine how deforestation contributes to both air and water pollution.
3. Explain how agricultural runoff contributes to water pollution.
4. Compare the effects of chemical pollutants versus biological pollutants on freshwater

ecosystems.

5. How can a municipality implement a successful recycling program to reduce the amount of waste sent to landfills?
6. What steps should a local government take to enhance resilience against floods in an urban area?

Unit-IV

1. Describe how sustainable development aims to balance economic growth, environmental protection, and social equity.
2. Explain how a rainwater harvesting system works from collection to storage.
3. How can a government design a resettlement program that minimizes disruption to affected communities?
4. What steps can individuals take to lower their personal contribution to global warming?
5. Discuss (i) Air (Prevention and Control of Pollution) Act (ii) Wildlife Protection Act

Unit-V

1. Explain how rapid population growth can impact natural resources.
2. Examine how population growth trends influence energy consumption and
3. Discuss possible solutions for sustainable energy use.
4. Evaluate the effectiveness of population control measures in addressing environmental issues in a specific country or region.
5. How can healthcare providers ensure that people at high risk for HIV are tested and receive appropriate prevention and care services?
6. Explain the concept of gender equality and its importance in women and child welfare.

7 Discuss the Role of information Technology in Environment and human health

Chairperson
Board of Studies (Chemistry)

R24HS06 FINANCIAL MANAGEMENT AND ECONOMICS 3 0 0 3

(Common to all UG Programmes)

Course Objectives:

The main objectives of the course are to:

1. To inculcate the basic knowledge of microeconomics and financial accounting
2. To make the students learn how demand is estimated for different products, input-output relationship for optimizing production and cost
3. To Know the Various types of market structure pricing methods and strategy
4. To give an overview of investment appraisal methods to encourage the students to learn how to plan long-term investment decisions.
5. To provide fundamental skills in accounting and to explain the process of preparing financial statements.

At the end of the course, students will be able to:

Course Code	Course Outcomes	Mapping with POs											DoK
		PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	
R24HS05.1	Understand what Managerial Economics is and how demand and its factors affect business decisions.	-	2	-	-	2	-	-	2	2	3	3	L1, L2
R24HS05.2	Learn how to predict future demand and understand how production and costs work in a business.	-	3	2	3	-	-	-	2	2	2	3	L2, L3
R24HS05.3	Know different types of markets and how com-panies decide prices in various situations.	1	3	2	2	2	-	-	2	2	2	3	L3, L4
R24HS05.4	Understand types of business organ-izations, business cycles, and how to plan for long-term investments.	2	2	-	-	3	-	-	3	3	3	3	L4, L5
R24HS05.5	Learn how to prepare and read financial statements and check a company's financial health using simple tools.	2	2	-	2	3	-	-	2	3	3	3	L5, L6

SYLLABUS

Unit I: Managerial Economics and Demand Analysis **14 Hours**

Definition, nature, and scope of Managerial Economics – Relationship with other disciplines (Accounting, Finance, Behavioral Economics) – Basic economic tools: Opportunity Cost, Marginal Analysis, Discounting Principle – Demand: Meaning, types, determinants – Law of Demand and its exceptions – Elasticity of Demand: Types and measurement (Total Outlay, Point, Arc Methods) – Significance in pricing decisions. **CO's-CO1**

Self-Learning Concepts: Explore opportunity cost and marginal analysis through business decision-making scenarios. Study elasticity of demand using real cases from airlines or luxury

goods, and understand behavioral economics in consumer choices. Use simulators to visualize demand shifts and learn about exceptions to the Law of Demand.

Unit II: Demand Forecasting and Production-Cost Analysis **12 Hours**

Demand Forecasting: Meaning, factors, methods (Survey, Statistical, Delphi) – Forecasting for new products – Characteristics of a good forecasting method – Production Function: Isoquants, Isocosts, MRTS – Cobb-Douglas, CES functions – Cost concepts: Fixed vs. Variable, Explicit vs. Implicit, Opportunity Cost – Break-even analysis: Meaning, graphical representation, managerial significance. **CO's-CO2**

Self Learning Concepts: Compare forecasting methods like Delphi and survey techniques across industries. Use Excel to model the Cobb-Douglas function and practice break-even analysis through tutorials. Analyze production optimization and cost structures in manufacturing vs. tech sectors.

Unit III: Market Structures and Pricing Policies **14 Hours**

Market Structures: Features of Perfect Competition, Monopoly, Monopolistic Competition, Oligopoly - Price-output determination under different market conditions - Pricing Methods: Cost-based, Marginal Cost, Value-based, Skimming, Penetration, Bundling, Surge Pricing - Internet Pricing Models: Flat Rate, Usage-based, Smart Market Mechanism. **CO's-CO3**

Self Learning Concepts: Watch case studies on market competition and pricing tactics used by companies like Uber or Netflix. Explore bundling, skimming, and penetration strategies in FMCG and e-commerce. Use simulations to understand different market structures like monopoly and oligopoly.

Unit IV: Industrial Organization and Capital Budgeting **13 Hours**

Forms of Business Organization: Sole Proprietorship, Partnership, Joint Stock Company, Co-operative Societies, LLPs – Public Enterprises: Types and features – Business Cycles: Phases and characteristics – Capital Budgeting: Need, importance – Methods: Payback Period, ARR, IRR, NPV, Profitability Index (simple problems). **CO's-CO4**

Self-Learning Concepts: Study real startup cases to understand choices in business forms like LLPs or partnerships. Practice NPV, IRR, and other capital budgeting tools using Excel or finance videos. Analyze the impact of business cycles through examples like the 2008 crisis or COVID-19 slowdown.

Unit V: Financial Accounting and Analysis **14 Hours**

Accounting Principles – Double-entry system – Journal, Ledger, Trial Balance, Final Accounts (with simple adjustments) – Introduction to Tally/ERP tools – Limitations of Financial Statements – Financial Statement Analysis: Liquidity, Profitability, Solvency Ratios – Fund Flow Statement – Cash Flow Statement (basic concepts as per AS-3). **CO's-CO5**

Self-Learning Concepts: Learn Tally basics through online tutorials and practice journal entries

using simulations. Analyze actual company financial statements from stock exchanges. Perform ratio analysis and understand cash flow vs. fund flow through annual reports and video explainers.

Board of Studies: Master of Business Administration

Approved in BOS No: 02, 13th May, 2025

Approved in ACM No: 02

Text Books:

1. Varshney & Maheswari: Managerial Economics, Sultan Chand.
2. Aryasri: Business Economics and Financial Analysis, 4/e, MGH.

Reference Books:

1. Ahuja Hl Managerial economics Schand.
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, NewAge International.
3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e,
4. New Delhi.
5. Domnick Salvatore: Managerial Economics in a Global Economy, Cengage.

Web References:

1. https://www.slideshare.net/123ps/managerial-economics-ppt
2. https://www.slideshare.net/rossanz/production-and-cost-45827016
3. https://www.slideshare.net/darkyla/business-organizations-19917607
4. https://www.slideshare.net/balarajbl/market-and-classification-of-market
5. https://www.slideshare.net/ruchi101/capital-budgeting-ppt-59565396
6. https://www.slideshare.net/ashu1983/financial-accounting

Internal Assessment Pattern

Cognitive Level	Internal Assessment # 1 (%)	Internal Assessment # 2 (%)
L1	17	-
L2	17	-
L3	33	30
L4	33	30
L5	-	28
L6	-	14
Total (%)	**100**	**100**

Sample Short and Long Answers to Questions of Various Cognitive Levels

L1: Remember

1. Define Managerial Economics and explain its features?
2. What is the Law of Demand?
3. List the types of price elasticity of demand.
4. Name any two methods of demand forecasting.

5. Define isoquant and isocost lines.
6. What are the features of perfect competition?
7. List the phases of the business cycle.
8. Mention any two pricing strategies used in the market.
9. State the assumptions of the Cobb-Douglas production function.
10. What is a journal in accounting?

L2: Understand

1. Explain the relationship between Managerial Economics and Finance.
2. Describe the concept of opportunity cost with an example.
3. Interpret the law of demand with the help of a demand schedule.
4. Explain the importance of elasticity in pricing decisions.
5. Discuss the significance of break-even analysis for managers.
6. Compare features of monopoly and oligopoly.
7. Describe the basic accounting principles underlying double-entry bookkeeping.
8. Explain the concept of liquidity ratio with examples.
9. Illustrate how journal and ledger entries are connected.
10. Describe the payback period method of capital budgeting.

L3: Apply

1. Apply the concept of marginal analysis to a managerial decision.
2. Calculate price elasticity using the point method.
3. Use a statistical method to forecast demand for a new product.
4. Construct isoquant and isocost lines and find the least-cost combination.
5. Determine the break-even point for a firm with given cost and revenue data.
6. Illustrate price-output determination under monopolistic competition.
7. Apply skimming pricing strategy to launch a new smartphone.
8. Record basic journal entries for a business transaction.
9. Prepare a simple final account from a trial balance.
10. Analyse a cash flow statement using AS-3 basic concepts.

L4: Analysing

1. Differentiate between accounting and finance in the context of managerial economics.
2. Analyse the impact of substitutes and complements on demand.
3. Compare the arc method and point method of measuring elasticity.
4. Examine the suitability of the Delphi method for demand forecasting.
5. Break down the elements of the Cobb-Douglas production function.
6. Distinguish between cost-based and value-based pricing methods.
7. Analyse a company's capital budgeting decision using NPV and IRR.
8. Compare the liquidity and solvency positions using appropriate ratios.
9. Evaluate the financial position of a company using profitability ratios.

10. Contrast different forms of business organization in terms of risk and control.

L5: Evaluating

1. Evaluate the relevance of managerial economics in business decision-making.
2. Assess the importance of marginal analysis over average analysis.
3. Justify the use of penetration pricing for a new market entrant.
4. Critically evaluate the Delphi method of forecasting.
5. Assess the strengths and weaknesses of monopolistic competition.
6. Evaluate the IRR method as a tool for investment appraisal.
7. Recommend a form of business organization suitable for a tech startup.
8. Appraise the effectiveness of Tally/ERP tools in financial accounting.
9. Evaluate the usefulness of break-even analysis in cost control.
10. Judge the limitations of financial statements for decision-making.

L6: Create and Develop

1. Design a pricing strategy for a new e-commerce platform using economic principles.
2. Develop a demand forecasting plan for a new electric vehicle.
3. Create a break-even chart for a new business.
4. Formulate a production strategy using isoquant and isocost analysis.
5. Construct a capital budgeting proposal comparing NPV and IRR outcomes.
6. Develop a comparative analysis report on perfect and monopolistic competition.
7. Design a journal-to-final-account workflow in a small business setup.
8. Compose a cash flow statement using hypothetical data.
9. Create a summary report evaluating the financial position of a company using ratio analysis.
10. Propose a policy for internet pricing for a subscription-based app.

Chairperson
Board of Studies (MBA)

R24ES10 ANALOG ELECTRONIC CIRCUITS DESIGN 3 0 0 3

(Common to ECE & EEE)

Course Objectives:

- Understand the characteristics of multi stage, differential amplifiers, feedback, power and tuned amplifiers.
- Analyze the performance parameters of various amplifier circuits.
- Analyze different oscillator circuits based on the frequency of operation.
- Study and analyze the various pulse electronic circuits.

Course Outcomes:

At the end of the course, students will be able to:

Course Code	Course Outcomes (COs)	Mapping with POs								Do K
		PO1	PO2	PO3	PO4	PO5	PO11	PSO1	PSO2	
R24ES10.1	Understand the characteristics of differential amplifiers, feedback and power amplifiers.	3	3	1	2	-	-	2	1	L1, L2
R24ES10.2	Examine the frequency response of multistage and differential amplifier circuits using BJT & FETs at low and high frequencies.	3	3	1	2	-	-	2	2	L2, L3
R24ES10.3	Investigate different feedback and power amplifier circuits based on the application.	3	3	1	2	-	-	2	2	L3, L4
R24ES10.4	Derive the expressions for frequency of oscillation and condition for oscillation of RC and LC oscillator circuit.	3	2	-	2	1	-	2	2	L4, L5
R24ES10.5	Analyze and design tuned amplifiers, including small signal and large signal amplifiers.	3	3	1	2	-	-	2	-	L3, L6

SYLLABUS

UNIT-I: 16 Hours

Multistage Amplifiers: Classification of amplifiers, distortion in amplifiers, frequency response of an amplifier, step response of an amplifier, methods of coupling, band pass of cascaded stages, Miller's theorem, analysis of n-stages cascaded transistor amplifier, two stage RC coupled amplifier using BJT & FET analysis, Darlington pair amplifier, Boot-strap emitter follower, Cascode amplifier, differential amplifier, Multi stage Amplifiers Using FET, Illustrative Problems.

COs – CO1

Self Learning Topics:

1. Input and Output Impedance: Understanding how multistage amplifiers impact input and output impedance, and how to match impedances for optimal performance.

2. Frequency Response: Studying the frequency response of multistage amplifiers, including the effects of coupling capacitors and bypass capacitors.

UNIT -II **12 Hours**

Feedback Amplifiers:: Classification of basic amplifiers, Feedback concept, types of feedback, feedback topologies, characteristics of negative feedback amplifiers, Effect of Negative feedback upon output and input resistance, generalized analysis of feedback amplifiers, performance comparison of feedback amplifiers, method of analysis of feedback amplifiers. Illustrative Problems. **COs–CO2**

Self Learning Topics:

1. Gain and Bandwidth: Analyzing how feedback affects gain and bandwidth, including the trade-offs between the two.
2. Stability and Oscillation: Understanding how feedback can lead to instability and oscillation, and how to prevent these issues.

UNIT-III **14 Hours**

Oscillators: Oscillator principle, condition for oscillations, types of oscillators, RC-phase shift and Wein bridge oscillators using BJT and FET, generalized analysis of LC oscillators using BJT, Hartley and Colpitt's oscillators using BJT and FET, crystal oscillator, frequency stability of oscillators, Illustrative Problems. **COs–CO3**

Self Learning Topics:

1. Oscillator Circuit Design: Learning how to design oscillator circuits, including selecting components and calculating values.
2. Frequency Stability: Understanding the factors that affect frequency stability, and how to improve it.

UNIT-IV **14 Hours**

Power Amplifiers: Classification of amplifiers, Class A power Amplifiers (Series fed and transformer coupled), harmonic distortions, Class B amplifier, Push-pull amplifier, Complementary symmetry push pull amplifier, Class AB amplifier, Class-C amplifier, thermal stability and heat sink, distortion in power amplifiers. **COs–CO4**

Self Learning Topics:

1. Power Amplifier Efficiency: Understanding the factors that affect power amplifier efficiency, and how to improve it.
2. Distortion and Linearity: Studying the causes of distortion in power amplifiers, and how to minimize it.

UNIT-V **14 Hours**

Tuned Amplifiers: Introduction, Q-Factor, small signal tuned amplifiers, effect of cascading single tuned and doubled tuned amplifiers on band width, stagger tuned amplifiers, comparison of tuned amplifiers, large signal tuned amplifiers, stability of tuned amplifiers. **COs–CO5**

Self Learning Topics:

1. Noise and Interference: Understanding how to minimize noise and interference in tuned amplifiers, including techniques like noise matching and shielding.
2. Modern Tuned Amplifier Designs: Studying modern designs and techniques for tuned amplifiers, including the use of active devices and feedback.

Board of Studies: Electronics and Communication Engineering
Approved in BOS No: 02,30th May, 2025

Approved in ACM No: 02

Text Books:

1. Electronic Devices and Circuits - J.Millman, C.C. Halkias & S.Jit, TMH, 4thEdition, 2015.
2. Pulse and Digital Circuits- A.Anand Kumar, PHI Learning Private Limited, 2012.

References:

1. Integrated Electronics- Jacob Millman, C. Halkies&C.D.Parikh, TMH, 2nd Edition, 2010.
2. Electronic Devices and Circuits- S.Salivahanan & N.Suressh Kumar,TMH,3rd Edition,
3. 2012.
4. Electronic Devices and Circuits – A.K.Maini & V.Agarawal, Wiley India Pvt.Ltd., First Edition, 2009.

Internal Assessment Pattern

Cognitive Level	Internal Assessment # 1 (%)	Internal Assessment # 2 (%)
L1	30	--
L2	40	--
L3	30	30
L4	--	40
L5	--	30
Total (%)	100	100

Questions on Various Cognitive Levels

L1: Remember

1. What is a multistage amplifier, and why is it used?
2. What are the benefits and drawbacks of using feedback in amplifiers?
3. What are the conditions required for sustained oscillation in an oscillator?
4. Do power amplifiers differ from voltage amplifiers?
5. What are the different classes of power amplifiers (e.g., Class A, Class B, Class AB)?
6. What is the purpose of tuning in amplifiers, and how is it achieved?
7. What are the applications of tuned amplifiers in electronic systems?

L2: Understand

1. How do you calculate the overall gain of a multistage amplifier?
2. What is the effect of cascading multiple amplifier stages on the bandwidth and gain of the overall amplifier?
3. What is the difference between voltage feedback and current feedback in amplifiers?
4. How do you design a feedback amplifier to achieve a specific gain and stability?
5. How do you design an oscillator to produce a specific frequency and amplitude?
6. What are the factors that affect the stability and accuracy of an oscillator?
7. How do you calculate the efficiency of a power amplifier?
8. What are the differences between Class A, Class B, and Class AB power amplifiers?
9. What is the effect of Q-factor on the selectivity and bandwidth of a tuned amplifier?
10. How do you use tuned amplifiers in radio frequency (RF) applications?

L3: Apply

1. How do you analyze the noise performance of a multistage amplifier, and what are the techniques to minimize noise?

2. How do you design a multistage amplifier for high-frequency applications, considering factors like parasitic capacitances and inductances?
3. Apply the stability of a feedback amplifier using techniques like Nyquist plots and Bode plots?
4. Apply the feedback concepts and design a feedback amplifier with a specific gain-bandwidth product and stability margin?
5. Describe the design procedure of phase-locked loop (PLL) oscillator, and what are its applications?
6. What are the effects of phase noise and jitter on oscillator performance, and how can they be minimized?
7. Write the principle of oscillator design an oscillator for high-frequency applications, such as microwave or millimeter-wave frequencies?
8. What are the effects of thermal management and heat sinking on power amplifier performance and reliability?
9. Explain the concepts of power amplifiers and apply these concepts for linearity and low distortion, using techniques like linearization and predistortion?
10. How do you use tuned amplifiers in applications like radio frequency identification (RFID) or wireless communication systems?

L4: Analysing

1. How can you optimize the noise figure and gain of a multistage amplifier using advanced techniques like noise matching and gain shaping?
2. Analyse the multistage amplifiers and design for high-speed applications, such as fiber-optic communication systems or high-speed data acquisition?
3. Analyze the stability and robustness of a feedback amplifier using advanced techniques like μ-analysis or singular value decomposition?
4. How do you design a feedback amplifier with optimal performance and robustness using advanced control theory techniques?
5. How do you design an ultra-low-phase-noise oscillator using advanced techniques like crystal oscillators or optoelectronic oscillators?
6. Explain the design Procedure of an oscillator for extreme environments, such as high-temperature or high-radiation applications?
7. How do you design a high-power amplifier for applications like radar or microwave heating, considering factors like thermal management and electrical breakdown?
8. What are the effects of load mismatch and VSWR on power amplifier performance, and how can they be mitigated?
9. Analyse design a tunable filter or amplifier using advanced techniques like varactor diodes or MEMS devices?
10. What are the effects of component aging and drift on tuned amplifier performance, and how can they be compensated?

L5 Evaluating:

1. What are the fundamental limits on the noise figure and gain of multistage amplifiers, and how can they be approached?
2. What are the implications of emerging technologies like graphene or nanotubes on the design and performance of multistage amplifiers?

3. Evaluate and analyze the stability and performance of feedback amplifiers with nonlinear and time-varying components using advanced mathematical tools like Lyapunov theory?
4. What is the trade-offs between feedback and feed forward control in amplifiers, and how can they be optimized?
5. What are the fundamental limits on the phase noise and stability of oscillators, and how can they be approached?
6. How can you design an oscillator with optimal performance and minimal power consumption using advanced techniques like injection locking or frequency division?
7. What is the trade-offs between different power amplifier architectures, such as Doherty or Chireix, and how can they be optimized?
8. Evaluate power amplifier for emerging applications like 5G or IoT, requiring high efficiency and linearity?
9. What are the implications of emerging technologies like met materials or graphene on the design and performance of tuned amplifiers?
10. Evaluate and design a tuned amplifier for applications like spectrum sensing or cognitive radio, requiring high selectivity and adaptability?

Chairperson
Board of Studies (ECE)

R24ECPC09 **Linear IC Applications** **3 0 0 3**

(Electronics and Communication Engineering)

Course Objectives:

- Understand the Fundamentals of Operational Amplifiers (Op-Amps).
- Analyze and Measure Op-Amp Specifications.
- Explore Practical Applications of Op-Amps.
- Design and Implement Active Filters.
- Understand and Apply Timer and PLL Circuits.
- Learn the Principles and Types of Data Converters.

Course Outcomes

At the end of the course, students will be able to:

Course Code	Course Outcomes (COs)	Mapping with POs and PSOs								Do K
		PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	
R24ECPC09.1	Understand the Op-Amp operation and internal Circuitry	3	3	1	2	-	2	3	-	L1, L2
R24ECPC09.2	Understand the Applications of Operational amplifier	3	3	1	2	-	1	3	-	L1, L2
R24ECPC09.3	Design the Active filters using Operational Amplifier	3	3	1	2	1	-	3	2	L3
R24ECPC09.4	Design the 555 Timer.	3	2	1	2	1	2	2	2	L3, L4
R24ECPC09.5	Design Op-Amp in A to D & D to A Converters	3	2	1	3	2	-	3	3	L3, L5

SYLLABUS

Unit I **16 Hours**

OP-Amp Block Diagram (Symbolic Representation), Characteristics of Op-Amp, Ideal and Practical Op-Amp specifications, DC and AC Characteristics, Definitions of Input and Output Off-set voltages and currents, Slew Rate, CMRR, PSRR. Three-Terminal Voltage Regulators 78xx & 79xx Series, current Booster. Functional Block Diagram of Op-Amp, Open-loop and Closed-loop Configurations, Applications of LM317 Adjustable Regulator **COs-CO1**

Self Learning Topics:

1. Use simulation tools like LTspice**,** Multisim, or Falstad to visualize Op-Amp behavior.
2. Try building small circuits on a breadboard (e.g., inverting amplifier, voltage regulator).

Unit II **16 Hours**

OP-AMPS Applications: Introduction, Basic Op-Amp Applications, Instrumentation Amplifier, AC Amplifier, V to I ,and I to V Converter, Sample and Hold Circuit, Multiplier and Divider, Differentiator, Integrator.

Precision Rectifier, **Peak Detector using Op-Amp**

Comparators and Waveform Generators: Introduction, Comparator, Square Wave Generator, Monostable Multivibrator, Triangular Wave Generator, Sine Wave Generators, Window Comparator, Wien Bridge Oscillator. **CO's-CO2**

Self Learning Topics:

1. Understand the role of negative and positive feedback in applications
2. Real-time application: Design of Heartbeat Sensor Circuit using Instrumentation Amplifier
3. Using comparator with positive feedback (Schmitt Trigger) in square wave generator.

Unit III **16 Hours**

Design & Analysis of Butterworth active filters – 1st order, 2nd order LPF, HPF filters. Band pass, Band reject and all pass filters, Introduction to Chebyshev Filters, Applications of Active Filters in Audio and Communication Systems, Design using Sallen-Key Topology **CO's-CO3**

Self Learning Topics:

1. Design and simulate active filters in MATLAB or LTspice
2. Comparative study: Butterworth vs Chebyshev filter responses

Unit IV **16 Hours**

Timers: Introduction to 555 timer, functional diagram, Monostable and Astable operations and applications, Schmitt Trigger, Applications of 555 Timer: PWM, Delay Timer, Tone Generator. Phase Locked Loops: Introduction, block schematic, principles and description of individual blocks, 565 PLL, Applications of PLL – frequency multiplication, frequency translation, Applications of VCO (566), PLL in Tone Decoding and Clock Recovery, Basic Frequency Synthesizer Concepts **CO's-CO4**

Self Learning Topics: Simulate circuits using Falstad (great for timers and PLLs)

Unit V **16 Hours**

Digital To Analog And Analog To Digital Converters: Introduction, basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, A-D Converters – parallel Comparator type ADC, counter type ADC, successive approximation ADC and dual slope ADC, DAC and ADC Specifications, Introduction to Flash ADC, Concept of Delta-Sigma ADC, Applications of DACs and ADCs in Embedded and Control Systems. **CO's-CO5**

Self Learning Topics:

1. Need for conversion in real-world electronics (e.g., sensors, microcontrollers)

Board of Studies: Electronics and Communication Engineering

Approved in BOS No:02, 30th May, 2025

Approved in ACM No: 02

Text Books:

1. Linear Integrated Circuits – D. Roy Choudhury, New Age International (p) Ltd, 2nd Edition 2003.
2. Operational Amplifiers & Linear Integrated Circuits –Sanjay Sharma ;SK Kataria&Sons;2nd Edition,2010.

Reference Books:

1. Op-Amps & Linear ICs - Ramakanth A. Gayakwad, PHI, 1993.
2. Operational Amplifiers & Linear ICs – David A Bell, Oxford Uni. Press, 3rd Edition.

Web References:

https://onlinecourses.nptel.ac.in/noc24_ee73/preview

Internal Assessment Pattern

Cognitive Level	Internal Assessment # 1 (%)	Internal Assessment # 2 (%)
L1	40	--
L2	40	--
L3	20	40
L4	--	30
L5	--	30
Total (%)	100	100

Sample Short and Long Answers Questions of Various Cognitive Levels:

L1: Remember

1. List out the characteristics of op-amp.
2. What are the Ideal & Practical specifications of op-amp?
3. Definitions of Input and Output Off-set voltages and currents, Slew Rate, CMRR, PSRR
4. Definitions of Slew Rate, CMRR, PSRR
5. What are the Applications of Op-Amp
6. Define low-pass, high-pass, and band-pass filters.

L2: Understand

1. Explain the functions of all the basic building blocks of an op-amp with a neat diagram.
2. Explain all the DC characteristics of an ideal op-amp with relevant expressions
3. Explain the function of op-amp as differentiator and draw the waveforms.
4. Explain the operation of a practical sample-and-hold circuit with a neat diagram.
5. Explain the operation of op-amp current to voltage converter circuit
6. With a neat sketch explain about voltage to current converter using op-amp.
7. Explain about band pass filter with neat diagrams.

L3: Apply

1. Design a differentiator using op-amp to differentiate an input signal with 1 kHz
2. Design a second-order Butterworth High pass filter with cut-off frequency of 10 kHz, given

that2K1 = 0.765 and 2K2 = 1.848.

3. Design a 1st-order low-pass filter with a given cutoff frequency
4. Design a 2nd-order low-pass filter and verify its gain at various frequencies.
5. Design a 1st-order high-pass filter with a given cutoff frequency.
6. Design a 2nd-order high-pass filter and verify its gain at various frequencies.
7. Convert a digital signal into analog using a weighted resistor DAC.

L4: Analysing

1. Differentiate between AC and DC characteristics of an Op-Amp.
2. Analyze the output waveform of an Op-Amp integrator for a given input.
3. Analyze the performance of band-reject filters in removing noise.

L5: Evaluating

1. Assess the performance of an Op-Amp based on measured parameters.
2. Critically evaluate the performance of a triangular wave generator.
3. Create a monostable multivibrator using Op-Amp configuration.

Chairperson
Board of Studies (ECE)

R24ECPC10 **ADVANCED CONTROL SYSTEMS** **3 0 0 3**

(Electronics and Communication Engineering)

Course Objectives:

- Introduce the basic principles and applications of control systems.
- Learn the time response and steady state response of the systems.
- Know the time domain analysis and solutions to time invariant systems.
- Understand different aspects of stability analysis of systems in frequency domain.
- Understand the concept of state space, controllability and observability.

Course Outcomes:

At the end of the course, students will be able to:

Course Code	Course Outcomes (COs)	Mapping with POs and PSOs								Do K
		PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	
R24ECPC10.1	Introduces feedback in control systems to enhance stability, accuracy, across various engineering applications.	3	3	1	2	2	2	3	2	L1, L2,
R24ECPC10.2	Analyze time and steady-state responses using time and frequency domains.	3	3	1	2	1	-	3	2	L2, L4
R24ECPC10.3	Understand state-space concepts and design control systems using time and frequency domain analysis techniques.	3	3	1	-	2	2	3	3	L2, L4
R24ECPC10.4	Design, analyze, and implement digital control systems for diverse real-world applications.	3	2	3	2	-	3	3	2	L3, L4, L5
R24ECPC10.5	Apply state space and frequency domain methods to analyze stability and performance of control systems.	3	3	2	2	-	3	2	2	L3, L4

SYLLABUS

UNIT-I **18 Hours**

Control Systems Concepts: Basic concepts of Control system, Classification- Open loop and Closed loop, Effect of Feedback, Examples of Control systems, Mathematical models Differential equations of translational and electrical systems, Analogous Systems, Block diagram reduction methods – Signal flow graphs - Reduction using Mason's gain formula, DC Servomotor and AC Servomotor. Digital autopilots-their transfer functions. **CO's- CO1**

Self Learning Topic: Examples of Control systems**,** synchros

UNIT-II **16 Hours**

Time Response Analysis: Step Response - Impulse Response - Time response of first order systems – characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications, Study of P, PI, PD and PID Controllers.

Stability Analysis in Time Domain: The concept of stability – Routh's stability criterion – Stability and conditional stability - limitations of Routh's stability. The Root locus concept - construction of root loci. **CO's-CO2**

Self Learning Topic: Effects and design of P, PI, PD, PID for second order system

UNIT-III **14 Hours**

Frequency Response Analysis: Introduction, Frequency domain specifications-Bode, Diagrams-Determination of Frequency domain specifications and Phase margin and Gain Margin-Stability Analysis, Introduction To Polar Plots- Nyquist Plots- Compensator, Introduction to Lag, Lead, Lag-Lead. Design of lead, lag ,lead lag compensator design in frequency domain on second order system. **CO's-CO3**

Self Learning Topic: Design of lead, lag, lead lag compensator design

UNIT IV **14 Hours**

Digital Control System Design: Introduction, Microprocessor Control, Pulse transfer function, Closed loop pulse transfer function, Digital control system Design, regulator and observer design, Study of digital Compensators, Examples of digital control system in real world applications-Automotive systems, Industrial Applications, Home appliances, Aerospace applications - Drone.

CO's-CO4

Self Learning Topic: Regulator and observer design, Study of digital Compensators

UNIT-V **17 Hours**

State Space Analysis of Continuous Systems: Concepts of state, state variables and state model differential equations & Transfer function models - Block diagrams. Transfer function from state model, solving the Time invariant state Equations- State Transition Matrix and its Properties. System response through State Space models. The concepts of controllability and observability. **CO's-CO5**

Self Topic: Learning: System response through State Space models.

Board of Studies: Electronics and Communication Engineering

Approved in BOS No: 02, 30th May, 2025

Approved in ACM No: 02

Text books:

1. Modern Control Engineering by Katsuhiko Ogata, Prentice Hall of India Pvt. Ltd., 5th edition, 2010.
2. Control Systems Engineering by I. J. Nagrath and M. Gopal, New Age International (P) Limited Publishers, 5th edition, 2007.
3. Advanced Control Systems, Ronald S.Burns , A division of Reed Educational and professional Ltd 2001.

References books:

1. Control Systems Principles & Design by M.Gopal, 4th Edition, McGraw Hill Education,2012.
2. Automatic Control Systems by B. C. Kuo and FaridGolnaraghi, John wiley and sons, 8th

edition,2003.
3. Feedback and Control Systems, Joseph J Distefano III, Allen R Stubberud& Ivan J Williams, 2nd Edition, Schaum's outlines, McGraw Hill Education,2013.
4. Control System Design by Graham C. Goodwin, Stefan F. Graebe and Mario E. Salgado, Pearson, 2000.
5. Feedback Control of Dynamic Systems by Gene F. Franklin, J.D. Powell and Abbas Emami- Naeini, 6th Edition, Pearson,2010.

Web References:

1. https://www.tutorialspoint.com/control_systems/control_systems_introduction.htm
2. https://ocw.mit.edu/courses/2-171-analysis-and-design-of-digital-control-systems-fall-2006
3. https://www.geeksforgeeks.org/what-is-state-space-analysis

Internal Assessment Pattern

Cognitive Level	Internal Assessment # 1 (%)	Internal Assessment # 2 (%)
L1	30	--
L2	40	--
L3	--	40
L4	30	30
L5	--	30
Total (%)	100	100

Sample Short and Long Answers Questions of Various Cognitive Levels:

L1: Remember

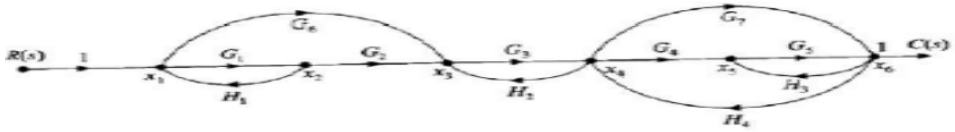
1. Define control system, open loop and closed loop control systems. Compare their merits and demerits.
2. Define transfer function. Explain its advantages and limitations .
3. Define impulse response and step response.
4. Test the stability of the system with the following characteristic equation by Routh's test s 6 + $2s^5$ + $8s^4$+ $20s^2$ + 16s + 16 = 0 .Define and derive the breakaway point on the root locus.
5. What is a pulse transfer function?
6. Define state, state variable, and state model.

L2: Understand

1. Differentiate between open-loop and closed-loop systems with diagrams.
2. Describe the working principle of a DC servomotor.
3. Describe the importance of time-domain specifications like rise time and settling time.
4. Describe the relationship between frequency response and system stability.
5. Explain how microprocessors are used in digital control systems..
6. Describe the difference between controllability and observability

L3: Apply

1. Form the analogous electrical system for a given translational mechanical system.
2. Apply Mason's gain formula to find the transfer function of the system shown below?

3. 
4. .Analyze the transient response of a second-order system for a given damping ratio.
5. .Derive the expression for Transfer function for the Closed loop pulse transfer function.

L4: Analyze

1. Compare the characteristics of DC and AC servomotors.
2. Use Mason's gain formula to determine the transfer function of a given signal flow graph.
3. Construct the polar plot of G(s)H(s)=K/S(S+3)(S+5) and there from determine range of K for stability using Nyquist Criterion?
4. Apply Routh's stability criterion to determine the stability of a system with a given characteristic equation.
5. Compare the frequency responses of Lag, Lead, and Lag-Lead compensators.
6. Analyze the behavior of a digital control system in automotive cruise control.

L5: Evaluating

1. Assess the stability of a system using Routh's table and justify if it's conditionally stable.
2. Evaluate the stability of a system using the Nyquist criterion.
3. Evaluate the advantages of state-space modeling over transfer function modeling.

Chairperson
Board of Studies (ECE)

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R24ECPC11 ANALOG AND DIGITAL COMMUNICATIONS 3 0 0 3

(Electronics and Communication Engineering)

Course Objectives:

- To develop a fundamental understanding on Communication Systems
- To analyze various analog modulation & demodulation schemes
- Analyze the performance of various modulation techniques in the presence of AWGN
- To understand operation of AM & FM radio receivers
- To understand the concepts of Digital Modulation Technique, Baseband transmission and Optimum Receiver.

Course Outcomes

At the end of the course, students will be able to:

Course Code	Course Outcomes (COs)	Mapping with POs								DoK
		PO1	PO2	PO3	PO4	PO5	PO11	PSO1	PSO2	
R24ECPC11.1	Introduces feedback in control systems to enhance stability, accuracy, across various engineering applications.	3	-	2	-	3	2	3		L1, L2
R24ECPC11.2	Analyze time and steady-state responses using time and frequency domains.	3	2	2	2	2	-	3		L3, L4
R24ECPC11.3	Understand state-space concepts and design control systems using time and frequency domain analysis techniques.	3	2	-	-	2	-	3	2	L2, L3
R24ECPC11.4	Design, analyze, and implement digital control systems for diverse real-world applications.	3	-	1	1	2	2	2	2	L4, L5
R24ECPC11.5	Apply state space and frequency domain methods to analyze stability and performance of control systems.	3	3	2	2	2	-	3	3	L4, L5

SYLLABUS

UNIT-I **14 Hours**

Introduction - Block diagram of communication system, analog and digital systems, need for modulation, Electromagnetic Spectrum (EM Spectrum), and basics analog and digital communication.

Amplitude Modulation- Amplitude (Linear) Modulation–AM,DSB-SC, SSB-SC and VSB-SC. Methods of generation and detection and Comparison, Application of different AM techniques.

CO's–CO1

Self learning topics: Simulation: Use **MATLAB** to generate and demodulate AM/DSB-SC signals, Compare: Power efficiency of AM vs. DSB-SC using equations.

UNIT-II **14 Hours**

Angle (Non-Linear) Modulation – Frequency and Phase modulation. Frequency Modulation: Single tone frequency modulation, Narrow band FM,Wideband FM, Transmission band width of FM signals. Generation: Direct Method, Indirect Method. Detection: Balanced Frequency discriminator, Zero crossing detector, Comparison of FM & AM, Applications. Concept of Pre-emphasis and de-emphasis. **COs–CO2**

Self learning topics: Need of pre-emphasis circuit in FM transmitters

UNIT-III **14 Hours**

Transmitters: Classification of Transmitters-AM Transmitters, FM Transmitters.

Receivers: Tuned radio frequency receiver, super heterodyne receiver, RF section and Characteristics - Frequency changing and tracking, Intermediate frequency, Image frequency, AGC, Amplitude limiting, FM Receiver, Comparison of AM and FM Receivers.

Noise Analysis - Internal and External Noise, Noise Calculation, Noise Figure, Noise temperature, Threshold effect, Noise analysis in AM&FM receivers. **CO's–CO3**

Self learning topics: Model AGC in MATLAB to stabilize receiver output under varying signal strengths., Need for limiters in FM receivers

UNIT-IV **14Hours**

Pulse analog Modulation: Types of Pulse modulation- PAM, PWM and PPM, Methods of generation and detection. Multiplexing techniques FDM,TDM,CDM and OFDM.

Pulse Digital Modulation: advantages of digital modulation in modern communication Elements of digital communication systems, Elements of PCM: Sampling, Quantization & Coding, Non-Uniform Quantization and Companding, Differential PCM systems (DPCM). Delta modulation, its draw backs, adaptive delta modulation, comparison of PCM and DM systems **CO's-CO4**

Self learning topics: Generation of PWM signals using a 555 timer circuit (simulate in Tinkercad)

UNIT-V **14 Hours**

Digital Modulation Techniques: ASK- Modulator, Coherent ASK Detector, FSK- Modulator and Non-Coherent FSK Detector, BPSK- Modulator, Coherent BPSK Detection, Principles of QPSK, Differential PSK and QAM. Key performance matrices of digital communication.

Baseband transmission: A Baseband Signal Receiver, Probability of Error, Optimum Receiver, matched filter. **CO's–CO5**

Self learning topics: Compare QPSK and 16-QAM constellations in MATLAB (error rate vs. SNR),Proof of matched filter maximizing SNR (use Cauchy-Schwarz inequality).

Board of Studies: Electronics and Communication Engineering

Approved in BOS No: 02, 30th May, 2025

Approved in ACM No: 02

Text Books:

1. Communication Systems-Simon Haykin,John Wiley & Sons, 2nd Edition.
2. B.P.Lathi, ZhiDing "Modern Digital and Analog Communication Systems", Oxford press.
3. Digital Communication-Simon Haykin, John Wiley, 2005.

Reference Books:

1. Digital Communications–John Proakis,TMH, 1983
2. Digital and Analog Communication Systems –Sam Shanmugam, John Wiley & Sons, 1999.
3. Digital Communications: Fundamentals and Applications - Bernard Sklar, F. J. Harris, Pearson Publications, 2020.
4. Principles of Communication Systems-Tauband Schilling,Tata McGraw Hill, 2007.

Web References:

1. https://ocw.mit.edu/courses/6-451-principles-of-digital-communication-ii-spring-2005/
2. https://ocw.mit.edu/courses/6-02-introduction-to-eecs-ii-digital-communication-systems-fall-2012/
3. https://ocw.mit.edu/courses/6-450-principles-of-digital-communications-i-fall-2006/
4. https://nptel.ac.in/courses/117105083

Internal Assessment Pattern (Electronics Engineering)

Cognitive Level	Internal Assessment # 1 (%)	Internal Assessment # 2 (%)
L1	30	--
L2	30	--
L3	30	30
L4	10	40
L5	--	30
Total (%)	100	100

Sample Short and Long Answers questions of Various Cognitive Levels

L1: Remembering

1. List the five basic components of a communication system block diagram.
2. Define "modulation" and state its two primary types (analog and digital).
3. Name three types of external noise in communication systems.
4. Identify the frequency range of the "VHF" band in the EM spectrum.
5. List the four variants of Amplitude Modulation (AM, DSB-SC, SSB-SC, VSB-SC).

L2: Understanding

1. Explain why modulation is necessary for long-distance signal transmission.
2. Differentiate between narrowband FM and wideband FM using the modulation index.
3. Describe the role of the "IF stage" in a superheterodyne receiver.
4. Clarify the difference between "noise figure" and "noise temperature."

5. What is the purpose of "companding" in PCM systems?

L3: Applying

1. Calculate the bandwidth of an FM signal with a modulation index of 6 and a maximum modulating frequency of 15 kHz.
2. Design a block diagram for a DSB-SC modulator using a balanced modulator.
3. Sketch the waveform of a PWM signal for a sinusoidal message signal.
4. Compute the noise figure of a two-stage cascaded amplifier with individual noise figures of 2 dB and 4 dB.
5. Determine the Nyquist sampling rate for a signal with a bandwidth of 4 kHz.

L4: Analyzing

1. Compare PCM and Delta Modulation in terms of quantization error and bandwidth efficiency.
2. Explain why digital modulation techniques (e.g., PSK, QAM) are preferred over analog modulation in modern systems.
3. Discuss the trade-offs between power efficiency and bandwidth in AM vs. DSB-SC.
4. Analyze how Inter-Symbol Interference (ISI) affects baseband signal detection.
5. Why does the "image frequency" problem occur in superheterodyne receivers?

L5: Evaluating

1. Evaluate the performance of AM and FM receivers in noisy environments. Which is more robust, and why?
2. Justify the use of VSB-SC over SSB-SC for television broadcast systems.
3. Assess the effectiveness of pre-emphasis and de-emphasis in improving FM signal quality.
4. Critique the limitations of Delta Modulation and propose how Adaptive Delta Modulation addresses them.
5. Compare the noise immunity of BPSK and FSK modulation schemes.

Chairperson
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R24ECPC12 ANALOG ELECTRONIC CIRCUITS DESIGN LAB 0 0 3 1.5

(Electronics and Communication Engineering)

Course Objectives:

- Design and analysis of multistage, differential, feedback, power and tuned amplifiers.
- Design and analysis of diode clippers, diode clampers, Astable, monostable multi vibrators and Schmitt trigger using BJT.
- Categorize different oscillator circuits based on the application.

Course Outcomes

At the end of the course, students will be able to:

Course Code	Course Outcomes	Mapping with POs and PSOs							DoK
		PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	
R24ECPC13.1	Design and analyze various types of amplifiers, including multistage, differential, feedback, power, and tuned amplifiers, to meet specific application requirements.	1	1	2	2	3	2	3	L1, L3, L4
R24ECPC13.2	Design and analyze waveform shaping circuits, including diode clippers, diode clampers, and multivibrators, and apply them in various electronic systems.	3	2	1	2	-	2	2	L2, L3, L4
R24ECPC13.3	Identify and categorize different types of oscillator circuits based on their characteristics and applications, and apply them in electronic systems.	3	3	2	2	-	2	2	L3, L4, L5

Board of Studies: Electronics and Communication Engineering

Approved in BOS No: 02, 30th May, 2025

Approved in ACM No: 02

List of Experiments:

Atleast twelve experiments shall be performed using BJT/FET/MOSFET devices and the relevant circuits shall be designed and perform the analysis using both hardware and equivalent EDA software tools.

1. Design and analysis of two-stage RC-Coupled Amplifier CO's:CO1
2. Design and analysis of Darlington pair amplifier. CO's:CO1
3. Design and analysis of Cascade Amplifier. CO's:CO1
4. Design and analysis of Bootstrap amplifier. CO's:CO1
5. Design and analysis of differential amplifier. CO's:CO1
6. Design and analysis of Voltage-Series/Voltage-shunt feedback amplifier. CO's:CO1
7. Design and analysis of current-Series/Current-shunt feedback Amplifier. CO's:CO1
8. Design and analysis of RC phase shift Oscillator CO's:CO3
9. Design and analysis of LC Heartley/Colpitts Oscillator CO's:CO3

10.	Design and analysis of class A power amplifier	CO's:CO1
11.	Design and analysis of class AB amplifier.	CO's:CO1
12.	Design and analysis of Wien Bridge Oscillator.	CO's:CO3
13.	Design and analysis of single Tuned amplifier.	CO's:CO1
14.	Diode clippers and Diode clampers	CO's:CO2
15.	Astable and monostable multi vibrators using BJT	CO's:CO2
16.	Schmitt trigger using BJT	CO's:CO2

Reference Books:

1. Integrated Electronics- Jacob Millman, C.Halkies&C.D.Parikh,TMH, 2nd Edition, 2010.
2. Electronic Devices and Circuits- S.Salivahanan & N.SuresshKumar,TMH,3rd Edition, 2012.
3. Electronic Devices and Circuits – A.K.Maini & V.Agarawal, Wiley India Pvt.Ltd., First Edition, 2009.

Web References:

1. WWW.acdlabs.com

Chairperson
Board of Studies (ECE)

R24ECPC13 ANALOG AND DIGITAL COMMUNICATIONS LAB 0 0 3 1.5

(Electronics and Communication Engineering)

Course Objectives:

1. To impart knowledge on basics of various analog and digital modulation techniques,
2. To implement various Pulse modulation and demodulation Techniques.

At the end of the course, students will be able to:

Course Code	Course Outcomes	Mapping with POs and PSOs								DoK
		PO1	PO2	PO3	PO4	PO5	PO12	PSO1	PSO2	
R24ECPC 13.1	Design and implement various pulse Analog modulation and demodulation Techniques and observe the time and frequency domain characteristics.	3	3	2	3	1	3	3	2	L2, L3
R24ECPC 13.2	Verify sampling theorem with different Sampling rates and duty Cycles.	3	3	2	3	1	3	3	2	L3, L4, L5
R24ECPC 13.3	Design and implement various Digital modulation and demodulation Techniques and verify the waveforms of these modulated Signals practically.	3	3	2	3	1	3	3	2	L3, L4, L5

Board of Studies : Electronics and communication Engineering

Approved in BOS No : 02, 30th May, 2025

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List of experiments:

Design the circuits and verify the following experiments taking minimum of six from each section shown below.

Section-A

1. AM Modulation and Demodulation **COs:CO1**
2. DSB-SC Modulation and Demodulation **COs:CO1**
3. SSB-SC Modulator & Detector (Phase Shift Method) **COs:CO1**
4. FM Modulation and Demodulation **COs:CO1**
5. PAM Modulation and Demodulation **COs:CO1**
6. PWM Modulation and Demodulation **COs:CO1**
7. PPM Modulation and Demodulation **COs:CO1**

Section-B

1. Sampling Theorem. **COs:CO2**
2. Time Division Multiplexing **COs:CO3**

3. Frequency Division Multiplexing **COs:CO3**
4. Delta Modulation and Demodulation **COs:CO3**
5. PCM Modulation and Demodulation **COs:CO3**
6. DPCM Modulation and Demodulation **COs:CO3**
7. BPSK Modulation and Demodulation **COs:CO3**
8. BFSK Modulation and Demodulation **COs:CO3**
9. DPSK Modulation and Demodulation **COs:CO3**

Reference Books:

1. Digital Communications – John Proakis, TMH, 1983
2. Digital and Analog Communication Systems - Sam Shanmugam, John Wiley & Sons, 1999.
3. Digital Communications: Fundamentals and Applications - Bernard Sklar, F. J. Harris, Pearson Publications, 2020.
4. Principles of Communication Systems- Taub and Schilling,Tata McGraw Hill, 2007.

Web References:

1. https://www.jntumaterials.co.in/2015/06/jntuk-btech-lab-manuals
2. www.jntumaterials.in

Chairperson
Board of Studies (ECE)

R24CSSC01 **Python Programming** **0 1 2 2**

(Common to CSE, ECE)

Course Objectives:

- Introduce core-programming concepts of Python programming language.
- Demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries
- Implement Functions, Modules and Regular Expressions in Python Programming and to create practical and contemporary applications using these

Course Outcomes

At the end of the course, students will be able to:

Course Code	Course Outcomes	Mapping with POs and PSOs			
		PO1	PO2	PO3	Dok
R24CSSC01.1	Introduce core-programming concepts of Python programming language.	3	3	3	L1
R24CSSC01.2	Develop, run and manipulate Python programs using Functions, Core data structures like Lists, Dictionaries, and use of Strings Handling methods	3	3	3	L2
R24CSSC01.3	Demonstrate about Python data structures like Tuples, Sets and dictionaries	3	3	3	L2
R24CSSC01.4	Develop, run and manipulate Python programs using File Operations and concepts of object-oriented programming	3	3	3	L3
R24CSSC01.5	Understand Data Science, Numpy, Pandas and working with XML, JSON and other file formats.	3	3	3	L3

Board of Studies : Computer Science and Engineering
Approved in BOS No: 02, 9th May, 2025
Approved in ACM No: 02

Developing the following programs:

UNIT-I: **CO's:CO1**

History of Python Programming Language, Thrust Areas of Python, Installing Anaconda Python Distribution, Installing and Using Jupyter Notebook, Features, Limitations, advantages, and applications of python.

Parts of Python Programming Language: Identifiers, Keywords, Statements and Expressions, Variables, Operators, Precedence and associativity, Data Types, Indentation, Comments, Reading Input, Print Output, Type Conversions, the type () Function and Is Operator, Dynamic and Strongly Typed Language.

Control Flow Statements: if statement, if-else statement, if...elif…else, Nested if statement, while Loop, for Loop, continue and break Statements, Catching Exceptions Using try and except Statement.

Sample Experiments:

1. Write a program to find the largest element among three Numbers.
2. Write a Program to display all prime numbers within an interval
3. Write a program to swap two numbers without using a temporary variable.
4. Demonstrate the following Operators in Python with suitable examples.
    i. Arithmetic Operators
    ii. Relational Operators
    iii. Assignment Operators
    iv. Logical Operators
    v. Bit wise Operators
    vi. Ternary Operator
    vii. Membership Operators
    viii. Identity Operators
5. Write a program to add and multiply complex numbers
6. Write a program to print multiplication table of a given number.
7. Write how to Handle specific exceptions – like division of a number by zero

UNIT-II: **CO's:CO2**

Functions: Built-In Functions, Commonly Used Modules, Function Definition and Calling the function, return Statement and void Function, Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments, Lambda Functions: Syntax and usage of lambda functions..

Strings: Creating and Storing Strings, Basic String Operations, Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings, Regular Expressions (Regex)

Lists: Creating Lists, Basic List Operations, Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods, del Statement.

Sample Experiments:

1. Write a Python program to square each element in a list using a lambda function.
2. Write a program to define a function with multiple return values.
3. Write a program to define a function using default arguments.
4. Write a program to find the length of the string without using any library functions.
5. Write a program to check if the substring is present in a given string or not.

6. Write a program to perform the given operations on a list:
    i. Addition
    ii. Insertion
    iii. Slicing
7. Write a program to perform any 5 built-in functions by taking any list.

UNIT-III: CO's:CO3

Dictionaries: Creating Dictionary, Accessing and Modifying key:value Pairs in Dictionaries, Built-In Functions Used on Dictionaries, Dictionary Methods, del Statement. Tuples and Sets: Creating Tuples, Basic Tuple Operations, tuple() Function, Indexing and Slicing in Tuples, Built-In Functions Used on Tuples, Relation between Tuples and Lists, Relation between Tuples and Dictionaries, Using zip() Function, Sets, Set Methods, Frozenset, Defaultdict and OrderedDict (from collections).

Sample Experiments:

1. Write a program to create tuples (name, age, address, college) for at least two members and concatenate the tuples and print the concatenated tuples.
2. Write a program to count the number of vowels in a string (No control flow allowed).
3. Write a program to check if a given key exists in a dictionary or not.
4. Write a program to add a new key-value pair to an existing dictionary.
5. Write a program to sum all the items in a given dictionary.
6. Write a program using defaultdict to count the frequency of each fruit in the given list:['apple', 'banana', 'apple', 'orange', 'banana', 'apple']

UNIT-IV: CO's:CO4

Files: Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files, Pickle Module, Reading and Writing CSV Files, Python os and os.path Modules.

Object-Oriented Programming: Classes and Objects, Creating Classes in Python, Creating Objects in Python, Constructor Method, Classes with Multiple Objects, Class Attributes Vs Data Attributes, Encapsulation, Inheritance, Polymorphism.

Sample Experiments:

1. Write a program to sort words in a file and put them in another file. The output file should have only lower-case words, so any upper-case words from source must be lowered.
2. Python program to print each line of a file in reverse order.
3. Python program to compute the number of characters, words and lines in a file.
4. Write a program to create, display, append, insert and reverse the order of the items in the array.

5. Write a program to add, transpose and multiply two matrices.
6. Write a Python program to create a class that represents a shape. Include methods to calculate its area and perimeter. Implement subclasses for different shapes like circle, triangle, and square.

UNIT-V: **CO's:CO5**

Introduction to Data Science: Functional Programming, JSON and XML in Python, NumPy with Python, Pandas.

Board of Studies: Computer Science and Engineering

Approved in BoS No: 02,--April, 2025

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Sample Experiments:

1. Python program to check whether a JSON string contains complex object or not.
2. Python Program to demonstrate NumPy arrays creation using array () function.
3. Python program to demonstrate use of ndim, shape, size, dtype.
4. Python program to demonstrate basic slicing, integer and Boolean indexing.
5. Python program to find min, max, sum, cumulative sum of array
6. Create a dictionary with at least five keys and each key represent value as a list where this list contains at least ten values and convert this dictionary as a pandas data frame and explore the data through the data frame as follows:
    a) Apply head () function to the pandas data frame
    b) Perform various data selection operations on Data Frame
7. Select any two columns from the above data frame, and observe the change in one attribute with respect to other attribute with scatter and plot operations in matplotlib

Reference Books:

1. Gowri shankar S, Veena A., Introduction to Python Programming, CRC Press.
2. Python Programming, S Sridhar, J Indumathi, V M Hariharan, 2nd Edition, Pearson, 2024
3. Introduction to Programming Using Python, Y. Daniel Liang, Pearson

Online Learning Resources Links:

1. https://www.coursera.org/learn/python-for-applied-data-science-ai
2. https://www.coursera.org/learn/python?specialization=python#syllabus

Web References:

1. https://www.geeksforgeeks.org/python-programming-language-tutorial/
2. https://www.python.org/about/gettingstarted/
3. https://www.w3schools.com/python/

Sample Short and Long Answers questions of Various Cognitive Levels

L1: Remember

1. Define identifiers and give two examples.
2. List any three features of Python.
3. What is the use of the type() function.
4. Define a function. What is a lambda function?
5. What are default and keyword arguments?
6. List any four string methods in Python.
7. Define a dictionary. How is it different from a list?
8. What is a frozenset?
9. What is the syntax of zip()?
10. What is a constructor in Python?
11. List any three file handling functions.
12. Define encapsulation.
13. What is a NumPy array?
14. Define a DataFrame in pandas.
15. Mention any two data visualization functions from matplotlib.

L2: Understand

1. Explain the significance of indentation in Python.
2. Differentiate between is and == with examples.
3. Explain the flow of execution for the if...elif...else structure.
4. Differentiate between *args and **kwargs.
5. Explain string slicing and joining with examples.
6. Explain the scope and lifetime of a variable in Python
7. Explain the relation between tuples and dictionaries.
8. Describe the purpose of defaultdict and OrderedDict.
9. Differentiate between class and object.
10. Explain the difference between class attributes and instance attributes.
11. Explain the difference between .ndim, .shape, and .size in NumPy.
12. Describe the process of reading JSON data in Python.

L3: Apply

1. Write a Python program to swap two variables without a temporary variable.
2. Write a program to print the largest of three numbers using conditional statements.
3. Write a Python program using a lambda function to square each element of a list.
4. Write a function that returns both sum and product of two numbers.

5. Write a program to check if a substring exists in a string.
6. Write a program to count vowels in a string using only string and set operations.
7. Write a program to check if a given key exists in a dictionary.
8. Write a program to concatenate two tuples.
9. Write a Python program to read from a file and print its contents in reverse line order.
10. Write a class representing a rectangle with methods to calculate area and perimeter.
11. Write a Python program to create a NumPy array and perform slicing.
12. Create a dictionary with lists and convert it into a pandas DataFrame.

L4: Analysing

1. Compare the use of for and while loops with scenarios.
2. Analyze how operator precedence affects the outcome of expressions in Python.
3. Analyze how positional arguments differ from keyword arguments in function calls.
4. Compare string formatting methods: %, .format(), and f-strings.
5. Compare the use of sets and dictionaries in Python.
6. Analyze the output when applying slicing on a tuple with an example.
7. Compare inheritance and polymorphism with suitable class examples.
8. Analyze the structure and behavior of a file object during read and write operations.
9. Analyze how data is structured differently in NumPy and pandas.
10. Compare JSON and XML data formats with Python parsing tools.

L5: Evaluating

1. Evaluate the use of dynamic typing in Python. What are its pros and cons?
2. Assess the effectiveness of Anaconda and Jupyter Notebook for beginner programmers
3. Evaluate the usefulness of using regular expressions for string validation.
4. Justify the use of built-in functions over writing manual logic
5. Evaluate the use of immutable data types (tuples, frozensets) in large applications.
6. Assess the performance difference between regular dict and defaultdict when counting frequencies.
7. Evaluate the usefulness of OOP in Python compared to procedural programming.
8. Judge whether using binary files or text files is better for storing structured data.
9. Evaluate the benefits of using pandas over lists/dictionaries for data manipulation.
10. Assess the effectiveness of functional programming in handling large-scale data pipelines.

Chairperson
Board of Studies (CSE)

R24HS05 Numerical Ability & Professional Communication skills 0 0 2 1
(Common to all UG Programmes)

Course Objectives:

1. **Develop problem-solving skills**: Students will be able to apply numerical concepts and techniques to solve problems in various contexts.
2. **Enhance data analysis skills**: Students will be able to collect, analyze, and interpret numerical data to inform decision-making.
3. **Develop effective communication skills**: Students will be able to communicate effectively in various professional settings, including verbal and non-verbal communication.
4. **Improve presentation skills**: Students will be able to deliver clear, concise, and engaging presentations to different audiences.
5. **Enhance writing skills**: Students will be able to write clear, concise, and well-structured professional documents, such as reports, emails, and memos.
6. **Develop interpersonal skills**: Students will be able to build and maintain effective relationships with colleagues, clients, and stakeholders.

At the end of the course, students will be able to:

Course Code	Course Outcomes	PO1	PO7	PO9	P011	Dok
R24HS05.1	Use their logical thinking and analytical abilities to solve Quantitative aptitude questions from company specific and other competitive tests..	2	---	---	---	L4
R24HS05.2	Solve questions related to time and distance and time and work etc. from company specific and other competitive tests.	1	---	---	---	L5
R24HS05.3	Comprehend the essentiality of LSRW skills in paper presentations, seminars, workshops, conferences etc. with teams and to solve different types of questions based on vocabulary, structure, grammar and verbal reasoning.	2	2	3	1	L1, L2
R24HS05.4	Attain the knowledge of soft skills in various conditions, Solve questions based on sentence completion and fill in the blanks	---	1	3	---	L2, L3
R24HS05.5	Explore diverse fields through English , To solve different types of questions based on vocabulary, structure, grammar and verbal reasoning	---	---	3	---	L4

SYLLABUS

UNIT-I: Numerical computation **15 Hours**

Application based on Numbers –Classification of Number System, Prime and Composite, Even and Odd Numbers, Divisibility Rule, BODMAS Rule, Unit digit, fractions, LCM &HCF**.** Percentages and its Applications, Profit Loss and Discount, Simple interest and Compound interest. Averages, Ratio Proportion, Application of Ratios**,** Partnerships, Shares and dividends.

Self Learning Topic: Problems on Ages

UNIT-II: Numerical Estimation **15 Hours**

Time and work, Application of Time-work (pipes and cisterns) , Time and Distance, circular Tracking, concept of Boats & steams. Mixtures and allegations, application of percentage and Ratios and Averages in Mixtures

Self Learning Topic: Problems on Trains

UNIT-III **5 Hours**

Abstract Preparation – Noticing Key Words –Literature Survey – Using Academic Verbs Verbal Ability: Sentence correction, Resume Writing and Cover letter

Self Learning Topic: Project Report

UNIT-IV **5 Hours**

Organizational Skills – Time Management – IELTS Test Papers Exercises Verbal Ability: sentence completion

Self Learning Topic: Jumbled Sentences

UNIT-V **5 Hours**

Analogy, origin of Words, Idioms and phrases, MNC's question papers Verbal Ability: Error Identification

Self Learning Topic: Speaking and writing diction (Choice of Words)

Board of Studies: MBA
Approved in BOS No: 02, 13th May, 2025
Approved in ACM No: 02

Text Books:

1. Quantitative Aptitude for competitive examinations by R.S.Agrawal - S.Chand publications.
2. Business Communication by C.S.G Krishnamacharyulu & Lalitha Ramakrishna – Himalaya publishing house

Reference Books:

1. Numerical Aptitude and Reasoning Ability tests in Competitive exams by Prof.A.Balasubramanian.
2. Numerical Ability and Mathematical Aptitude by Dr.A.B.Rao
3. Communication skills and soft skills by E.Suresh Kumar , p.sreehari & j.savithri

Web References:

1. https://faceprep.in/ logical reasoning

2. www.sawaal.com
3. http://nptel.ac.in/courses
4. www.prepinsta.com

Model Questions from Numerical Ability

1. What is the unit digit of 2^10?
2. Find the unit digit of 17^5.
3. What is the unit digit of 3 × 7 × 9 × 11?
4. Determine the unit digit of 123^4.
5. Find the unit digit of 2^20 + 3^15.
6. Is 432 divisible by 3?
7. Check if 756 is divisible by 9.
8. Determine if 1240 is divisible by 8.
9. Is 531 divisible by 11?
10. Check if 2700 is divisible by 15.
11. Simplify: 2 × 3 + 12 ÷ 4 - 5
12. Evaluate: 18 - 3 × 2 + 12 ÷ 4
13. Simplify: 9 + 8 ÷ 2 × 3 - 1
14. Evaluate: 15 - 2 × 3 + 8 ÷ 2
15. Simplify: 24 ÷ 4 × 2 + 10 – 3
16. Find the HCF of 12 and 18.
17. Determine the HCF of 24 and 30.
18. The HCF of two numbers is 6 and their LCM is 72. What are the two numbers?
19. The LCM of two numbers is 120 and their HCF is 10. If one of the numbers is 24, what is the other number?
20. A shirt is marked at $80 and sold at a 20% discount. What is the selling price?
21. A student scored 75% marks in an exam. If the total marks were 200, how many marks did the student score?
22. A number is increased by 25% and then decreased by 10%. What is the net percentage change?
23. A book is bought for $50 and sold for $60. What is the profit percentage?
24. A shopkeeper sells an item at a 15% loss. If the cost price is $100, what is the selling price?
25. A person buys a product for $80 and sells it for $100. What is the profit percentage?
26. Find the simple interest on $1000 at 5% per annum for 2 years.
27. A sum of money amounts to $1200 in 3 years at 8% per annum simple interest. What is the principal amount?
28. What is the rate of interest if a sum of $500 amounts to $600 in 4 years at simple interest?

Model Questions from professional communication skills

1. You're working with a team member who has a different work style. How would you adapt your communication approach?
2. A client is unhappy with the project's progress. How would you handle the situation?
3. You're part of a team, and there's a conflict between two members. How would you facilitate a resolution?
4. How would you use body language to convey confidence during a presentation?
5. You're in a virtual meeting, and your internet connection is unstable. How would you

handle the situation?

6. You're meeting a client for the first time. What nonverbal cues would you use to build rapport?
7. You're presenting a project update to a client. How would you structure your presentation to ensure effective communication?
8. A colleague is not meeting their deadlines, affecting the team's project timeline. How would you approach the conversation?
9. You're in a meeting, and a team member is dominating the discussion. How would you politely intervene?
10. You're tasked with writing a report on a project's progress. How would you structure the report?

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Board of Studies (MBA)

R24ES13 **Design Thinking & Innovation** **0 1 2 2**

(Common to All Branches)

Course Objectives:

1. The objective of this course is to familiarize students with design thinking process as a tool for breakthrough innovation.
2. It aims to equip students with design thinking skills and ignite the minds to create innovative ideas, develop solutions for real-time problems.

Course Code	Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO9	PO10	PO11	PSO1	PSO2	DOK
R24ES13.1	Define the concepts related to design thinking. Explain the fundamentals of Design Thinking and innovation	3	3	2	2	2	-	1	2	2	2	L1, L2
R24ES13.2	Apply the design thinking techniques for solving problems in various sectors.	3	3	3	2	3	-	1	2	3	3	L3
R24ES13.3	Analyse to work in a multidisciplinary environment	3	3	3	2	3	-	-	2	3	3	L4
R24ES13.4	Evaluate the value of creativity	3	2	3	2	3	1	1	3	3	3	L5
R24ES13.5	Formulate specific problem statements of real time issues	3	2	3	2	3	1	1	3	3	3	L3, L6

SYLLABUS

UNIT-I **10 Hours**

Introduction to Design Thinking: Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry. **CO's: CO1**

UNIT-II **10 Hours**

Design Thinking Process: Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brainstorming, product development

Activity: Every student presents their idea in three minutes, every student can present design process in the form of flow diagram or flow chart etc. Every student should explain about product development. **CO's: CO2**

UNIT-III **10 Hours**

Innovation: Art of innovation, Difference between innovation and creativity, role of creativity and

innovation in organizations- Creativity to Innovation- Teams for innovation- Measuring the impact and value of creativity.

Activity: Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation. **CO's: CO3**

UNIT IV **10 Hours**

Product Design: Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications- Innovation towards product design- Case studies.

Activity: Importance of modeling, how to set specifications, Explaining their own product design.

CO's: CO4

UNIT V **10 Hours**

Design Thinking in Business Processes: Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs- Design thinking for Startups- Defining and testing Business Models and Business Cases- Developing & testing prototypes.

Activity: How to market our own product, about maintenance, Reliability and plan for startup.

CO's: CO5

Board of Studies: Mechanical Engineering

Approved in BOS No: 02,13th May, 2025

Approved in ACM No: 02

Text Books:

1. Tim Brown,Change by design, Harper Bollins (2009)
2. Idris Mootee, Design Thinking for Strategic Innovation, 2013, John Wiley & Sons..

Reference Books:

1. David Lee, Design Thinking in the Classroom, Ulysses press
2. Shrutin N Shetty, Design the Future, Norton Press
3. William Lidwell, Universal Principles of Design- Kritinaholden, Jill Butter.
4. Chesbrough. H, The Era of Open Innovation – 2013

Online Learning Resources:

- https://nptel.ac.in/courses/110/106/110106124/
- https://nptel.ac.in/courses/109/104/109104109/
- https://swayam.gov.in/nd1_noc19_mg60/preview

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)

L1	10	--
L2	30	--
L3	30	20
L4	30	30
L5	--	30
L6	--	20
Total (%)	**100**	**100**

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