



MECHANICAL ENGINEERING



Estd:1980

SAGIRAMAKRISHNAM RAJU ENGINEERING COLLEGE(AUTONOMOUS)
China Amiram, Bhimavaram-534204.(AP)

B. TECH – MECHANICAL ENGINEERING

Department Vision

Mechanical Engineering Department strives to be recognized globally for quality education, training and research leading to well-qualified engineers, who are innovative, entrepreneurial, and successful in solving problems of society.

Department Mission:

- Impart quality education to students to enhance their skills and make them globally competitive.
- Maintain a vital and state-of-the-art research to provide its students and faculty with opportunities to create, interpret, apply, and disseminate knowledge.
- Prepare its graduates to pursue higher studies, serve the profession and meet intellectual, ethical and career challenges.

Program Educational Objectives (PEOs) :

PEO1	To Educate the graduate of the program to build a successful technical or professional career in Mechanical Engineering.
PEO2	To envisage graduate engineer to achieve the goal in terms of pursuing higher education and Research and Development activities.
PEO3	To help graduates become a moral & ethically responsible citizen in nation building.

Program Specific Outcomes (PSO's):

PSO1	Apply mechanical engineering fundamentals to design mechanical engineering systems and thermal systems.
PSO2	Identify and select appropriate manufacturing processes and apply quality control methods for production of various components.



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Program Outcomes (POs):

Engineering Graduates will be able to:

1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multi-disciplinary environments.
12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.



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Course outcomes (Cos) of all courses of all programs offered by the institution

Course Outcomes for First Year First Semester Course	
Course Code: B16 ENG1101	
Course Title: ENGLISH	
CO-1	The overall performance of the students will be enhanced after the course; they will be in a position to make presentations on topics of current interests – politics, famous personalities, science and technology, tourism, work, and business environment, with increased public speaking skills.
CO-2	Students will be able to read, listen, speak, and write effectively in both academic and non-academic environment.
CO-3	The students will be updated with certain real life situations, which they can handle when come face to face.
Course Code: B16 ENG1102	
Course Title: MATHEMATICS – I	
CO-1	Find partial derivatives, expand a function of more than one variable in a Taylor series and utilize them for errors and approximations, maxima and minima.
CO-2	Solve a first order ODE and also find orthogonal trajectories and solve problems related to simple applications.
CO-3	Solve a given higher order ODE, an equation with constant coefficients, a Cauchy's equation or a Legendre's equation.
CO-4	Utilize knowledge of Fourier series for solving partial differential equations and also in understanding courses like Signals & Systems
Course Code: B16 ENG1103	
Course Title: MATHEMATICS – II	
CO-1	Utilizing the knowledge of matrices for solving linear simultaneous equations, find Eigen values and Eigen vectors and handle quadratic forms.
CO-2	Utilizing the knowledge of Laplace Transforms to find transforms of important functions that arise in applications and also solve ODE
CO-3	Utilizing the knowledge of Laplace Transforms in courses like Net Works, Signals & Systems and Control Systems
CO-4	Utilizing the knowledge of difference equations and Z-transforms in understanding courses like Discrete Mathematical Structures and also Signals & Systems.
Course Code: B16 ENG1105	
Course Title: PHYSICS	
CO-1	Students learn in depth about the topics of Lasers, fiber optics, quantum mechanical theory and classical theories of thermodynamics and electromagnetism.
CO-2	Students understand the classical and modern concepts.
Course Code: B16 ENG1107	
Course Title: ENGINEERING GRAPHICS	
CO-1	Apply principles of drawing to represent dimensions of an object.
CO-2	Construct polygons and engineering curves.
CO-3	Draw projections of points, lines, planes and solids.
CO-4	Represent sectional views of solids.
CO-5	Develop the surfaces of regular solids.
CO-6	Draw the isometric views of solids and combination of solids.
Course Code: B16 ENG1109	
Course Title: PROFESSIONAL ETHICS AND MORAL VALUES	
CO-1	By the end of the course student should be able to understand the importance of ethics and values in life and society.
Course Code: B16 ENG1111	
Course Title: PHYSICS LAB	
Course Code: B16 ENG1113	
Course Title: WORKSHOP	
CO-1	Use various tools to prepare basic carpentry and fitting joints.
CO-2	Fabricate simple components using tin smithy

Course Outcomes for First Year Second Semester Course	
Course Code: B16 ENG1201	
Course Title: MATHEMATICS – III	
CO-1	Utilize knowledge of line, sphere etc. in his engineering subjects
CO-2	Utilize the knowledge of Beta and Gamma functions and multiple integrals to evaluate the integrals



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	they come across in their applications.
CO-3	Utilize the knowledge of Fourier Transform in courses like Signals and Systems and in the solution of partial differential equations at a later stage
Course Code: B16 ENG1203	
Course Title: CHEMISTRY	
CO-1	Students learn in-depth about the topics of desalination of sea water, CNG, LPG Biogas, Semiconductors, Liquid crystals, Conducting polymers, fiber reinforced plastics, building materials.
CO-2	Students understand the basic and advanced applied concepts.
CO-3	Students learn to inter relate the theory and with the relevant experiment.
CO-4	Students learn experimental techniques and understand the theory about experiments.
Course Code: B16ENG1205	
Course Title: COMPUTERPROGRAMMINGUSINGC & NUMERICAL METHODS	
CO-1	Student can understand basic terminology used in C programming.
CO-2	Student can write programs by applying elementary algorithms to solve problems in C language.
CO-3	Student can write, compile and debug programs in C language.
CO-4	Student can Write programs to solve numerical methods
CO-5	Student can be familiar with finite precision computation.
Course Code: B16ENG1207	
Course Title: HISTORYOFSCIENCE ANDTECHNOLOGY	
CO-1	By the end of this course the students should be able to understand the contribution of Scientific and Technological developments for the benefit of society at large.
Course Code: B16 ME 1208	
Course Title: METALLURGYANDMATERIALENGINEERING	
CO-1	Understand crystal line solids and their atomic structures.
CO-2	Suggest and recommend necessary engineering materials for specific applications keeping in view of the cost, design, reliability, life, working conditions and properties of the products.
CO-3	Understand different phase transformations in Iron-Iron Car bide diagram and distinguish between steels and cast irons.
CO-4	Select different materials for tools and components based on functional requirements.
CO-5	Use composite materials for different engineering applications like aerospace, automobile, ship building industry, sports item etc.
Course Code: B16 ENG1210	
Course Title: CHEMISTRYLAB	
Course Code: B16 ENG1212	
Course Title: COMPUTERPROGRAMMINGUSINGC & NUMERICALMETHODSLAB	
Course Code: B16 ENG1213	
Course Title: ENGLISHLANGUAGELAB	
CO-1	To make students recognize the sounds of English through Audio-Visual aids.
CO-2	To help students build their confidence and help overcome their inhibitions and self consciousness while speaking in English. <i>The focus shall be on fluency.</i>
CO-3	To familiarize the students with stress and intonation and enable them to speak English effectively.

Course Outcomes for Second Year First Semester Course	
Course Code: B16 ENG2101	
Course Title: MATHEMATICS – IV	
CO-1	Apply the concepts of Gradient, Divergence, Curl, Directional derivative, solenoidal and irrotational fields.
CO-2	Determine scalar potential, circulation and work done.
CO-3	Evaluate integrals using Green's, Stokes' and Divergence theorems.
CO-4	Obtain the solution of 1-D wave equation and 1-D heat equation.
CO-5	Determine the zeroes and poles of functions and residues at poles.
CO-6	Evaluate certain real definite integrals that arise in applications by the use of Residue theorem
Course Code: B16 ME 2101	
Course Title: MECHANICS OF SOLIDS	
CO-1	Fundamental understanding of the concepts of stress and strain in mechanics of solids and structures and material properties.
CO-2	Apply the fundamental concepts of principle of superposition, equilibrium, compatibility, force-deformation, and stress-strain relationships to the solid and structural mechanics problems.
CO-3	Analyze determinate bars, beams, to determine axial forces, torques, shear forces, and bending moments.
CO-4	Physical insight into distribution of stresses and strains in structural members by determining stress,



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	strain, and deformation of bars, and beams, and performing stress and strain transformations.
CO-5	Basic understanding of the method of superposition, flexibility method, and stiffness method as applied to statically determinate axial and torsional members, and beams.
CO-6	Ability to design structural members given the dimensions, material properties such as force-displacement relationships, boundary conditions, loading, allowable stresses, and factor of safety.
Course Code: B16 ME 2102	
Course Title: THERMODYNAMICS	
CO-1	Students realize the practical importance of ideal gas theory and the use of real gases in combustion engines such as IC Engines and Gas turbines.
CO-2	Students are able to calculate the properties of the gases such as internal energy, enthalpy and entropy.
CO-3	Students are able to estimate the losses which occur during operation of the heat engines, and their maximum possible operating efficiencies under STP conditions.
CO-4	Students can estimate the maximum work-output delivered by the heat engines and maximum work consumed by the reversed heat engines
Course Code: B16 ME 2103	
Course Title: MANUFACTURING PROCESSES	
CO-1	Student will be able to recognize various manufacturing materials, manufacturing process and types of productions.
CO-2	Student will be able to identify various casting processes, metal forming process and welding process.
CO-3	Student will be able to design of gating system, patterns and cores for various casting processes.
CO-4	Student will be able to apply knowledge of casting process for manufacturing of products.
CO-5	Student will be able to apply knowledge of rolling, for going, extrusion for manufacturing of products.
CO-6	Student will be able to apply knowledge of welding, brazing and soldering for joining of metals.
Course Code: B16 ME 2104	
Course Title: ENGINEERING MECHANICS	
CO-1	Use scalar and vector analytical techniques for analyzing forces in statically determinate structures.
CO-2	Apply fundamental concepts of kinematics and kinetics of particles to the analysis of simple, practical problems.
CO-3	Apply basic knowledge of maths and physics to solve real-world problems
Course Code: B16 ME 2105	
Course Title: MECHANICAL ENGINEERING DRAWING	
CO-1	Know drawing of Screw threads and Screw Fastenings using standard Empirical formulae.
CO-2	Draw Riveted joints, Keys, Cotter-joint, Draw Couplings (Shaft couplings: Box and split muff couplings, Flanged, Flexible, Universal and Oldham couplings).
CO-3	Draw the dimensional and geometrical tolerances and surface roughness symbols.
CO-4	Draw Assembly and production drawings of various engine components and machine tool components.
Course Code: B16 ME 2107	
Course Title: MECHANICAL ENGINEERING LAB	
CO-1	Students are now aware of the use of drawing valve timing diagrams of an engine and method to evaluate the volumetric efficiency of air compressor.
CO-2	They are also aware of method of calibrating pressure gauge, the importance of flash and fire points and calorific values of fuels.
CO-3	The importance and application by calculating viscosities of oil samples are understood.
CO-4	The use of moment of inertia and modulus of rigidity is understood.
CO-5	They are also now able to identify the parts of boiler and engines etc.
Course Code: B16 CE 2108	
Course Title: MECHANICS OF SOLIDS LAB	
CO-1	To understand the different types of loading and measure the loads.
CO-2	To understand the material properties of different materials and the ways of finding them.
CO-3	To understand the bulking property and fineness of sand grains and the methods of finding them.
Course Code: B16 ENG2104	
Course Title: ENGLISH PROFICIENCY	
CO-1	Students enhance their vocabulary and use it in the relevant contexts.
CO-2	They improve speaking skills.
CO-3	They learn and practice the skills of composition writing.
CO-4	They enhance their reading and understanding of different texts.
CO-5	They enrich their communication both in formal and informal contexts.
CO-6	They strengthen their confidence in presentation skills.
Course Code: B16 ME 2108	
Course Title: AutoCAD	



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CO-1	Auto CAD screen and various Toolbars and menus and Explain about Dimensioning and Hatching
CO-2	Draw the 2D-drawings like knuckle joint, screwjack, flange coupling, lathe tool post, eccentric etc.,
CO-3	Explain about 3D solids and solids toolbar options and Drawing of 3D-components like bolt & nut, screw jack
CO-4	Rendering of 3 Dimages

Course Outcomes for Second Year Second Semester Course	
Course Code: B16 ME 2201	
Course Title: ADVANCEDSTRENGTHOFMATERIALS	
CO-1	Students are able to evaluate the stresses across the cross-sections of the curved beam.
CO-2	Calculate the radial stress and circumferential stress for rotating circular disc (both hollow and solid) of uniform thickness
CO-3	Modeling the thickness of circular rotating disc having uniform strength
CO-4	Calculate the radial and circumferential stress for both thick and compound cylinders under different pressurized conditions
CO-5	Evaluate the deflection and slope of simply supported beams and can til ever beams using different energy methods.
Course Code: B16 ME 2202	
Course Title: THERMALENGINEERING	
CO-1	The student gets complete knowledge of steam and its properties.
CO-2	The student learns the complete calculation procedures for designing steam turbines, steam condensers nozzles excused in the rmal power plants, steam engines, and water turbines and many other industrial applications.
CO-3	The student is prepared to work in industry immediately after his course
Course Code: B16 ME 2203	
Course Title: METALCUTTING& MACHINETOOLS	
CO-1	Students will be able to describe the mechanisms of metal cutting.
CO-2	Students will be able to calculate cutting forces, tool life and machining parameters.
CO-3	Students will be able to design the single point and multipoint cutting tools.
CO-4	Students will be able to demonstrate the working of various machine tools like lathe, milling machine and grinding machine etc.
CO-5	Students will be able to identify different micro finishing operations.
CO-6	Students will be able to assess the advantages, limitations and applications of unconventional methods of machining.
Course Code: B16 ENG2202	
Course Title: ENGINEERINGECONOMICS	
CO-1	Awareness about how resources should be allocated and utilized efficiently and types of demand.
CO-2	Determine types of economic systems with their respective pros & cons and how factors of production will help engineers to achieve their goals.
CO-3	Develop the capability to understand different market structures and act accordingly.
CO-4	Understand the stages of business cycles and causes and effects of inflation.
CO-5	Examine the nature of cost and learn how to construct a break-even chart to known profit– no loss point.
CO-6	Evaluate forms of business organization along with their pros and cons.
CO-7	Construct a financial statement to know the financial position and calculation of depreciation by using different methods.
Course Code:B16 EE 2204	
Course Title: BASIC ELECTRICAL&ELECTRONICSENGINEERING	
CO-1	Able to analyze the various Electrical networks.
CO-2	Able to understand the basics of Magnetic Circuits.
CO-3	Able to understand the operation of DC generators, 3-Point starter and conduct the Swinburne's test.
CO-4	Able to analyze the Performance of Transformers.
CO-5	Able to explain the operation of three phase induction motors and alternator.
CO-6	Able to analyze the operation of Half-wave and Full-wave rectifiers.
CO-7	Able to explain the operation of single stage CE amplifier.
Course Code:B16 ENG2201	
Course Title: ENVIRONMENTALSTUDIES	
CO-1	Get awareness among the students about the nature and natural ecosystems.
CO-2	Learn sustainable utilization of natural resources like water, land, minerals, air.
CO-3	Learnresourcepollutionandoverexploitationofland,water,airandcatastrophic(events)impactsofclimatec hange,globalwarming,ozonelayerdepletion,marine,radioactive pollution etc to inculcate the students about environmental awareness and safe transfer of our mother earth and its natural resources to the



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	next generation.
CO-4	Safe guard against industrial accidents particularly nuclear accidents.
CO-5	Learn Constitutional provisions for the protection of natural resources.
Course Code: B16 ME 2205	
Course Title: MANUFACTURINGPROCESSLAB	
CO-1	Student will be able to prepare moulds for a given component.
CO-2	Student will be able to apply the knowledge of arc welding to join two metal pieces.
CO-3	Student will be able to practice plain turning, facing, step turning, taper turning, and thread cutting operations on the lathe machine.
CO-4	Student will be able to generate horizontal, vertical and angular surfaces on a given work piece using shaper.
CO-5	Student will be able to generates pur gear on milling machine.
CO-6	Student will be able to demonstrate Capstan and Turret lathe, cylindrical grinder and surface grinding machine.
Course Code: B16 EE 2206	
Course Title: BASICELECTRICALLAND ELECTRONICSENGINEERINGLAB	
CO-1	Distinguish various machining operations on Lathe, Shaper and Milling.
CO-2	Analyze the shear angle, tool tip temperature and surface roughness by applying the knowledge of metal cutting.
Course Code: B16 ME 2206	
Course Title: INDUSTRYORIENTED TECHNOLOGY LAB	
CO-1	CATIA screen and various Toolbars and menus and Explain about Dimensioning and Hatching.
CO-2	Draw the 2D–drawings like knuckle joint, screw jack, flange coupling, lathe tool post, eccentric etc.,
CO-3	Explain about 3D solids and solids toolbar options and Drawing of 3D–components like bolt & nut, screw jack.
CO-4	Renderingof3Dimages

Course Outcomes for Third Year First Semester Course

Course Code: B16 ME 3101	
Course Title: OPERATIONS RESEARCH	
CO-1	Find the best use of an organization's resources.
CO-2	Design an optimum distribution schedule of products from different sources to different destinations.
CO-3	Allocate various resources to various activities on a one to one basis.
CO-4	Assign a right job to a right person using job sequencing.
CO-5	Design optimum schedules for projects.
CO-6	Make right decisions and strategies in operations management using game theory and queuing theory.
CO-7	Define optimum inventory policies suitable to a given situation.
Course Code: B16 ME 3102	
Course Title: FLUIDMECHANICS	
CO-1	Apply the Bernoulli equation to solve problems in fluid mechanics.
CO-2	Apply the concepts of momentum equation for finding the forces acting on the vanes of the turbines.
CO-3	Apply control volume analysis to problems in fluid mechanics.
CO-4	Apply potential flow theory to solve problems in fluid mechanics.
CO-5	Identifytherecentdevelopmentsinfluidmechanics,withapplicationtoaerospace systems
Course Code: B16 ME 3103	
Course Title: ICENGINES &GASTURBINES	
CO-1	Apply the knowledge of gas power cycles adequately and can calculate their efficiencies.
CO-2	Explain the processes involved in combustion in S.I Engines.
CO-3	Explain the processes involved in combustion in C.I Engines.
CO-4	Apply the knowledge of reciprocating compressors in engineering applications.
CO-5	Calculate the performance of rotary compressors in various engineering applications.
CO-6	Compute and develop various methods to improve the efficiency of gas turbine power plants, and can explain jet propulsions.
Course Code: B16 ME 3104	
Course Title: INDUSTRIALMEASUREMENTS & METROLOGY	
CO-1	Identify the uncertainties in dimensional metrology and the define the measurement standards;
CO-2	Describe the fundamentals of dimensional and geometrical tolerances;
CO-3	Measure length and angles using line-graduated instruments, i.e. vernier calipers, micrometers, bevel protractor, sine bar and surface plates;
CO-4	Use comparative length-measuring instruments, i.e. dial indicator, to measure variations in the distance between two or more surfaces;
CO-5	Use effective methods of measuring straightness, flatness, roundness, profile, screw threads and gear



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	teeth;
CO-6	Measure dimensions of shafts, bearings and linear surfaces in metric and imperial units using calipers, micrometers, and scales;
CO-7	Use contour projector and coordinate measuring machines to record measurements of complex profiles with high sensitivity;
CO-8	Use gage blocks, fixed gages, pneumatic gage blocks to measure various work pieces;
CO-9	Explain the effect of environmental conditions on the accuracy of measurements;
CO-10	Demonstrate the correct methods for adjustment and calibration of various measuring instruments;
CO-11	Use appropriate method for determination of accuracy based on product function and manufacturing capability.
Course Code: B16 ME 3105	
Course Title: KINEMATICS OF MACHINES	
CO-1	Understand the basic principles of mechanisms in mechanical engineering applications.
CO-2	Apply kinematic and dynamic analysis of various machine components
CO-3	Understand the turning moment diagrams and flywheel in various applications
CO-4	Understand the importance of governors, bearings, clutches and their applications
CO-5	Analyze the effect of inertia in mechanism and inertia torque
Course Code: B16 ME 3106	
Course Title: FINITE ELEMENT ANALYSIS	
CO-1	Understand the principles and concepts related to finite element methods.
CO-2	Implement finite element methods for simple analysis of 1-D problems such as bar, truss and beam either by hand calculation or by programming.
CO-3	Numerically solve for deformation, stresses and strains of a structural component subjected to axial and bending loads.
CO-4	Use commercial software package to perform structural analysis and are able to conduct engineering design.
Course Code: B16 ME 3107	
Course Title: AUTOMATION IN MANUFACTURING	
CO-1	Understand the basic principles of automation and its components which are implemented in production systems.
CO-2	Identify the importance of material handling and various automatic identification methods used in production systems.
CO-3	Understand the components of manufacturing systems and different production lines.
CO-4	Understand cellular manufacturing, forming part families, group technology and their involvement in flexible manufacturing systems.
CO-5	Understand various automated inspection methodologies and manufacturing support systems like CAPP, shop floor control, etc.
Course Code: B16 ME 3108	
Course Title: TOOL DESIGN	
CO-1	Designing Injection Moulding Dies and Die Casting Dies, Jigs & Fixtures
CO-2	Design jigs and fixtures for conventional and NC machining.
CO-3	Select and design progressive, compound or combination dies for press working operations.
CO-4	Can apply knowledge of designing Limit gauges and the use of gauge materials.
Course Code: B16 ME 3109	
Course Title: NONCONVENTIONAL ENERGY RESOURCES	
CO-1	Analyze the significance of renewable energy.
CO-2	Understand the principles of solar radiation and design the solar collectors.
CO-3	Know the functioning of basic components of wind energy and understand the utilization of biomass in power generation.
CO-4	Understand the working principles of geothermal, ocean, tidal and wave energy techniques.
CO-5	Know the functioning of direct energy conversion techniques.
Course Code: B16 ME 3110	
Course Title: PRODUCTION PLANNING AND CONTROL	
CO-1	Student is able to participate and can interact in real world scenario regarding production planning and production control and suggest the type of production required for specific real world requirement
CO-2	Student can undertake the responsibility of doing forecasting in real world situation is able to suggest correct forecasting method/technique for a specific real world situation and can also able to judge the suitability of the method for a real world situation depending on the error associated with the method.
CO-3	Student can understand the need of inventory control and can able to undertake activities relating to inventory management



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CO-4	The student is knowledge able about MRP-I & II, Aggregate planning can able to implement them in real world situation.
CO-5	Student can understand and participate in the design of both forward and backward scheduling and Master scheduling and can able to evaluate different job shop schedules with reference to priority scheduling rules.
Course Code: B16 ME 3111	
Course Title: RAPIDPROTOTYPING	
CO-1	Assess the need of RPT in Product development.
CO-2	Judge the correct RP Process for Product/ Prototype development.
CO-3	Predict the technical challenges in 3D printing.
CO-4	List the applications of RPT
Course Code: B16 ME 3112	
Course Title: INDUSTRIAL METROLOGY &MECHATRONICSLAB	
CO-1	Students will be able to understand the various logics involved in controlling mechanical industry equipment.
CO-2	The student will be able to operate measurement instruments on their own and test different components for their dimensional accuracy.
CO-3	A project involving writing ladder logic for controlling a mechanical device, executing the program is required from each student and graded by the instructor, so that the student will be able to understand the Mechatronics concept, practically and from the application point of view
Course Code: B16 ME 3113	
Course Title: IC ENGINES LAB	
CO-1	Students would appreciate the fundamentals of thermo dynamics being extended to real time applications
CO-2	Students might come out with innovative ideas which may be extended in the form of projects
Course Code: B16ENG3102	
Course Title: VERBAL & QUANTITATIVEAPTITUDE-I	
CO-1	Detect grammatical errors in the text/sentences and rectify them while answering their competitive/ company specific tests and frame grammatically correct sentences while writing.
CO-2	Answer questions on synonyms, antonyms and other vocabulary based exercises while attempting CAT, GRE,GATE and other related tests.
CO-3	Use their logical thinking ability and solve questions related to analogy, syllogisms and other reasoning based exercises.
CO-4	Choose the appropriate word/s/phrases suitable to the given context in order to make the sentence/ paragraph coherent.
CO-5	Apply soft skills in the work place and build better personal and professional relationships making informed decisions.

Course Outcomes for Third Year Second Semester Course	
Course Code: B16 ME 3201	
Course Title: INDUSTRIAL ENGINEERING AND MANAGEMENT	
CO-1	Students will be able to apply management theories in organization
CO-2	They will know personal management techniques to motivate the workers.
CO-3	They are able to settle the industrial disputes in organization.
CO-4	They are also acquire full knowledge on production planning and control procedures.
CO-5	They understand the economics of plant layout.
CO-6	Students are aware of materials handling principles and equipment.
CO-7	They will be able to apply maintenance practices.
CO-8	They will have knowledge of materials management
CO-9	They will be able to improve the productivity by applying work study procedures and quality concepts
Course Code: B16 ME 3202	
Course Title: FLUIDMACHINERY &SYSTEMS	
CO-1	Apply the Bernoulli equation to solve problems in fluid mechanics.
CO-2	Apply the concepts of momentum equation for finding the forces acting on the vanes of the turbines.
CO-3	Apply control volume analysis to problems in fluid mechanics.
CO-4	Apply potential flow theory to solve problems in fluid mechanics.
CO-5	Identify the recent developments in fluid mechanics, with application to aerospace systems.
CO-6	To impart the knowledge of various types of turbines and the performance of hydraulic turbines and pumps
Course Code: B16 ME 3203	
Course Title: DESIGNOFMACHINEELEMENTS	



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CO-1	Identify the need for design process and enumerate different design models.
CO-2	Design the machine elements subjected to static and fatigue loading.
CO-3	Determine the dimensions of shafts and keys subjected to different types of loadings.
CO-4	Design and Analyze bolted, riveted and welded joints subjected to different types of loadings.
CO-5	Classify Design and Analyze the Helical, torsion and Leaf springs for the given loading.
CO-6	Design of various types of joints and couplings subjected to different types of loadings
Course Code: B16 ME 3204	
Course Title: REFRIGERATION AND AIR CONDITIONING	
CO-1	Explain necessary, applications of refrigeration, ideal cycle and also aircraft refrigeration system.
CO-2	Demonstrate the working principle of vapor compression refrigeration system and its performance parameters.
CO-3	Describe working principle of vapor absorption refrigeration system.
CO-4	Describe working principle of steam jet refrigeration system.
CO-5	Demonstrate different psychrometric properties in air conditioning and requirements of comfort air conditioning.
CO-6	Explain cooling and heating loads in air conditioning and describe the various components of air conditioning system
Course Code: B16 ME 3205	
Course Title: DYNAMICS OF MACHINES	
CO-1	Perform balancing of rotating and reciprocating masses
CO-2	Understand the importance of toothed gears, gear trains and their practice application.
CO-3	Calculate gyroscopic couple on various vehicles.
CO-4	Analyze free and forced vibrations of machines, engines and structure.
CO-5	Design cam and follower for specific motion profile
Course Code: B16 ME 3206	
Course Title: CONTROL SYSTEMS	
CO-1	Develop mathematical models for physical systems using the knowledge of fundamental principles of mathematics and control systems.
CO-2	Apply the knowledge of various controlling techniques to develop suitable controller to meet specific requirements.
CO-3	Describe and determine the various time and frequency domain specifications.
CO-4	Select appropriate stability techniques to determine performance characteristics of physical systems
Course Code B16 ME 3207	
Course Title: OPTIMIZATION TECHNIQUES	
CO-1	Have a basic understanding of conventional, unconventional optimization algorithms and concepts of reliability.
CO-2	Formulate engineering design problems as mathematical optimization problems and solve them by using suitable optimization technique(s).
CO-3	Use mathematical software for the solution of engineering problems.
CO-4	Several home work assignments delving on core concepts and reinforcing analytical skills learned in class.
Course Code: B16 ME 3208	
Course Title: AUTOMOBILE ENGINEERING	
CO-1	Students are familiar with the basic knowledge of automotive vehicles, and various modes of vehicle driving, including the safety aspects.
CO-2	Students can understand the affects of automotive exhaust emissions on the environment and the health of human beings. And also the techniques of exhaust emission control/reduction techniques used in modern vehicles.
CO-3	Students are able to understand the principle of electronic fuel injection and spark ignition.
CO-4	Students are familiar with the various design aspects of chassis and power transmission components, including the design of wheels and tires.
CO-5	Students are exposed to different maintenance procedures of automotive vehicles and the safety aspects while driving, including traffic regulations.
Course Code: B16 ME 3209	
Course Title: SUPPLY CHAIN MANAGEMENT	
CO-1	Provide students with the requisite knowledge and skills to design and manage Supply chain. Analyze and improve the supply chain performance.
CO-2	Align appropriate supply chain strategies with product characteristics.
CO-3	To engage students in case studies based on real world logistics and supply chain decisions
CO-4	Acquaint the student with various Supply Chain Strategies; the differences between efficient and responsive supply chains and the correct strategies to use based on product type and location in the product lifecycle.



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CO-5	Causes of Bull whip Effect by playing a version of the well known "Beer Game" simulation
CO-6	The student will be able to explore three fundamental design concepts: component commonality, modularities. Integral design, and universality, and a cost/benefit framework
CO-7	Learn process improvements such as postponement, mass customization, resequencing production operations, and shifting the push-pull point; these design changes can significantly improve the performance of your supply chain.
CO-8	Understand the importance of technology in supply chain optimization
Course Code: B16 ME 3210	
Course Title: NANOTECHNOLOGY	
CO-1	Identify the essential concepts used in nano technology.
CO-2	Identify the materials, properties, synthetic and fabrication techniques, characterization techniques and applications in various fields.
Course Code: B16 ME 3211	
Course Title: COMPUTATIONALFLUIDDYNAMICS	
CO-1	After undergoing the course the student shall be able to apply various numerical tools like finite volume, finite difference etc for solving the different fluid flow problems.
Course Code: B16 ME 3212	
Course Title: INDUSTRIAL ENGINEERING LAB	
CO-1	Students will be able to find the quality of the product using different charts.
CO-2	Can improve the method of doing work by applying principle of motion economy and method study charts.
CO-3	Can find the standard time required for completing a job by different methods.
CO-4	Understands the basic probability distributions.
CO-5	Understands the impact of work on the human body and also the physiological constraints of the body
Course Code: B16 ME 3213	
Course Title: FLUID MECHANICS AND MACHINERY LAB	
CO-1	The student gets complete knowledge on fluid mechanics, hydraulic turbines and pumps.
CO-2	The student learns the complete calculation procedures for designing hydraulic turbines, and pumps.
CO-3	The student is prepared to work in industry immediately after this course.
Course Code: B16ENG3202	
Course Title: VERBAL & QUANTITATIVE APTITUDE- II	
Part-A: Verbal and Soft Skills-II	
CO-1	Construct coherent, cohesive and unambiguous verbal expressions in both oral and written discourses.
CO-2	Analyze the given data/text and find out the correct responses to the questions asked based on the reading exercises; identify relationships or patterns within groups of words or sentences
CO-3	Write paragraphs on a particular topic, essays (issues and arguments), e mails, summaries of group discussions, reports, make notes, statement of purpose(for admission into foreign universities), letters of recommendation(for professional and educational purposes).
CO-4	Converse with ease during interactive sessions/seminars in their classrooms, compete in literary activities like elocution, debates etc., raise doubts in class, participate in JAM sessions/versant tests with confidence and convey oral information in a professional manner.
CO-5	Participate in group discussions/group activities, exhibit team spirit, use language effectively according to the situation, respond to their interviewer/employer with a positive mind, tailor make answers to the questions asked during their technical/personal interviews, exhibit skills required for the different kinds of interviews (stress, technical, HR) that they would face during the course of their recruitment process
Part-B:QuantitativeAptitude-II	
CO-1	The students will be able to perform well in calculating different types of data interpretation problems.
CO-2	The students will perform efficaciously on analytical and logical problems using various methods.
CO-3	Students will find the angle measurements of clock problems with the knowledge of calendars and clock.
CO-4	The students will skillfully solve the puzzle problems like arrangement of different positions.
CO-5	The students will become good at solving the problems of lines, triangulars, volume of cone, cylinder and so on.
Course Code: B16 ME 3214	
Course Title: MINI PROJECT	
CO-1	Demonstrate a sound technical knowledge of their selected project topic.
CO-2	Under take problem identification, formulation and solution.
CO-3	Design engineering solutions to complex problems utilizing a systems approach.
CO-4	Conduct an engineering project.



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CO-5	Communicate with engineers and the community at large in written and oral forms.
CO-6	Demonstrate the knowledge, skills and attitudes of a professional engineer
Course Code: B16 ENG 3203	
Course Title: BASIC CODING	
CO-1	Know about Control Structures, Loop Structures and branching in programming.
CO-2	Know about various searching and sorting methods.
CO-3	Know about Functions, Recursions and Storage Classes.
CO-4	Know about Structures and Unions.
CO-5	Know different Operating System concepts.
CO-6	Differentiate OSI Model Vs. TCP/IP suite

Course Outcomes for Fourth Year First Semester Course	
Course Code: B16 ME 4101	
Course Title: COMPUTER AIDED DESIGN	
CO-1	Analyze and use engineering computer graphics and geometric modeling techniques for mechanical engineering applications.
CO-2	Able to understand and apply theories, methods and procedures for complex-shapes part design.
CO-3	Apply advanced modeling and computational tools for complex part and shape design and analysis.
CO-4	Select and use various engineering design procedures for mechanical design problems involving complex shapes.
CO-5	Execute professional engineering CAD projects for mechanical engineering applications in the current industrial practice.
Course Code: B16 ME 4102	
Course Title: MACHINE DESIGN	
CO-1	Classify different types of gears and apply the design concepts to evaluate the strength of gears.
CO-2	Design various parts of IC Engines such as cylinders, pistons and connecting rods.
CO-3	Apply the design concepts to determine the various parameters of clutches.
CO-4	Apply the design concepts to determine the torque and dimensions related to brakes.
CO-5	Design the sliding and roller contact bearings under various environmental and service Conditions.
CO-6	Classify and Analyze different types of stresses induced in wire ropes and chain drives.
Course Code: B16 ME 4103	
Course Title: HEAT AND MASS TRANSFER	
CO-1	Understand the basic laws of heat transfer.
CO-2	Apply principles of heat and mass transfer to basic engineering systems.
CO-3	Will be able to do basic calculations involving heat and mass transfer as is typical for a mechanical engineer. This includes conduction, convection and radiation heat transfer as well as heat exchanger design.
CO-4	Calculate fluid temperatures, mass flow rates, pressure drops, heat exchange and effectiveness during parallel, counter and cross flow in simple and baffled-shell and tube type heat exchangers, condensers, evaporators, etc.
Course Code: B16 ME 4104	
Course Title: MECHANICAL VIBRATIONS	
CO-1	Develop a mathematical model for a physical system and derive the governing differential equations.
CO-2	Determine the natural frequencies of single and two degrees of freedom systems without and with damping.
CO-3	Determine and analyze the response of machine members or structures in forced vibration with different excitation frequencies.
CO-4	Apply the techniques of vibration isolation to minimize the transmission of vibrating forces.
CO-5	Determine the natural frequencies and mode shapes of bar in longitudinal and torsion and beam in bending.
Course Code: B16 ME 4105	
Course Title: PROJECT MANAGEMENT	
CO-1	Understand that PM skills are critical to most careers and they can be applied at most businesses and professions.
CO-2	Acquire thorough knowledge on various analytical tools required during different stages of project life cycle.
CO-3	They will be able to apply various tools and techniques for planning and scheduling the projects.
CO-4	Learn how to be pro active to the risks and be able to manage them that occur during the progressive stages of the projects.



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CO-5	Acquire thorough knowledge on cost accounting systems and key performance indicators.
CO-6	Learn all possible practical situations that lead to different changes during the course of project execution and the problems related to controlling the changes.
CO-7	Possess full knowledge on how to evaluate the projects, terminate the projects and finally how to close the contract.
CO-8	Finally, students will acquire all the key skills to become effective project managers across various industries.
Course Code: B16ME4106	
Course Title: NON-DESTRUCTIVETESTING	
CO-1	Classify various non-destructive testing.
CO-2	Check different metals and alloys by visual inspection method.
CO-3	Explain and perform non-destructive tests like: Liquid penetrant test, Magnetic particle test, Ultrasonic test, X-ray and Gamma ray radiography, Leak Test, Eddy current test.
CO-4	Identify defects by using relevant NDT methods
Course Code: B16ME4107	
Course Title: POWERPLANTENGINEERING	
CO-1	Principle of operation and performance of steam power plant along with their economics and their impact on environment.
CO-2	Principle of operation and performance of internal combustion and gas turbine power plants along with their economics and their impact on environment.
CO-3	Principle of operation and performance of hydro electric power plant along with their economics and their impact on environment.
CO-4	Principle of operation and performance of nuclear power plant along with their economics and their impact on environment.
Course Code: B16ME4108	
Course Title: MECHATRONICS	
CO-1	Model and analyze electrical and mechanical systems and their inter connection.
CO-2	Integrate mechanical, electronics, control and computer engineering in the design of mechatronics systems.
CO-3	Do the complete design building, interfacing and actuation of a mechatronic system for a set of specifications.
Course Code: B16ME4109	
Course Title: DESIGNFORMANUFACTURING	
CO-1	Select the design principle, suitable material, mechanism, fit and tolerance for designing a product/component.
CO-2	Select the appropriate material, proper working principle and a feasible design.
CO-3	Design (optimum) a component which requires less material removal, easy to machine, assemble, access and cost effective.
CO-4	Redesign the uneconomical casting design and know the applications of DFMA.
CO-5	Incorporate the Environmental Objectives, issues and guidelines into the design.
Course Code: B16ME4110	
Course Title: HEATTRANSFERLAB	
CO-1	Understand the basic laws of heat transfer, account for the consequence of heat transfer in thermal analyses of engineering systems.
CO-2	Will be able to apply their knowledge of Dimensional Analysis to forced and free convection.
CO-3	Analyze heat exchanger performance by using the method of log mean temperature difference, heat exchanger, effectiveness.
CO-4	Calculate radiation heat transfer between black body surfaces and gray body surfaces.
CO-5	Demonstrate and explain mechanism of boiling and condensation.

Course Outcomes for Fourth Year Second Semester Course	
Course Code: B16ME4201	
Course Title: COMPUTERAIDED MANUFACTURING	
CO-1	After completion of the course students can
CO-2	Handle various NC machines,
CO-3	Write G.T codes for any complex component, a
CO-4	Apply techniques on various old machines and converted into retrofitted,
CO-5	Gain knowledge on various types of robots, AGV'S, Automated conveyors systems, FMS centers
Course Code: B16ME4202	
Course Title: QUALITYCONTROLANDASSURANCE	
CO-1	Stewart's normal bowl, control charts for variables, X, Rand sigma control charts.

CO-2	Control charts for attributes, p-chart, standardized p –chart, np-chart, c-chart, u-chart, demerit control chart.
CO-3	Type-I and Type-II errors, Process capability analysis.
CO-4	Sampling plans: single, double, multiple and sequential sampling plans, rectifying inspection, AOQ, AOQL, and ATI. Use of Dodge Romig Tables, Design of single and sequential sampling plans.
Course Code: B16ME4203	
Course Title: CAD/CAMLAB	
CO-1	Students will be able to know to produce the industrial drawings by using CAD/CAM software's.
CO-2	After successful completion of this laboratory student can do the job in CAD/CAM industry as a design engineer.
Course Code: B16ME4204	
Course Title: PROJECTPHASE-II	
CO-1	Identify a current problem through literature/ field/ case studies and define the back ground objectives and methodology for solving the same.
CO-2	Analyze, design and develop a technology/process.
CO-3	Implement and evaluate the technology at the laboratory level.
CO-4	Write report and present it effectively.