



AVANTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

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

NAAC "B++" Accredited Institute

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

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

Department of Mechanical Engineering

Program: B.Tech- Mechanical Engineering

Regulation: R16

Course Outcomes

No. of Courses: 84

I-I Sem	Course:English-1
CO-1	Write and speak competently and correctly
CO-2	Improve Improving comprehension and fluency of speech.
CO-3	Gain confidence in using English in verbal situations.
CO-4	Acquisition of writing skills
CO-5	Motivate the public to adopt road safety measure
CO-6	Create an awareness in the readers that mass production is ultimately detrimental to biological survival
I-I Sem	Course:Mathematics-I
CO-1	Solve linear differential equations of first, second and higher order
CO-2	Determine Laplace transform and inverse Laplace transform of various functions and use Laplace transforms to determine general solution to linear ODE.
CO-3	Calculate total derivative, Jacobian and minima of functions of two variables.
CO-4	Calculate Maxima and Minima of functions of two variables without constraints and Lagrange's method
CO-5	Explain the method of Variation of parameters
CO-6	Classify of second order partial differential equations
I-I Sem	Course:Applied Chemistry
CO-1	Use in design would be understood.
CO-2	Discuss about Fuels which are used commonly and their economics, advantages and limitations
CO-3	Understand the reasons for corrosion and some methods of corrosion control
CO-4	Use Materials like nano-materials and fullerenes
CO-5	Know the importance of green synthesis is well understood and how they are different from conventional methods is also explained
CO-6	Expose of the alternative fuels and their advantages and limitations.
I-I Sem	Course:Computer Programming



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CO-1	Understand the basic terminology used in computer programming
CO-2	Write, compile and debug programs in C language.
CO-3	Use different data types in a computer program.
CO-4	Design programs involving decision structures, loops and functions.
CO-5	Explain the difference between call by value and call by reference
CO-6	Understand the dynamics of memory by the use of pointers
I-I Sem	Course:Environmental Studies
CO-1	Know the importance for the sustenance of the life and recognize the need to conserve the natural resources
CO-2	Know the importance of protecting the producers and consumers in various ecosystems and their role in the food web
CO-3	Know the biodiversity of India and the threats to biodiversity, and conservation practices to protect the biodiversity
CO-4	Know the impacts and measures to reduce or control the pollution along with waste management practices
CO-5	Identify the Social issues both rural and urban environment and the possible means to combat the challenges
CO-6	Know the environmental legislations of India and the first global initiatives towards sustainable development
I-I Sem	Course:Applied/Engineering Chemistry Lab
CO-1	Exposure to lab classes.
CO-2	Analyze redox titrations with different indicators; EDTA titrations; then they are exposed to a few instrumental methods of chemical analysis.
CO-3	Expose to different methods of chemical analysis and use of some commonly employed instruments
I-I Sem	Course: English - Communication Skills Lab- I
CO-1	Communicate items in the laboratory will help the students become successful in the competitive world.
CO-2	Provide a primary exposure to employability
CO-3	Practice work
I-I Sem	Course: Computer Programming Lab
CO-1	Apply and practice logical ability to solve the problems.



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CO-2	Understand C programming development environment, compiling, debugging, and linking and executing a program using the development environment
CO-3	Analyze the complexity of problems, Modularize the problems into small modules and then convert them into programs
I-II Sem	Course: English -II
CO-1	Enhance wisdom.
CO-2	Service the nation, inspires the readers to follow leader footsteps.
CO-3	Promote peaceful co-existence and universal harmony among people and society.
CO-4	Know the Achievements of C V Raman are inspiring and exemplary to the readers and all scientists
CO-5	The seminal contributions of homijehangirbhabha to Indian nuclear programme provide an aspiration to the readers to serve the nation and sterngthen it.
CO-6	The theme projects society's need to re examine its traditions when they are outdated
I-II Sem	Course: Mathematics-II (Mathematical Methods)
CO-1	Calculate a root of algebraic and transcendental equations.
CO-2	Compute interpolating polynomial for the given data.
CO-3	Solve ordinary differential equations numerically using Euler's and RK method.
CO-4	Find Fourier series and Fourier transforms for certain functions.
CO-5	Identify/classify and solve the different types of partial differential equations.
CO-6	Explain relationbetween the finite difference operators.
I-II Sem	Course: Mathematics-III
CO-1	Determine rank, Eigen values and Eigen vectors of a given matrix and solve simultaneous linear equations.
CO-2	Solve simultaneous linear equations numerically using various matrix methods.
CO-3	Determine double integral over a region and triple integral over a volume.
CO-4	Calculate gradient of a scalar function, divergence and curl of a vector function.
CO-5	Determine line, surface and volume integrals
CO-6	Apply Green, Stokes and Gauss divergence theorems to calculate line, surface and volume integrals.
I-II Sem	Course: Applied Physics



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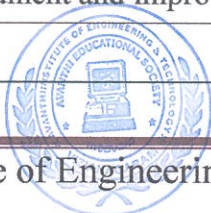
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CO-1	Study the Construction and working details of instruments
CO-2	Study EM-fields
CO-3	Learn Interferometer, Diffractometer and Polarimeter
CO-4	Know the concepts of Quantum mechanics paves way for their optimal utility
CO-5	Impart the knowledge of materials with characteristic utility in appliances.
CO-6	Explore the Nuclear Power as a reliable source required to run industries
I-II Sem	Course: Electrical Circuit Analysis – I
CO-1	Know the importance of Various electrical networks in presence of active and passive elements
CO-2	Know the importance of Electrical networks with network topology concepts.
CO-3	Know the importance of any magnetic circuit with various dot conventions
CO-4	Analyze any R, L, C network with sinusoidal excitation
CO-5	Apply any R, L, network with variation of any one of the parameters R, L, C. & f.
CO-6	Analyze Electrical networks by using principles of network theorems.
I-II Sem	Course: English Language Communication Skills Lab- II
CO-1	A study of the communicative items in the laboratory will help the students become successful in the competitive world.
CO-2	Develop and improve Team Building Skills
CO-3	Practice work
I-II Sem	Course: Applied/Engineering Physics Lab
CO-1	Design of an Instrument with targeted accuracy for physical measurements.
CO-2	Design methods to improve the accuracy of measurements.
CO-3	Practice work
I-II Sem	Course: Applied/Engineering Physics - Virtual Labs – Assignments
CO-1	Prepare a /technical/mini-project/ experimental report with scientific temper.
CO-2	Prepare a technical document and improving their writing skills.
CO-3	Practice work





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II-I SEM	Course: Metallurgy & Materials Science
CO1	Understand the basic concepts of bonds in metals and alloys, and to understand the basic requirements for the formation of solid solutions and other compounds.
CO2	Understand the regions of stability of the phases that can occur in an alloy system in order to solve the problems in practical metallurgy
CO3	Differentiate cast irons and steels, their properties and practical applications.
CO4	Analyzethe effect of various alloying elements on iron-iron carbide system, and to understand the various heat treatment and strengthening processes used in practical applications.
CO5	Understand the properties and applications of widely used non-ferrous metals and alloys so as to use the suitable material for practical applications.
CO6	Understand the properties and applications of ceramic, composite and other advanced materials so as to use the suitable material for practical applications
II-I SEM	Course:Mechanics Of Solids
CO1	Explain about simple stresses and strains
CO2	Draw the characteristics of shear force and bending moment
CO3	Know about the flexural stresses and shear stresses
CO4	Draw the deflection of beams
CO5	Categorize the thin cylinders and thick cylinders
CO6	Describe the torsions and columns
II-I SEM	Course:Thermodynamics
CO1	Understand the basic concepts of thermodynamic system
CO2	Learnabout the first law of thermodynamics
CO3	Understand the second law statements and the associated terms, and able to analyses the concepts of carnot cycle, entropy, availability and irreversibility&understand the use of maxwells relations and thermodynamic functions.
CO4	Understand the process of steam formation and its representation on property diagrams
CO5	Use psychrometric chart and calculate various psychrometric properties of air
CO6	Understand the concept of air standard cycles and should be able to calculate the efficiency and performance parameters of the systems that use these cycles



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II-I SEM	Course:Managerial Economics And Financial Analysis
CO-1	Introduce the managerial economics and demand analysis
CO-2	Analyze the production and cost
CO-3	Introducethe markets, theories of the firm & pricing policies
CO-4	Initializetypes of business organization and business cycles
CO-5	Introduce accounting& financing analysis
CO-6	Explain about the capital and capital budgeting
II-I SEM	Course:Fluid Mechanics And Hydraulic Machines
CO1	Explain the concept of fluid and its properties, manometry, hydrostatic forces acting on different surfaces and also problem solving techniques
CO2	Exhibit the basic laws of fluids, flow patterns, viscous flow through ducts and their corresponding problems
CO3	Explain the concepts related to boundary layer theory, flow separation, basic concepts of velocity profiles, dimensionless numbers and dimensional analysis
CO4	Discuss the hydrodynamic forces acting on vanes and their performance evaluation
CO5	Explain the importance, function and performance of hydro machinery
CO6	Evaluate the performance characteristics of hydraulic turbines
II-I SEM	Course:Computer Aided Engineering Drawing Practice
CO1	Exhibit knowledge of projections of solids is essential in 3d 6odeling and animation
CO2	Draw sections of solids, development and interpenetration of solids
CO3	Draw intersection of solids also plays an important role in designing and manufacturing
CO4	Use computer aided drafting
CO5	Compare view points and view ports
CO6	Use the computer aided solid modeling
II-I SEM	Course:Electrical & Electronics Engineering Lab
CO1	Find out the efficiency of dc shunt machine without actual loading of the machine



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CO2	Pre-determine the regulation of an alternator by synchronous impedance method
CO3	Determine the ripple factor of half wave & full wave rectifiers
II-I SEM	Course:Mechanics Of Solids & Metallurgy Lab
CO1	Impart practical exposure on the microstructures of various materials and their hardness evaluation
CO2	Impart practical knowledge on the evaluation of material properties through various destructive testing procedures
CO3	Practice work
II-II SEM	Course:Kinematics Of Machinery
CO1	List the relative motion of parts in a machine without taking into consideration the forces involved
CO2	Understand various mechanisms for straight line motion and their applications including steering mechanism
CO3	Compare the velocity and acceleration concepts and the methodology using graphical methods and principles and application of four bar chain
CO4	Discuss the theories involved in cams.
CO5	Compare gears, power transmission through different types of gears including gear profiles and its efficiency
CO6	Distinguish various power transmission mechanisms and methodologies and working principles.
II-II SEM	Course:Thermal Engineering – I
CO1	Explain the reasons and affects of various losses that occur in the actual engine operation
CO2	Discuss various engine systems along with their function and necessity
CO3	Compare the normal combustion phenomenon and knocking in s.i. And c.i. Engines
CO4	Perform testing on s.i and c.i engines for the calculations of performance and emission parameters
CO5	Discuss different types of compressors and to calculate power and efficiency of reciprocating compressors
CO6	Analyze mechanical details, and to calculate power and efficiency of rotary compressor
II-II SEM	Course:Production Technology



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CO1	Design patterns, gating, runner and riser systems
CO2	Select a suitable casting process based on the component
CO3	Analyse various arc and solid state welding processes and select a suitable process based on the application and requirement
CO4	Explain various bulk deformation processes
CO5	Discuss various sheet metal forming and processing of plastics
CO6	Classify manufacturing technology
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CO4	Draw the Deflection of Beams
CO5	Categorize the Thin Cylinders and Thick Cylinders
CO6	Describe the Torsions and Columns
II-II Sem	Course:Thermodynamics
CO1	Understand the basic concepts of Thermodynamic System
CO2	Learn about the First Law of Thermodynamics



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CO3	Understand the second law statements and the associated terms, and able to analyses the concepts of Carnot cycle, entropy, availability and irreversibility&understand the use of Maxwells relations and thermodynamic functions.
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CO5	Use Psychrometric chart and calculate various psychrometric properties of air
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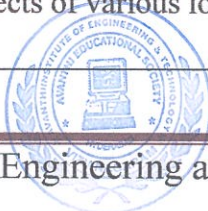
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II-II Sem	Course:Thermal Engineering – I
CO1	Explain the reasons and affects of various losses that occur in the actual engine operation





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CO2	Discuss various engine systems along with their function and necessity
CO3	Compare the normal combustion phenomenon and knocking in S.I. and C.I. Engines
CO4	Perform testing on S.I and C.I Engines for the calculations of performance and emission parameters
CO5	Discuss different types of compressors and to calculate power and efficiency of reciprocating compressors
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CO1	Design patterns, Gating, runner and riser systems
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CO4	Explain various bulk deformation processes
CO5	Discuss various sheet metal forming and processing of plastics
CO6	Classify manufacturing technology
II-II Sem	Course: Design Of Machine Members – I
CO1	Apply the design procedure to engineering problems, including the consideration of technical and manufacturing constraints
CO2	Select suitable materials and significance of tolerances and fits in critical design applications
CO3	Utilize design data hand book and design the elements for strength, stiffness and fatigue
CO4	Identify the loads, the machine members subjected
CO5	Calculate static and dynamic stresses to ensure safe design.
CO6	Differentiate types of failure modes and criteria.
II-II Sem	Course: Machine Drawing
CO1	Provide basic understanding and drawing practice of various joint, simple mechanical parts
CO2	Draw assembled views for the part drawings of the following using conventions and easy drawing proportions



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CO3	Draw Selection of Views, additional views for the following machine elements and parts with every drawing proportions
II-II Sem	Subject Name and Code:Industrial Engineering And Management
CO1	Design and conduct experiments, analyse, interpret data and synthesize valid conclusions
CO2	Design a system, component, or process, and synthesize solutions to achieve desired needs
CO3	Use techniques, skills, and modern engineering tools necessary for engineering practice with appropriate considerations for public health and safety, cultural, societal, and environmental constraints
CO4	Function effectively within multi-disciplinary teams and understand the fundamental precepts of effective project management
CO5	Describe the interactions between engineering, business, technological and environmental spheres in the modern society.
CO6	Restate their role as engineers and their impact to society at the national and global context.
II-II Sem	Course: Fluid Mechanics & Hydraulic Machines
CO1	Identify importance of various fluid properties at rest and in transit
CO2	Derive and apply general governing equations for various fluid flows
CO3	Explain the concept of boundary layer theory and flow separation.
CO4	Plot velocity and pressure profiles for any given fluid flow.
CO5	Evaluate the performance characteristics of hydraulic turbines and pumps.
CO6	Calculate loss of head due to sudden contraction in a pipeline and Turbine flow meter
II-II Sem	Course:: Fluid Mechanics & Hydraulic Machines Lab
CO1	Calculate and design engineering applications involving fluid.
CO2	Impart hands-on practical exposure on metal casting
CO3	Impart hands-on practical exposure on welding
III-I Sem	Course:Dynamics Of Machinery
CO1	Analyze stabilization of sea vehicles, aircrafts and automobile vehicles
CO2	Compute frictional losses, torque transmission of mechanical systems



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CO3	Analyze dynamic force analysis of slider crank mechanism and design of flywheel
CO4	Understand how to determine the natural frequencies of continuous systems starting from the general equation of displacement
CO5	Understand balancing of reciprocating and rotary masses
CO6	Develop understanding of dynamic balancing, flywheel analysis, gyroscopic forces and moments
III-I Sem	Course: Metal Cutting & Machine Tools
CO1	Apply cutting mechanics to metal machining based on cutting force and power consumption
CO2	Operate lathe, milling machines, drill press, grinding machines, etc
CO3	Select cutting tool materials and tool geometries for different metals
CO4	Select appropriate machining processes and conditions for different metals
CO5	Learn machining economics.
CO6	Design jigs and Fixtures for simple parts
III-I Sem	Course: Design Of Machine Members– II
CO1	Categorize the suitable bearing based on the application of the loads and predict the life of the bearing
CO2	Design power transmission elements such as gears, belts, chains, pulleys, ropes, levers and power screws
CO3	Design of IC Engines parts
CO4	Explain Construction, Designation, Stresses in wire ropes, rope sheaves and drums
CO5	Define insight of slider and roller bearings and the life prediction
CO6	Design the mechanical systems for power transmission elements such as gears, belts, ropes, chains, keys and levers
III-I Sem	Course: Operations Research
CO1	Teach importance of Operations Research in the design, planning, scheduling, manufacturing and business applications and to use the various techniques of Operations Research in solving such problem
CO2	Solve the LP and DP problems
CO3	Solve the Transportation, assignment, game, inventory, replacement, sequencing, queuing problems



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CO4	Define Instantaneous demand and continuous demand and no set up cost
CO5	Explain purchase inventory models with one price break and multiple price breaks
CO6	Define exponential service times with infinite population single channel poisson arrivals.
III-I Sem	Course:Thermal Engineering – II
CO1	Teach the working of steam and gas power plant cycles
CO2	Analyze and evaluate the performance of individual components
CO3	Explain basic principles of Jet propulsion and rocket engineering
CO4	Describe working of steam and gas power plant cycles should be able to analyze
CO5	Illustrate concept of mean temperature of heat addition
CO6	Investigate De-laval turbine - methods to reduce rotor speed-velocity compounding, pressure compounding and velocity & pressure compounding, velocity and pressure variation along the flow
III-I Sem	Course:Theory Of Machines Lab
CO1	Determine whirling speed of shaft theoretically and experimentally
CO2	Analyze the motion of a motorized gyroscope when the couple is applied along its spin axis
CO3	Determine the frequency of damped force vibration of a spring mass system
III-I Sem	Course:Machine Tools Lab
CO1	Teach the parts of various machine tools and operate them
CO2	Differentiate the different shapes of products that can be produced on these machine tools
CO3	Explain operating principles to produce different part features to the desired quality.
III-I Sem	Course:Thermal Engineering Lab
CO1	Draw I.C. Engines valve / port timing diagrams
CO2	Test Fuels – Viscosity, flash point/fire point, carbon residue, calorific value
CO3	Perform Economical speed test of an IC engine



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III-I Sem	Course: Ipr & Patents
CO1	Explain IPR Laws and patents pave the way for innovative ideas which are instrumental for inventions to seek Patents
CO2	Evaluate insight on Copyrights, Patents and Software patents which are instrumental for further advancements
CO3	Describe importance of Intellectual property rights, which plays a vital role in advanced Technical and Scientific disciplines.
III-II Sem	Course: Metrology
CO1	Design tolerances and fits for selected product quality
CO2	Choose appropriate method and instruments for inspection of various gear elements and thread elements
CO3	Draw the standards of length, angles
CO4	Evaluate surface finish and measure the parts with various comparators
CO5	Inspect of spur gear and thread elements
CO6	Test Machine tool testing to evaluate machine tool quality
III-II Sem	Course: Instrumentation & Control Systems
CO1	Select appropriate device for the measurement of parameters like temperature, pressure, speed, stress, humidity, flow velocity etc
CO2	Justify its use through characteristics and performance
CO3	Impart the principles of measurement which includes the working mechanism of various sensors and devices
CO4	Construct various transducers to measure displacement – piezo electric, inductive, capacitance, resistance, ionization and photo electric transducers, calibration procedures.
CO5	Explain Rotameter, magnetic, ultrasonic, turbine flow meter, hot – wire anemometer, laser Doppler anemometer (LDA).
CO6	Evaluate method of usage of resistance strain gauge for bending compressive and tensile strains, usage for measuring torque, strain gauge rosettes.
III-II Sem	Course: Refrigeration & Air Conditioning
CO1	Analyze various refrigerating cycles and evaluate their performance
CO2	Perform cooling load calculations



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CO3	Select the appropriate process and equipment for the required comfort and industrial air-conditioning
CO4	Impart knowledge of psychrometric properties, processes which are used in air-conditioning systems for comfort and industrial applications
CO5	Understand Requirements of human comfort and concept of effective temperature- comfort chart, comfort air conditioning
CO6	Explain requirements of industrial air conditioning, air conditioning load calculations.
III-II Sem	Course:Heat Transfer
CO1	Illustrate the principles of heat transfer
CO2	Apply to practical situations where in heat exchange takes place through various modes of heat transfer
CO3	Impart knowledge of principles of heat transfer
CO4	Analyze the heat exchange process in various modes for the evaluation of rate of heat transfer and the temperature distribution in different configurations
CO5	Draw Emission characteristics and laws of black-body radiation
CO6	Derive overall heat transfer coefficient and fouling factor
III-II Sem	Course:Data Base Management System
CO1	Describe a relational database and object-oriented database
CO2	Create, maintain and manipulate a relational database using SQL
CO3	Describe ER model and normalization for database design
CO4	Examine issues in data storage and query processing and can formulate appropriate solutions
CO5	Teach the role and issues in management of data such as efficiency, privacy, security, ethical responsibility, and strategic advantage
CO6	Design and build database system for a given real world problem
III-II Sem	Course:Waste Water Management Open Elective
CO1	Plan and design the sewerage systems
CO2	Characterization of sewage
CO3	Select the appropriate appurtenances in the sewerage systems
CO4	Select the suitable treatment flow for sewage treatment



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CO5	Identify the critical point of pollution in a river for a specific amount of pollutant disposal into the river
CO6	Outline planning and the design of waste water collection ,conveyance and treatment systems for a community/town/city
III-II Sem	Course:Computer Graphics
CO1	Use the principles and commonly used paradigms and techniques of computer graphics
CO2	Write basic graphics application programs including animation
CO3	Design programs to display graphic images to given specifications
CO4	Teach multimedia authoring tools.
CO5	Plot Points and lines, line drawing algorithms, mid-point circle algorithm, Filled area primitives: scan-line polygon fill algorithm, boundary-fill and flood-fill algorithm.
CO6	Design animation sequence, general computer animation functions, raster animation, computer animation language, key frame system, motion specification
III-II Sem	Course:: Industrial Robotics
CO1	Identify various robot configuration and components
CO2	Select appropriate actuators and sensors for a robot based on specific application
CO3	Carry out kinematic and dynamic analysis for simple serial kinematic chains
CO4	Perform trajectory planning for a manipulator by avoiding obstacles
CO5	Explain Mathematical approach to explain how the robotic arm motion can be described
CO6	Describe the concepts of robot kinematics, Dynamics, Trajectory planning.
III-II Sem	Course:Green Engineering Systems
CO1	Describe the principles and working of solar, wind, biomass, geo thermal, ocean energies and green energy systems
CO2	Explain importance in the current scenario and their potential future applications
CO3	Highlight the significance of alternative sources of energy, green energy systems and processes
CO4	Differentiate Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.



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CO5	Explain Principles of bio-conversion, anaerobic/aerobic digestion, types of bio-gas digesters, gas yield
CO6	Differentiate types of wells, methods of harnessing the energy, potential in India
III-II Sem	Course:Heat Transfer Lab
CO1	Evaluate the amount of heat exchange for plane, cylindrical & spherical geometries
CO2	Compare the performance of extended surfaces and heat exchangers
CO3	Determine amount of heat exchange in various modes of heat transfer including condensation & boiling for several geometries.
III-II Sem	Course:Metrology & Instrumentation Lab
CO1	Measure linear, angular, roundness and roughness measurements
CO2	Select proper measuring instrument and know requirement of calibration, errors in measurement
CO3	Perform accurate measurements.
III-II Sem	Course:Computational Fluid Dynamics Lab
CO1	Derive steady state conduction
CO2	Describe Lumped heat transfer
CO3	Derive Convective heat transfer – Internal flow (study both velocity and thermal boundary layers)
III-II Sem	Course:Professional Ethics & Human Values
CO1	Illustrate variety issues that are encountered by every professional in discharging professional duties
CO2	Describe about sensitivity and global outlook in the contemporary world to fulfill the professional obligations effectively
CO3	Explain Professional Ethics instills the student to maintain ethical conduct and discharge their professional duties.
CO4	Assess their own ethical values and the social context of problems
CO5	Identify ethical concerns in research and intellectual contexts, including academic integrity, use and citation of sources, the objective presentation of data, and the treatment of human
CO6	Demonstrate knowledge of ethical values in non-classroom activities, such as



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	service learning, internships, and field work
IV-I Sem	Course:Mechatronics
CO1	Use various mechatronics systems devices
CO2	Use the components in the design of electro mechanical systems
CO3	Describe the different components and devices of mechatronics systems
CO4	Explain Solid state electronic devices - PN junction diode, BJT, FET, DIAC, TRIAC and leds. Analog signal conditioning, operational amplifiers, noise reduction, filtering
CO5	Explain Digital electronics and systems, digital logic control, micro processors and micro controllers, programming, process controllers, programmable logic controllers, plcs versus computers, application of plcs for control
CO6	Explain Dynamic models and analogies, System response. Process Controllers – Digital Controllers, Programmable Logic Controllers, Design of mechatronics systems & future trends.
IV-I Sem	Course:CAD/CAM
CO1	Describe the mathematical basis in the technique of representation of geometric entities including points, lines, and parametric curves, surfaces and solid, and the technique of transformation of geometric entities using transformation matrix
CO2	Describe the use of GT and CAPP for the product development
CO3	Identify the various elements and their activities in the Computer Integrated Manufacturing Systems
CO4	Describe overall configuration and elements of computer integrated manufacturing systems
CO5	Write the part programming, importance of group technology, computer aided process planning, computer aided quality control
CO6	Draw 2D & 3D transformations of the basic entities like line, circle, ellipse etc
IV-I Sem	Course:: Finite Element Methods
CO1	Understand the concepts behind variational methods and weighted residual methods in FEM
CO2	Identify the application and characteristics of FEA elements such as bars, beams, plane and isoparametric elements, and 3-D element
CO3	Develop element characteristic equation procedure and generation of global stiffness equation will be applied



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CO4	Apply Suitable boundary conditions to a global structural equation, and reduce it to a solvable form
CO5	Identify how the finite element method expands beyond the structural domain, for problems involving dynamics, heat transfer, and fluid flow
CO6	Analyze model complex geometry problems and solution techniques.
IV-I Sem	Course:Power Plant Engineering
CO1	Explain various conventional methods of power generation
CO2	Explain the principle of operation and performance of respective prime movers along with their economics and their impact on environment
CO3	Discuss power generation through different prime movers viz steam, ICGT, Hydro, nuclear and hybrid systems along with their economics and environmental considerations
CO4	Compare different types of reactors
CO5	Control power plant instrumentation
CO6	Explain environmental considerations of power plant
IV-I Sem	Course:Computational Fluid Dynamics
CO1	Apply various numerical tools like finite volume, finite difference etc for solving the different fluid flow heat transfer problems.
CO2	Solve numerical methods
CO3	Apply finite difference methods
CO4	Implement aspects of finite different methods
CO5	Solve first order wave equations
CO6	Solve surface integrals
IV-I Sem	Course:Condition Monitoring
CO1	Explain the benefits of Condition Monitoring
CO2	Compare reasons for selecting particular maintenance strategies
CO3	Illustrate effective methodologies for implementing Condition Monitoring Techniques
CO4	Identify the optimum maintenance strategy for different types of equipment
CO5	Analyze practical approaches to minimize the risk of plant and machinery breakdowns



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CO6	Describe International Standards covering asset management
IV-I Sem	Course: Additive Manufacturing
CO1	Identify the use of Rapid Prototyping Techniques in the manufacturing of complex components that are otherwise very difficult to manufacture
CO2	Teach the different tools, soft-wares required and the applications of Additive Manufacturing
CO3	Explain selective laser sintering
CO4	Discuss rapid cooling
CO5	Describe rapid prototyping
CO6	Apply RP-II to engineering
IV-I Sem	Course: Advanced Materials
CO1	Illustrate the mechanics of different materials
CO2	Explain concepts such as anisotropic material behavior, constituent properties
CO3	Explain manufacturing processes of different composites, and Suitability of smart and nano materials for engineering applications.
CO4	Analyse micromechanical lamina
CO5	Compare graded materials
CO6	Explain nano materials
IV-I Sem	Course: Design For Manufacture
CO1	Design components for machining
CO2	Simulate the casting design and choose the best casting process for a specific product
CO3	Evaluate the effect of thermal stresses in weld joints
CO4	Design components for sheet metal work by understanding in depth the sheet metal processes and their formation mechanisms
CO5	Design plastic components for machining and joining and selecting a proper processes for different joining cases
CO6	Examine DFM principles including how the design affects manufacturing cost, lean manufacturing, six sigma, etc
IV-I Sem	Course: Gas Dynamics And Jet Propulsion



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CO1	Analyze the gas flow in different situations with and without friction
CO2	Analyze the gas flow in different situations with and without heat transfer in particular jet propulsion
CO3	Analyze the gas flow in different situations with and without rocket engineering applications
IV-I Sem	Course:CAD/CAM Lab
CO1	Appreciate the utility of the tools like ANSYS or FLUENT in solving real time problems and day to day problems
CO2	Use of these tools for any engineering and real time applications
CO3	Impart knowledge of utilizing these tools for a better project in their curriculum as well as they will be prepared to handle industry problems with confidence when it matters to use these tools in their Employment
IV-I Sem	Course:Mechatronics Lab
CO1	Measure load, displacement and temperature using analogue and digital sensors
CO2	Develop PLC programs for control of traffic lights, water level, lifts and conveyor belts.
CO3	Simulate and analyze PID controllers for a physical system using MATLAB
IV-II Sem	Course:Production Planning And Control
CO1	Explain the concepts of production and service systems
CO2	Apply principles and techniques in the design, planning and control of these systems to optimize/make best use of resources in achieving their objectives
CO3	Identify different strategies employed in manufacturing and service industries to plan production and control inventory
CO4	Measure the effectiveness, identify likely areas for improvement, develop and implement improved planning and control methods for production systems
CO5	Apply techniques of scheduling
CO6	Apply computers in PPC
IV-II Sem	Course:Unconventional Machining Processes
CO1	Discuss the principle of working, mechanism of metal removal in the various unconventional machining process
CO2	Identify the process parameters, their effect and applications of different



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	processes
CO3	Identify the classification of unconventional machining processes
CO4	Explain electron beam machining
CO5	Apply plasma machining in industries
CO6	Compare abrasive jet & water jet machining
IV-II Sem	Course:Automobile Engineering
CO1	Draw layout of an automobile and its systems like transmission, steering, suspension, braking, safety etc
CO2	Impart principles of automobile systems and provides the salient features of safety, emission and service of automobiles
CO3	Compare different steering systems
CO4	Explain suspensions and braking systems
CO5	Specify engine
CO6	Control emissions of engine
IV-II Sem	Course:Thermal Equipment Design
CO1	Explain about Classification of heat exchangers
CO2	Teach about Basic Design Methods of Heat Exchanger and Double Pipe Heat Exchanger
CO3	Teach about Shell & Tube Heat Exchangers
CO4	Explain about Condensation of single vapors
CO5	Explain about Vaporizers, Evaporators and Reboilers
CO6	Explain about Direct Contact Heat Exchanger
IV-II Sem	Course:Non - Destructive Evaluation
CO1	Apply the techniques and methods of nondestructive testing
CO2	Apply methods knowledge of nondestructive testing to evaluate products of railways, automobiles, aircrafts, chemical industries etc
CO3	Compare liquid penetrant test and eddy current test
CO4	Explain magnetic particle test
CO5	Perform infrared and thermal test



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CO6	Apply NDE in industries
IV-II Sem	Course:Quality And Reliability Engineering
CO1	Assess and improve process and/or product quality and reliability
CO2	Discuss principles and techniques of Statistical Quality Control and their practical uses in product and/or process design and monitoring
CO3	Teach techniques of modern reliability engineering tools.
CO4	Compare N-type & L-type tolerance design
CO5	Evaluate hazard models
CO6	Explain economics of reliability engineering
IV Sem -II	Course:Project
CO-1	Formulate., and apply mathematical, science and engineering principles to solve real time engineering problems
CO-2	Test the existing data, communicate and conduct research on complex problems using modern tools
CO-3	Validate the obtained results on contemporary issues related to society and environment
CO-4	Determine effectively the engineering principles used intheir project individually and as a team as per the norms of engineering practice
CO-5	Structure future work to promote life long learning in the context of technological adaptation.




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