



# Vidya Jyothi Institute of Technology

(An Autonomous Institution)

(Accredited by NAAC & NBA, Approved by AICTE New Delhi & Permanently Affiliated to JNTUH)  
Aziznagar Gate, C.B. Post, Hyderabad-500 075

## Course Outcomes for B.Tech Mechanical Engineering Programme

I YEAR I SEM		
<b>English-I/ A11001</b>	<b>CO1</b>	Demonstrate real life skills in the light of literature.
	<b>CO2</b>	Understand influential personalities, and practice human and professional values
	<b>CO3</b>	Explain new versions of technology for effective usage of human resources towards development and to avoid risks
	<b>CO4</b>	Identify principles and values to build collaborative knowledge and to cultivate social responsibility
	<b>CO5</b>	Enhance communication skills through grammar, vocabulary with emphasis on LSRW skills.
<b>Mathematics-I/ A11002</b>	<b>CO1</b>	Understand the term rank and Elementary Transformations of a Matrix, System of Equations.
	<b>CO2</b>	Compute Eigen values and corresponding Eigen vectors of a square matrix, finding Inverse and method of Diagonalization
	<b>CO3</b>	Evaluate the Mean value theorems and maxima and minima of functions of two variables
	<b>CO4</b>	Evaluate of improper integrals by using beta gamma functions and evaluation of double and triple integrals by tracing the region of integration
	<b>CO5</b>	Apply Laplace transform of various functions and solve the initial value problems by using Laplace transforms.
<b>Engineering Physics-I/ A11003</b>	<b>CO1</b>	Analyze the crystal structures, properties and to identify defects in crystals
	<b>CO2</b>	Explain the diffraction, interference and polarization phenomenon of light rays
	<b>CO3</b>	Identify the basics of statistical mechanics and applications of LASERS in various fields
	<b>CO4</b>	Interpret the significance of Magnetic materials
	<b>CO5</b>	Explain fundamentals of Dielectrics and their applications
<b>C Programming/ A11501</b>	<b>CO1</b>	Explain the basics of computers and its Generations
	<b>CO2</b>	Solve problems using flow charts, algorithms and programs
	<b>CO3</b>	Develop programs on control structures.
	<b>CO4</b>	Develop programs using Arrays, Strings and derived data types
	<b>CO5</b>	Design programs on functions

<b>Engineering Graphics-I/ A11301</b>	<b>CO1</b>	Understand the usage of different drawing instruments and know the application of different curves used in engineering practice. Appreciate the concept of projections in first angle.
	<b>CO2</b>	Generate various scales used in engineering practice.
	<b>CO3</b>	Conceptualize and draw the projections of points and straight lines.
	<b>CO4</b>	Visualize and project different views of a planes.
	<b>CO5</b>	Visualize and draw the views of a given solid.
<b>Engineering Mechanics-I/ A11302</b>	<b>CO1</b>	Understand and apply the concepts of force, moment and their resolutions.
	<b>CO2</b>	Develop free body diagrams in system of forces.
	<b>CO3</b>	Analyze and apply the concepts of friction.
	<b>CO4</b>	Identify centroid for plane figures and centre of gravity for any given topology.
	<b>CO5</b>	Calculate area and mass Moment of Inertia for given cross-sections.
<b>C Programming Lab/ A11581</b>	<b>CO1</b>	Have Fundamental Concept On Basic Commands In Linux.
	<b>CO2</b>	Write, Compile And Debug Programs in C Language
	<b>CO3</b>	Formulate Problems and Implement in C Language.
	<b>CO4</b>	Choose Control Structures and Arrays to Solve Computing Problems in Real-World
	<b>CO5</b>	Implement Functions and Recursion
<b>English Language Communication Skills Lab-I/ A11081</b>	<b>CO1</b>	Facilitate computer-aided multimedia instruction enabling individualized and independent language learning.
	<b>CO2</b>	Improve accent and intelligibility in pronunciation of English through Ice breaking and JAM sessions
	<b>CO3</b>	Use vocabulary, glosses and pronunciation for appropriate usage of the target language.
	<b>CO4</b>	Develop learners' communicative ability through frequent exchange of ideas and discussions.
	<b>CO5</b>	Explain the concepts of verbal and non-verbal skills of communication useful in day-to- day life
<b>Engineering Physics Lab/ A11082</b>	<b>CO1</b>	Understand the practical concept of stationary waves using Melde's apparatus
	<b>CO2</b>	Study the mechanical properties of material using Torsional pendulum
	<b>CO3</b>	Visualize the fundamental optical phenomenon like Interference, diffraction and Dispersion
	<b>CO4</b>	Study the basic Electrical characteristics of LED, RC circuits
	<b>CO5</b>	Identify the variation of magnetic field by Stewart and Gee's apparatus experimentally

<b>Engineering Workshop/ A11381</b>	<b>CO1</b>	Study and practice on workshop tools and their operations.
	<b>CO2</b>	Manufacture wooden and metallic components using carpentry and foundry respectively.
	<b>CO3</b>	Join two or materials using welding equipment.
	<b>CO4</b>	Fabricate ferrous components using blacksmith technique
	<b>CO5</b>	Demonstrate skills on plumbing and machine shops trades.

<b>I YEAR II SEM</b>		
<b>English-II/ A12005</b>	<b>CO1</b>	Acquire the real life skills in the light of literature.
	<b>CO2</b>	Develop managerial skills for successful careers. By making critical decisions
	<b>CO3</b>	Demonstrate physical and mental fitness with true sportsman spirit.
	<b>CO4</b>	Build collaborative knowledge and cultivate social responsibility.
	<b>CO5</b>	Enhance communication skills through grammar, vocabulary with emphasis on LSRW skills.
<b>Mathematics-II/ A12006</b>	<b>CO1</b>	Solve first order differential equations and their applications.
	<b>CO2</b>	Identify different types of higher order differential equations and their applications in engineering problems
	<b>CO3</b>	Apply Fourier series and defining it for various types of functions
	<b>CO4</b>	Evaluating the Fourier transforms of functions of single variable
	<b>CO5</b>	Justify integrals of functions or vector-related quantities over curves, surfaces, and domains in two- and three-dimensional space.
<b>Engineering Physics-II/ A12007</b>	<b>CO1</b>	Understand the principles of Quantum mechanics & free electron theory.
	<b>CO2</b>	Differentiate the types of solids based on band theory of solids and to understand the applications of optical fibers in various fields.
	<b>CO3</b>	Explain the basics of semiconductors and semiconductor devices
	<b>CO4</b>	Explain superconductivity and their applications in modern technology
	<b>CO5</b>	Identify the importance and characteristics of nanomaterials in various fields
<b>Applied Chemistry/ A12008</b>	<b>CO1</b>	Understand the operating principles and the reaction mechanisms of batteries and fuel cells.
	<b>CO2</b>	Apply their knowledge for the protection of different metals from corrosion.
	<b>CO3</b>	Apply the concept of adsorption in various industries
	<b>CO4</b>	Apply the knowledge of fuels and lubricants in industry.
	<b>CO5</b>	Understand the various applications of advanced engineering materials.

<b>Engineering Mechanics-II/ A12304</b>	<b>CO1</b>	Analyze given system and find reaction forces in each member of Trusses.
	<b>CO2</b>	Identify the rigid body motion to compute velocity and acceleration.
	<b>CO3</b>	Understand the kinetics of rigid body in translation and rotation.
	<b>CO4</b>	Analyze the motion of bodies with and without considering cause of motion. Appreciate and apply the concept of Work-Energy method.
	<b>CO5</b>	Analyze the free vibration concepts from the fundamentals of Simple Harmonic Motion.
<b>Engineering Graphics-II/ A12305</b>	<b>CO1</b>	Analyze given solids and represent sectional views, developments and their intersections.
	<b>CO2</b>	Represent and differentiate Isometric and Orthographic projections
	<b>CO3</b>	Generate isometric and corresponding orthographic views of any given component.
	<b>CO4</b>	Visualize and draw the perspective view of a given solid.
	<b>CO5</b>	Appreciate the concepts of Computer Aided Drafting.
<b>English Language Communication Skills Lab-II/ A12085</b>	<b>CO1</b>	Build the language proficiency in English with emphasis on LSRW skills.
	<b>CO2</b>	Develop communication skills through various language learning activities.
	<b>CO3</b>	Summarize the nuances of English speech sounds, stress, rhythm, intonation and syllable division.
	<b>CO4</b>	Acquire and exhibit acceptable etiquette essential in social & professional settings.
	<b>CO5</b>	Improve the fluency in spoken English and neutralize mother tongue influence.
<b>Engineering Physics &amp; Chemistry Lab/ A12086</b>	<b>CO1</b>	Experiment on Melde's and Torsional pendulum with knowledge in waves and mechanics
	<b>CO2</b>	Visualize the fundamental optical phenomenon like Interference, diffraction and Dispersion
	<b>CO3</b>	Identify the basic Electrical characteristics of LED, RC circuits
	<b>CO4</b>	Apply Titrimetric analysis for estimating the quantity of the compound accurately.
	<b>CO5</b>	Handle instruments like conductometer and potentiometer for measuring conductance & emf value.
	<b>CO6</b>	Evaluate and record the physical properties like Viscosity and Surface tension
<b>IT &amp; Engineering Workshop/ A12087</b>	<b>CO1</b>	Understand the process of assembly/disassembly of computer parts.
	<b>CO2</b>	Work on advanced concepts of Microsoft word software.
	<b>CO3</b>	Appreciate the usage of advanced options in MS Excel and PowerPoint.
	<b>CO4</b>	Apply basic electrical engineering knowledge for house wiring practice.
	<b>CO5</b>	Fabricate components using tin smithy and fitting.

**II YEAR I SEM**

<b>Numerical Methods/ A13013</b>	<b>CO1</b>	Develop skills in solving engineering problems involving Algebraic and transcendental equations.
	<b>CO2</b>	Acquires the knowledge of interpolation in predicting future outcomes based on the present knowledge.
	<b>CO3</b>	Evaluating the Numerical Solutions for Integrals and Fitting of different types of curves to the given data
	<b>CO4</b>	Understand the various Numerical Methods to solve Initial Value Problems.
	<b>CO5</b>	To solve the initial and boundary value problems of differential equations which are essential in engineering applications
<b>Electrical and Electronics Engineering/ A13207</b>	<b>CO1</b>	Understand different electrical circuits and gain thorough knowledge about DC machines.
	<b>CO2</b>	Identify and formulate outcomes in the part of transformers.
	<b>CO3</b>	Appreciate the working of AC machines along with regulation and efficiency calculations. Know the working of different measuring instruments.
	<b>CO4</b>	Gain knowledge of PN junction diodes, transistor and rectifiers and analyzing characteristics.
	<b>CO5</b>	Understand the working principles of CRT and applications of CRO for measurement of voltage, current and frequency.
<b>Mechanics of solids/A13308</b>	<b>CO1</b>	Understand the concepts of stress, strain and material properties. Derive basic stress strain equations with appropriate assumptions.
	<b>CO2</b>	Appreciate the concepts of shear force and bending moments. Generate shear force and bending moment diagrams for any given beam problem.
	<b>CO3</b>	Determine the stresses and strains in the members subjected to bending and shear and interpret the stress distribution across various beams like rectangular, circular, triangular, I, T and angle sections.
	<b>CO4</b>	Calculate and analyze the slope and deflection of beams under different types of loadings.
	<b>CO5</b>	Analyze and compute stresses and strains in thin and thick cylinders.
<b>Thermodynamics/ A13309</b>	<b>CO1</b>	Identify thermodynamic systems, understand concepts of zeroth law, first law, work and heat interactions.
	<b>CO2</b>	State and illustrate second law of thermodynamics. Identify and explain concepts of entropy, enthalpy, specific energy, reversibility, availability and irreversibility
	<b>CO3</b>	Understand the concepts of phase transformation of pure substance.
	<b>CO4</b>	Appreciate the concepts of perfect gas laws. Analyze mixtures of perfect gases
	<b>CO5</b>	Understand power cycles and evaluate the performance

<b>Metallurgy and Material Science/ A13310</b>	<b>C01</b>	Understand the structure of metals and constitution of alloys with phases.
	<b>C02</b>	Understand the basic concepts of phase transformation during solidification and phase diagrams.
	<b>C03</b>	Understand different heat treatment processes and their influence on properties of metals and alloys.
	<b>C04</b>	Understand classifications of steels, cast irons and their alloys. Analyze the structure and properties of different non-ferrous metals.
	<b>C05</b>	Know the classification, properties and applications of composite and ceramic materials.
<b>Environmental Science/ A13011</b>	<b>C01</b>	Understanding the importance of Ecosystem and its Resources.
	<b>C02</b>	Appreciate different types of natural resources and the means to utilize them.
	<b>C03</b>	Identify different root causes for pollution of environment and their control.
	<b>C04</b>	Understand the impact of global environmental problems and their assessment.
	<b>C05</b>	Know environmental policy, legislation, rules and regulations
<b>Electrical and Electronics Engineering Lab/ A13282</b>	<b>C01</b>	Perform the tests on D.C. shunt machine, Single phase transformer and brake test on Three phase induction motor.
	<b>C02</b>	Determination of regulation of alternator by synchronous impedance method.
	<b>C03</b>	Perform brake test on D.C. shunt motor and determine the speed control methods on D.C. shunt motor.
	<b>C04</b>	Perform input and output of CE characteristics and full wave rectifier with and without filters.
	<b>C05</b>	Execute CE amplifiers, class A power amplifier and RC phase shift oscillator and micro processor
<b>Metallurgy and Mechanics of solids Lab/ A13383</b>	<b>C01</b>	Understand the micro structures of pure metals, steels, cast irons, non-ferrous alloys and heat treated steels.
	<b>C02</b>	Estimate the hardenability of steels by Jominy End Quench test.
	<b>C03</b>	Determine the hardness of various treated and untreated steels by using Brinells hardness test & Rockwell hardness test.
	<b>C04</b>	Conduct the direct tension test, torsion test, impact test and punch shear test on metal rod.
	<b>C05</b>	Perform compression tests on spring and cube, bending test on Simply Supported and Cantilever Beam.

**II YEAR II SEM**

<p align="center"><b>Production Technology/ A14312</b></p>	<b>CO1</b>	Understand the basic concepts of casting processes to make different engineering components of industrial applications
	<b>CO2</b>	Differentiate the types of welding processes and decide which type of process to be selected for any given industrial application.
	<b>CO3</b>	Recognize the differences between hot working and cold working processes and understand the processes of various forging operations.
	<b>CO4</b>	Understand the basic principles of sheet metal operations and known the principles of drawing and extrusion processes.
	<b>CO5</b>	Ability to know the processing of thermo setting and thermo plastics.
<p align="center"><b>Kinematics of Machinery/ A14313</b></p>	<b>CO1</b>	Understand working principles of different lower and higher pairs, mechanisms and their inversions.
	<b>CO2</b>	Mathematical modeling of mechanisms to compute velocity and accelerations of links.
	<b>CO3</b>	Understanding various steering gear mechanisms and Hooke's joint.
	<b>CO4</b>	Appreciate different cams and followers used in mechanical systems.
	<b>CO5</b>	Appreciate the concepts of velocity in gearing systems.
<p align="center"><b>Thermal Engineering-I/ A14314</b></p>	<b>CO1</b>	Understand the concepts of actual cycles and their analysis.
	<b>CO2</b>	Appreciate the working principles of four stroke and two stroke IC engines.
	<b>CO3</b>	Analyze the combustion phenomenon in SI & CI engines
	<b>CO4</b>	Understand the testing and performance of IC engines.
	<b>CO5</b>	Analyze the working of air compressors and evaluate their performance
<p align="center"><b>Mechanics of Fluids and Hydraulic Machines/ A14315</b></p>	<b>CO1</b>	Understand the basic mechanics of fluid statics.
	<b>CO2</b>	Understand the principles of flow and energy momentum equations.
	<b>CO3</b>	Analyze the losses in pipe flow, boundary layer, separation of flows, forces on different vanes. Able to quantify the flow of fluid in flow measurement instruments.
	<b>CO4</b>	Understand the working of hydraulic machinery and analyze their characteristic curves.
	<b>CO5</b>	Appreciate the working principles of pumps and their applications.

<b>Machine Drawing/ A14316</b>	<b>C01</b>	Understand the conventional representation of materials used in machine drawing.
	<b>C02</b>	Know various methods of dimensioning and general rules.
	<b>C03</b>	Draw the machine elements including screw threads, keys, couplings and bearings.
	<b>C04</b>	Draw the machine elements including cotters, knuckle, riveted, and bolted joints.
	<b>C05</b>	Construct an assembly drawing using part drawings of machine components.
<b>Probability and Statistics/ A14015</b>	<b>C01</b>	Demonstrate an understanding of the basics concepts of probability, random variables, binomial and normal distributions.
	<b>C02</b>	Understand the concept of the sampling distribution of a statistics, and in particular describe the behavior of the sample mean.
	<b>C03</b>	Use the normal distributions to test statistical hypotheses and to Compute confidence intervals.
	<b>C04</b>	Application of regression analysis to analyze a problem.
	<b>C05</b>	Application of control charts for quality control and measurement of trends.
<b>Production Technology Lab/ A14384</b>	<b>C01</b>	Understand pattern designs & making, test sand properties and perform moulding, melting & casting
	<b>C02</b>	Attain knowledge on arc and spot welding processes and able to perform them.
	<b>C03</b>	Analyze and select suitable welding process based on the type of material used.
	<b>C04</b>	Study different mechanical press working operations and perform operations like blanking, piercing, deep drawing, extrusion and bending operations
	<b>C05</b>	Attain knowledge on processing of plastics and perform operations like injection moulding and blow moulding
<b>Mechanics of Fluids and Hydraulic Machines Lab/ A14385</b>	<b>C01</b>	Practical exposure of using components like vacuum gauge, pressure gauge, manometers, pipes, motors, pumps, turbines.
	<b>C02</b>	Measure fluid flow using Ventutimeter and Orificemeter.
	<b>C03</b>	Understand friction factor and minor losses in a pipe line
	<b>C04</b>	Understand and calculate performance of turbines and pumps at constant speed and head.
	<b>C05</b>	Know and understand the impact of jet on vanes and Bernoulli's theorem.



<b>III YEAR I SEM</b>		
<b>Design of Machine Members-I/ A15317</b>	<b>CO1</b>	Understand the design procedure and selection of material for a specific application. Analyze the simple stresses and strains in components.
	<b>CO2</b>	Appreciate variable stresses in mechanical components, fatigue analysis and fatigue theories of failure.
	<b>CO3</b>	Design fastened joints like riveted and welded joints.
	<b>CO4</b>	Design various joints like bolted joints, keys, cotter joints and knuckle joint.
	<b>CO5</b>	Design shafts for strength and rigidity. Design rigid and flexible shaft couplings.
<b>Thermal Engineering-II/ A15318</b>	<b>CO1</b>	Understand the basic concepts of rankine cycle and analyze improvements in rankine cycle, types of fuels and combustion, analysis of fuels and combustion, stoichiometry.
	<b>CO2</b>	Know the working principles of different types of boilers, mountings and accessories. Perform Thermodynamic analysis of nozzles.
	<b>CO3</b>	Analyze impulse and reaction steam turbines and subsequently apply to real time scenarios.
	<b>CO4</b>	Understand working of different types of gas turbines, efficiency improvements. Know the concepts and types of steam condensers.
	<b>CO5</b>	Appreciate different types of propulsive engines, thrust augmentation methods, rockets, propellant types.
<b>Dynamics of Machinery/ A15319</b>	<b>CO1</b>	Understand gyroscopic effects of rotating bodies for aero planes, naval ships, automobiles, and two wheelers. Perform static and dynamic force analysis of planar mechanisms.
	<b>CO2</b>	Compute friction in clutches, breaks and dynamometers.
	<b>CO3</b>	Diagrammatically represent turning moment and design flywheels. Understand the applications of Governors in mechanical systems
	<b>CO4</b>	Understand how to balance rotating and reciprocating masses in different planes.
	<b>CO5</b>	Perform calculations pertinent to several parameters of free and forced vibrations.
<b>Machine tools and Metrology/ A15320</b>	<b>CO1</b>	Understand the mechanics of metal cutting and working principles of lathe machines.
	<b>CO2</b>	Understand the working, classification, specifications and kinematic schemes of shaping, planing, drilling and boring machines.
	<b>CO3</b>	Know the operations of milling, grinding, lapping, honing and broaching machines.
	<b>CO4</b>	Understand the concepts of limits, fits and interchangeability. Design of GO and NO GO gauges
	<b>CO5</b>	Understand how to measure different parameters of surface roughness. Appreciate measurement of different dimensional parameters in screw threads.

<b>Automobile Engineering/ A15321</b>	<b>C01</b>	Understand the components of four wheeler automobile engines. Appreciate the functions and importance of lubrication and cooling systems.
	<b>C02</b>	Know about the fuel systems in SI engine and CI engines.
	<b>C03</b>	Appreciate the functions and importance of ignition and electrical systems.
	<b>C04</b>	Explain the working principles, types and importance of transmission and suspension systems
	<b>C05</b>	Appreciate the working principles, types and importance of braking and steering systems. Understand the environmental implications of automobile emissions and application of various alternative fuels.
<b>OPEN ELECTIVE – I Elements of Mechanical engineering/ A15324</b>	<b>C01</b>	Understand the basic concepts of mechanical engineering.
	<b>C02</b>	Applying principles of engineering mechanics in mechanism and machines
	<b>C03</b>	Develop manufacturing methods to produce engineering components.
	<b>C04</b>	Evaluating alternative designs for the engineering components
	<b>C05</b>	Comparing various standards relevant to automobiles.
<b>Thermal Engineering lab/ A15386</b>	<b>C01</b>	Investigate IC engines with varied parameters to evaluate the performance.
	<b>C02</b>	Evaluate engine friction and heat balance of 4-stroke SI and CI engines.
	<b>C03</b>	Determine A/F ratio, Volumetric Efficiency, Economical Speed and optimum cooling water temperature for IC engines.
	<b>C04</b>	Acquire hands on experience on the assembly & disassembly of various IC engine parts
	<b>C05</b>	Test performance of Reciprocating Air-compressor and understand the working of different types of boilers.
<b>Metrology and machine Tools Lab/ A15387</b>	<b>C01</b>	Identify suitable instrument for measuring dimensions and surface roughness of a given component.
	<b>C02</b>	Perform alignment and flatness tests on given machine and component.
	<b>C03</b>	Perform wear resistance test and know the usage of tool makers microscope.
	<b>C04</b>	Operate lathe, milling machines, drilling machine, grinding machines.
	<b>C05</b>	Select suitable machining operation to fabricate the required product from the given raw material.

**III YEAR II SEM**

<b>Design of Machine Members-II/ A16326</b>	<b>CO1</b>	Understand different sliding contact and rolling contact bearings and perform design calculations.
	<b>CO2</b>	Analyze design considerations of IC engine parts like piston, connecting rod and cylinder.
	<b>CO3</b>	Appraise the design of belt and rope drives used in power transmission. Understand the stresses, deflection and energy storage capacity of helical springs.
	<b>CO4</b>	Design spur and helical gear drives by calculating different parameters.
	<b>CO5</b>	Compute design parameters of bevel gear drives. Design power screws applied in various mechanical members.
<b>Heat Transfer/ A16327</b>	<b>CO1</b>	Understand the basic modes of heat transfer, steady and unsteady periodic heat transfer.
	<b>CO2</b>	Solve 1-D problems of steady state and transient conduction heat transfer.
	<b>CO3</b>	Appreciate concepts of convective heat transfer process and evaluate heat transfer coefficient for free and forced convection over exterior and interior surfaces with proper boundary conditions.
	<b>CO4</b>	Applying the boiling and condensation principles in the heat transfer equipment design. Analyze the performance of heat exchangers by LMTD and NTU methods.
	<b>CO5</b>	Analyze radiation heat transfer scenarios in black and gray bodies
<b>Finite Element Methods/ A16328</b>	<b>CO1</b>	Understand the basics of FEM, stress-strain relations and gain knowledge of Weighted Residual Methods and Variational Methods.
	<b>CO2</b>	Solve 1-D problems by applying the pertinent boundary conditions.
	<b>CO3</b>	Analyze and formulate finite element equations for 1-D planar truss element and beam element.
	<b>CO4</b>	Appreciate the treatment of CST, iso-parametric and axi-symmetric elements to solve 2-D problems.
	<b>CO5</b>	Analyze and solve 1-D and 2-D heat transfer problems using FEM. Formulate Finite element equations for a stepped bar and a beam using dynamic analysis.
<b>Managerial Economics and Financial Analysis/ A16018</b>	<b>CO1</b>	Analyze the scope of managerial economics.
	<b>CO2</b>	Apply managerial tools and techniques to attain optimal decisions
	<b>CO3</b>	Analyze how production function is carried out to achieve maximum output.
	<b>CO4</b>	Analyze changing business environment in post liberalization scenario.
	<b>CO5</b>	Evaluate and interpret the financial statements to make informed decisions.

<b>Refrigeration and Air Conditioning/ A16329</b>	<b>CO1</b>	Understand the basic concepts of refrigeration and thermodynamically analyze air refrigeration systems.
	<b>CO2</b>	Appreciate the working principle and thermodynamically analyze vapor compression refrigeration system.
	<b>CO3</b>	Classify basic components of vapor compression refrigeration system according to different criteria and understand their working. Identify the different refrigerants used in the field of refrigeration and air conditioning, and understand their desirable properties and nomenclature.
	<b>CO4</b>	Understand the working principles and thermodynamically analyze vapor absorption refrigeration system, steam jet refrigeration system and different non conventional methods of producing cooling effect.
	<b>CO5</b>	Estimate the air conditioning load for comfort and industrial applications by applying the principles of psychrometry. Appreciate the working of different air conditioning systems, their components, heat pump and different heat pump circuits.
<b>OPEN ELECTIVE - II Basic Automobile engineering/A16332</b>	<b>CO1</b>	Understanding the basic structure of an automobile
	<b>CO2</b>	Evaluating different cooling and lubrication systems of an automobile
	<b>CO3</b>	Analyzing the electrical systems in tandem with ignition systems
	<b>CO4</b>	Comparing the various transmission systems for their effectiveness
	<b>CO5</b>	Understanding and there by implement the subsystems in the automobile for its low emission
<b>Heat Transfer Lab/ A16388</b>	<b>CO1</b>	Evaluate the amount of heat exchange for plane, cylindrical and spherical geometries
	<b>CO2</b>	Compare the performance of extended surfaces and heat exchangers.
	<b>CO3</b>	Measure heat transfer coefficient in free and forced convection and correlate with theoretical values.
	<b>CO4</b>	Perform tests on Emissivity, Stefan-Boltzmann and Critical Heat Flux apparatus.
	<b>CO5</b>	Demonstrate the working principle of heat pipe and compare convective heat transfer phenomena with phase change heat transfer processes.
<b>Advanced English communication Skills Lab/ A16090</b>	<b>CO1</b>	Listen to the speakers attentively, accurately and precisely to understand and respond appropriately in different contexts.
	<b>CO2</b>	Analyze and communicate intelligently while speaking with professionalism and enact different roles; engage themselves in preparing, organizing and delivering speeches, presentations etc
	<b>CO3</b>	Demonstrate command over English vocabulary and develop the ability to read intelligently and imaginatively for comprehending different contexts
	<b>CO4</b>	Master the mechanics of writing and practice it as a process and communicate the ideas relevantly and coherently
	<b>CO5</b>	Gain employability skills; develop leadership qualities and problem solving skills to apply them for careers at advanced levels in a wide range of English and enrich themselves to meet industrial needs

**IV YEAR I SEM**

<p align="center"><b>Operation Research /A17334</b></p>	<b>CO1</b>	Model the real life situations with mathematical models. Understand the concept of linear programming.
	<b>CO2</b>	Solve transportation and assignment problems.
	<b>CO3</b>	Formulate the sequencing of jobs on machines. Understand the various replacement concepts.
	<b>CO4</b>	Identify and apply various inventory models.
	<b>CO5</b>	Apply queuing and dynamic programming models.
<p align="center"><b>CAD/CAM/ A17335</b></p>	<b>CO1</b>	Appreciate CAD/CAM principles and know the various input and output peripherals of computers. Understand geometric modeling principles.
	<b>CO2</b>	Develop mathematical models to represent surfaces and solids.
	<b>CO3</b>	Understand numerical control systems and develop CNC part programs.
	<b>CO4</b>	Understand the elements of group technology and computer aided process planning
	<b>CO5</b>	Acquire knowledge of Flexible Manufacturing Systems, Computer Aided Quality Control and Computer Integrated Manufacturing Systems.
<p align="center"><b>Mechanical measurements and Instrumentation /A17336</b></p>	<b>CO1</b>	Define basic terms related to measurements, understand measurement techniques.
	<b>CO2</b>	Understand working principles of various displacements, pressure and temperature measuring instruments.
	<b>CO3</b>	Describe the working, advantages, disadvantages and applications of various flow, level, speed, acceleration and vibration measuring instruments.
	<b>CO4</b>	Model and analyze various stress, strain, humidity, force, torque and power measuring instruments.
	<b>CO5</b>	Understand control systems and their applications.
<p align="center"><b>Maintenance and safety engineering / A17344</b></p>	<b>CO1</b>	Understanding the need for maintenance of a machine in an industry
	<b>CO2</b>	Identifying various maintenance policies
	<b>CO3</b>	Analyzing the cost and time concepts while implementing the maintenance
	<b>CO4</b>	Evaluating the quality concepts for safety and maintenance of an equipment
	<b>CO5</b>	Appreciating the terms reliability and maintainability with reference

		the maintenance of an equipment
<b>E-III Robotics/A17337</b>	<b>CO1</b>	Understand the basic concepts of robotics and know the components of industrial robots. Analyze the motion of robots with respect to position and orientation.
	<b>CO2</b>	Model forward and inverse kinematics of robot manipulators.
	<b>CO3</b>	Model differential kinematics of robot manipulators. Formulate dynamic analysis equations for robotic manipulators.
	<b>CO4</b>	Plan the trajectory of robot. Know principles of different actuators and feedback components (sensors).
	<b>CO5</b>	Appreciate the industrial applications of robots.
<b>Power Plant Engineering /A70353</b>	<b>CO1</b>	Understand the layout of steam power plant and know different handling systems. Appreciate the working principles of various components responsible for combustion.
	<b>CO2</b>	Understand the layout of diesel power plant with detailed emphasis on its auxiliaries.
	<b>CO3</b>	Know the working of hydroelectric power plants and characteristics of hydrographs.
	<b>CO4</b>	Know the advantages, disadvantages & applications of nuclear power plants.
	<b>CO5</b>	Analyze and estimate different power plant economic factors and environmental considerations.
<b>Computer Aided Design and Manufacturing Lab/A17389</b>	<b>CO1</b>	Design 2D drawings using solid edge software
	<b>CO2</b>	Develop 3D cad models as per given dimensions
	<b>CO3</b>	Assemble of sub components in their working positions.
	<b>CO4</b>	Perform Finite Element Analysis and obtain results to any given problem.
	<b>CO5</b>	Prepare CNC programs and simulate the manufacturing process
<b>Production Drawing Practice and Instrumentation Lab/A17390</b>	<b>CO1</b>	Represent limits, fits, tolerances, surface roughness, heat and surface treatment symbols.
	<b>CO2</b>	Generate detailed and part drawings from assembly drawings.
	<b>CO3</b>	Calibrate pressure, flow, strain and displacement measuring instruments.
	<b>CO4</b>	Use magnetic and speed pickups for speed measurement.
	<b>CO5</b>	Calibrate different instruments used for temperature measurement

<b>Industrial Oriented Mini Project/A80087</b>	<b>CO1</b>	Interact with industry and get familiarized with its practices.
	<b>CO2</b>	Identify a topic in various areas of Mechanical Engineering.
	<b>CO3</b>	Review literature to identify gaps and define objectives & scope of the work.
	<b>CO4</b>	Generate and implement innovative ideas for social benefit.
	<b>CO5</b>	Develop a report that meets specified standards and defend the work.
<b>IV YEAR II SEM</b>		
<b>Production Planning &amp; Control/A18345</b>	<b>CO1</b>	Understand the basic concepts of production planning and control.
	<b>CO2</b>	Appreciate principles and importance of forecasting techniques.
	<b>CO3</b>	Analysis of various inventory management and control systems. Plan the stock required based on various methods like MRP, ERP, LOB, JIT and other Japanese concepts.
	<b>CO4</b>	Know the factors of routing and schedule. Apply standard scheduling methods and line balancing.
	<b>CO5</b>	Appreciate dispatching procedure and application of computer in production planning and control.
<b>Plant Layout &amp; Material Handling/A18346</b>	<b>CO1</b>	Understand different plant layouts, selection and comparison of process and product layouts.
	<b>CO2</b>	Understand heuristics for plant layouts like ALDEP, CORELAP and CRAFT.
	<b>CO3</b>	Get an overview of material handling systems and relationship between material handling and plant layout.
	<b>CO4</b>	Understand various methods of material handling like path and function oriented systems.
	<b>CO5</b>	Minimize cost of material handling with safety prerequisites
<b>Unconventional Machining Processes/A18347</b>	<b>CO1</b>	Understand the need, importance and classification of various unconventional machining processes. Gain a thorough understanding of ultrasonic machining.
	<b>CO2</b>	Appreciate basic principles and process parameters of water jet, abrasive jet machining and electro-chemical machining processes.
	<b>CO3</b>	Appreciate thermal energy based machining processes with emphasis on surface finish and accuracy.
	<b>CO4</b>	Understand electron beam machining and laser beam machining along with applications.

	<b>CO5</b>	Know the advanced unconventional processes like plasma machining, chemical machining, magnetic abrasive finishing and abrasive flow finishing.
<b>Seminar/A80089</b>	<b>CO1</b>	Identify and compare technical and practical issues related to the area of course specialization.
	<b>CO2</b>	Outline annotated bibliography of research demonstrating scholarly skills.
	<b>CO3</b>	Prepare a well-organized report employing elements of technical writing and critical thinking.
	<b>CO4</b>	Demonstrate the ability to describe, interpret and analyze technical issues and develop competence in presenting.
	<b>CO5</b>	Communicate and articulate effectively so as to present the required technical content.
<b>Project work/A80088</b>	<b>CO1</b>	Identify methods and materials to carry out experiments.
	<b>CO2</b>	Reorganize the procedures with a concern for society, environment and ethics.
	<b>CO3</b>	Analyze and discuss the results to draw valid conclusions.
	<b>CO4</b>	Prepare a report as per recommended format and defend the work.
	<b>CO5</b>	Explore the possibility of publishing papers in peer reviewed journals/conference proceedings.
<b>Comprehensive Viva/A80090</b>	<b>CO1</b>	Comprehend the knowledge gained in the course work
	<b>CO2</b>	Infer principles of the working of various systems of mechanical engineering
	<b>CO3</b>	Demonstrate the ability of problem solving.
	<b>CO4</b>	Communicate effectively and enunciate the skills lucidly.
	<b>CO5</b>	Acquire profound knowledge on cutting edge technologies.