



MALLAREDDY ENGINEERING COLLEGE AND MANAGEMENT SCIENCES
 (Approved by AICTE New Delhi & Affiliated to JNTU Hyderabad)
 Kistapur Village, Medchal, Medchal District-501401

Department of Mechanical Engineering						
R16 - COURSE OUTCOMES						
Sr. No.	Class	Regulation	Subjects	Course code	Co's	Course Outcomes
1	II/I	R16	Mathematics - IV	MA301BS	Co-1	Analyze the complex functions with reference to their analyticity, integration using Cauchy's integral theorem
					Co-2	find the Taylor's and Laurent's series expansion of complex functions
					Co-3	the bilinear transformation
					Co-4	express any periodic function in term of sines and cosines
					Co-5	express a non-periodic function as integral representation
2	II/I	R16	Thermodynamics	ME304ES	Co-1	To understand and differentiate between different thermodynamic systems and processes.
					Co-2	To understand the thermodynamic cycles and evaluate performance parameters.
					Co-3	To analyze the thermodynamic cycles and evaluate performance parameters.
					Co-4	To understand the laws of Thermodynamics to different types of systems undergoing various processes and to perform thermodynamic analysis.
					Co-5	To apply the laws of Thermodynamics to different types of systems undergoing various processes and to perform thermodynamic analysis.
3	II/I	R16	Kinematics of Machinery	ME302ES	Co-1	Understand the various elements in mechanism and the inversions of commonly used mechanisms such as four bar, slider crank and double slider crank mechanisms.
					Co-2	Draw the velocity and acceleration polygons for a given configuration of a mechanism.
					Co-3	Understand the conditions for straight line motion mechanisms, steering mechanism and the usage of Hooke's joint.
					Co-4	Draw the displacement diagrams and cam profile diagram for followers executing different types of motions and various configurations of



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						followers.
					Co-5	Calculate the number of teeth and velocity ratio required for a given combination of gears.
4	II/I	R16	Metallurgy and Material Science	ME305ES	Co-1	An ability to apply knowledge of mathematics, science and engineering, to understand different materials and their properties.
					Co-2	An ability to design a system, component or process to meet desired needs within, realistic constraints such as economic , safety, manufacturability and sustainability etc., while selecting a material to manufacture the designed components.
					Co-3	An ability to identify the phases and their interrelationship in different alloy systems.
					Co-4	To understand the various heat treatment processes.
					Co-5	A recognition of the need for, and an ability to engage in lifelong learning with the concepts of composite, ceramic and nano materials for practical application
5	II/I	R16	Mechanics of Solids	ME303ES	Co-1	Students will be able to understand basic concepts of stress, strain and their relations based on linear elasticity. Material behaviors due to different types of loading will be discussed.
					Co-2	Students will be able to understand and know how to calculate stresses and deformation of a bar due to an axial loading under uniform and non-uniform conditions.
					Co-3	Students will understand how to develop shear-moment diagrams of a beam and find the maximum moment/shear and their locations
					Co-4	Students will understand how to calculate normal and shear stresses
					Co-5	Apply knowledge of materials and structural elements to the analysis of simple structures.
6	II/I	R16	Fuels and Lubricants Lab	ME306ES	Co-1	Determination of Flash and Fire points of Liquid Fuels / Lubricants: Pensky martens apparatus
					Co-2	Carbon Residue Test : Solid/ Liquid Fuels
					Co-3	Determination of Viscosity : Liquid Lubricants & Fuels : Saybolts viscometer, Redwood Viscometer, Engler Viscomete
					Co-4	Determination of Calorific Value: Solid/Liquid/Gaseous Fuels: Bomb



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						Calorimeter, Junker Calorimeter
					Co-5	Grease Penetration Tes
7	II/I	R16	Mechanics of Solids Lab	ME307ES	Co-1	Students will be able to understand basic concepts of stress, strain and their relations based on linear elasticity.
					Co-2	To study the material behaviors due to different types of loading
					Co-3	Students will be able to understand and know how to calculate stresses and deformation of a bar due to an axial loading under uniform and non-uniform conditions
					Co-4	Students will understand how to develop shear-moment diagrams of a beam and find the maximum moment/shear and their locations
					Co-5	Students will understand how to calculate normal and shear stresses on any crosssection of a beam. Different cross-sections (including I-beam) will be discussed and applied Continuous Assessment Test 10 marks Mid Semester Test 15 marks End
8	II/I	R16	Metallurgy and Material Science Lab	ME308ES	Co-1	The Primary focus of the Metallurgy science program is to provide undergraduates with a fundamental knowledge based associated materials properties, and their selection and application.
					Co-2	The Primary focus of the Material science program is to provide undergraduates with a fundamental knowledge based associated materials properties, and their selection and application.
					Co-3	Upon graduation, students would have acquired and developed the necessary background and skills for successful careers in the materials-related industries.
					Co-4	after completing the program, the student should be well prepared for management positions in industry.
					Co-5	after completing the program, the student should be well prepared for management positions in continued education toward a graduate degree.
9	II/I	R16	Gender Sensitization Lab	*MC300H S	Co-1	Students will have developed a better understanding of important issues related to gender in contemporary India
					Co-2	Students will be sensitized to basic dimensions of the biological,



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						sociological, psychological and legal aspects of gender. This will be Achieved through discussion of materials derived from research, facts, everyday life, literature and film.
					Co-3	Students will attain a finer grasp of how gender discrimination works in our society and how to counter it
					Co-4	Students will acquire insight into the gendered division of labour and its relation to politics and economics.
					Co-5	Men and women students and professionals will be better equipped to work and live together as equals.
10	II/II	R16	Dynamics of Machinery	ME403ES	Co-1	Analyze the effect of a gyroscope on ships, aeroplanes and automobile
					Co-2	Explain the inertia forces in the working of important machine elements like flywheels, connecting rod etc
					Co-3	Understand the types of brakes and the roll of friction
					Co-4	Understand the working of governors and estimate the unbalanced forces in a multi-cylinder reciprocating engine
					Co-5	Estimate the longitudinal, transverse and torsional vibrations so as to avoid resonance
11	II/II	R16	Fluid Mechanics and Hydraulic Machines	ME401ES	Co-1	Able to explain the effect of fluid properties on a flow system
					Co-2	Able to identify type of fluid flow patterns and describe continuity equation
					Co-3	To analyze a variety of practical fluid flow and measuring devices and utilize fluid Mechanics principles in design
					Co-4	To select and analyze an appropriate turbine with reference to given situation in power plants
					Co-5	To estimate performance parameters of a given Centrifugal and Reciprocating pump
12	II/II	R16	Machine Drawing	ME404ES	Co-1	Preparation of engineering and working drawings with dimensions and bill of material during design and development. Developing assembly drawings using part drawings of machine components
					Co-2	Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs, ribs
					Co-3	Types of sections – selection of section planes and drawing of sections and auxiliary sectional views. Parts not usually sectioned
					Co-4	Methods of dimensioning, general rules for sizes and placement of dimensions for holes, centers, curved and tapered features



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					Co-5	Title boxes, their size, location and details - common abbreviations and their liberal usage
13	II/II	R16	Manufacturing Process	ME405ES	Co-1	Understand the idea for selecting materials for patterns.
					Co-2	Understand the types and allowances of patterns used in casting and analyze the components of moulds.
					Co-3	To design core, core print and gating system in metal casting processes
					Co-4	Understand arc, gas, solid state and resistance welding processes.
					Co-5	To develop process-maps for metal forming processes using plasticity principles. Identify the effect of process variables to manufacture defect free products.
14	II/II	R16	Business Economic and Financial Analysis	SM405MS	Co-1	The students will understand the various forms of Business economic variables on the Business.
					Co-2	The students will understand the various forms of impact of economic variables on the Business.
					Co-3	Understand the demand, Supply, Production, Cost, Market Structure,
					Co-4	The student understand the Pricing aspects.
					Co-5	The Students can study the firm's financial position by analysing the Financial Statements of a Company.
15	II/II	R16	Kinematics and Dynamics Lab	ME406ES	Co-1	Understand types of motion
					Co-2	Analyze forces of components in linkages
					Co-3	Analyze torques of components in linkages
					Co-4	Understand static and dynamic balance
					Co-5	Understand forward and inverse kinematics of open-loop mechanisms
16	II/II	R16	Fluid Mechanics and Hydraulic Machines Lab	ME407ES	Co-1	Able to explain the effect of fluid properties on a flow system
					Co-2	Able to identify type of fluid flow patterns and describe continuity equation
					Co-3	To analyze a variety of practical fluid flow and measuring devices and utilize fluid mechanics principles in design
					Co-4	To select and analyze an appropriate turbine with reference to given situation in power plants
					Co-5	To estimate performance parameters of a given Centrifugal and Reciprocating



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						pump.
17	II/II	R16	Manufacturing Process Lab	ME408ES	Co-1	Understanding the properties of moulding sands and pattern making.
					Co-2	Evaluate the quality of welded joints.
					Co-3	Fabricate joints using gas welding and arc welding.
					Co-4	Understand the basic idea of press working tools.
					Co-5	Performs moulding studies on plastics
18	II/II	R16	Environmental Science and Technology	*MC400ES	Co-1	Define basic definitions and can explain complex relationship between Predators, Prey and the plant community.
					Co-2	Categorize resources in natural environment and its relationships with human activities as well as human impacts.
					Co-3	Demonstrate an awareness, knowledge and appreciation of the intrinsic values of ecological processes and communities.
					Co-4	Assess different scientific research strategies, including collection, management, evaluation and interpretation of environmental data and role of information technology in environment.
					Co-5	Examine the transnational character of environmental problems, protection acts and ways of addressing them, including interactions across local to global scales. Formulate an action plan for suitable alternatives that integrate science, humanist and social perspectives, for the remediation or restoration of degraded environment.
19	III/I	R16	Design of Machine Members - I	ME501PC	Co-1	The student acquires the knowledge about the principles of design, material selection, component behavior subjected to loads, and criteria of failure.
					Co-2	Understands the concepts of principal stresses, stress concentration in machine members and fatigue loading
					Co-3	Design on the basis of strength and rigidity and analyze the stresses and strains induced in a machine element.
					Co-4	To acquire knowledge on design of keys and cotters
					Co-5	To acquire knowledge on design of flange coupling and muff coupling
20	III/I	R16	Thermal Engineering-I	ME502PC	Co-1	the student should be able to evaluate the performance of IC engines and compressors under the given operating conditions.



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					Co-2	Apply the laws of Thermodynamics to evaluate the performance of Refrigeration and air-conditioning cycles.
					Co-3	Understand the functionality of the major components of the IC Engines and effects of operating conditions on their performance
					Co-4	To study the performance of gas turbines
					Co-5	To study the performance of jet engines
21	III/I	R16	Metrology & Machine Tools	ME503PC	Co-1	Identify techniques to minimize the errors in measurement
					Co-2	Identify methods and devices for measurement of length, angle, gear & thread parameters, surface roughness and geometric features of parts.
					Co-3	Understand working of lathe, shaper, planer, drilling, milling and grinding machines.
					Co-4	Comprehend speed and feed mechanisms of machine tools
					Co-5	Estimate machining times for machining operations on machine tools
22	III/I	R16	Fundamentals of Management	SM504MS	Co-1	The students understand the significance of Management in their Profession.
					Co-2	The various Management Functions like Planning, Organizing, Staffing, Leading, Motivation and Control aspects are learnt in this course.
					Co-3	The students can explore the Management Practices in their domain area.
					Co-4	The students acquire knowledge of basic principles of management.
					Co-5	Get the basic knowledge of project management.
23	III/I	R16	Thermal Engineering Lab	ME505PC	Co-1	Identify the various fuel characterizations through experimental testing
					Co-2	Analyze the performance characteristics of an internal combustion engines
					Co-3	Evaluate the performance parameters of refrigeration systems
					Co-4	Analyze the air compressor characteristics
					Co-5	To study the various models of boilers
24	III/I	R16	Machine Tools Lab	ME506PC	Co-1	Introduction of general purpose machines -Lathe, Drilling machine, Milling machine, Shaper
					Co-2	Planing machine, slotting machine, Cylindrical Grinder, surface grinder and tool and cutter grinder.



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					Co-3	Step turning, thread cutting, and taper turning on lathe machine
					Co-4	The student will get the basic knowledge of surface grinding
					Co-5	The student will get exposed to gear cutting and indexing on milling machine
25	III/I	R16	Engineering Metrology Lab	ME507PC	Co-1	Develop quality standards of engineering products in industries
					Co-2	Demonstrate work in quality control departments of industries and to ensure quality of products.
					Co-3	Analyze the measurement of the surface roughness and perform alignment tests
					Co-4	Develop the ability to apply the principles in instruments and measuring techniques
					Co-5	Demonstrate work in designing the instrumentation for a particular purpose and special purpose devices
26	III/I	R16	Professional Ethics	*MC500HS	Co-1	The students will understand the importance of Values and Ethics in their personal lives and professional careers.
					Co-2	The students will learn the rights and responsibilities as an employee, team member and a global citizen.
					Co-3	Excelling in competitive and challenging environment to contribute to industrial growth.
					Co-4	Professional Ethical values and contemporary issues
					Co-5	Acquiring knowledge of various roles of Engineer In applying ethical principles at various professional levels
27	III/I	R16	Finite Element Methods	ME611PE	Co-1	Basics of Finite Element Analysis
					Co-2	Available material models for structural materials, soils and interfaces/joints
					Co-3	Modeling of engineering systems and Soil–Structure Interaction (SSI)
					Co-4	Importance of interfaces and joints on the behavior of engineering systems.
					Co-5	Implementation of material model in finite element method and applications
28	III/I	R16	Refrigeration and Air Conditioning	ME612PE	Co-1	At the end of the course, the student should be able to Differentiate between different types of refrigeration systems with respect to application as well as conventional and unconventional refrigeration



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						systems. Thermodynamically analyse refrigeration and air conditioning systems and evaluate performance parameters. Apply the principles of Psychometrics to design the air conditioning loads for the industrial applications.
29	III/I	R16	Machine Tool Design	ME613PE	Co-1	Implement the tool design process when designing tooling for the manufacturing of a product.
					Co-2	Apply Geometric Tolerancing principles in the designs of tooling
					Co-3	Evaluate and select appropriate materials for tooling applications
					Co-4	Design, develop, and evaluate cutting tools and work holders for a manufactured product.
					Co-5	Design, develop, and evaluate appropriate gaging /gaging systems to define limits and specifications of a work piece during the manufacturing process.
30	III/I	R16	IC Engines and Gas Turbines	ME614PE	Co-1	Explain basic concepts of actual cycles with analysis and to describe the fundamental concepts of IC engines along with its working principles
					Co-2	Describe the combustion phenomenon in SI and CI engines
					Co-3	Evaluate the performance of IC engines and the importance of alternate fuels.
					Co-4	Classify the essential components of gas turbine along with its performance Improving methods
					Co-5	Illustrate the working principle of different types of Jet propulsive engines and Rockets.
31	III/II	R16	Thermal Engineering –II	ME601PC	Co-1	Develop state – space diagrams based on the schematic diagrams of process flow of steam and gas turbine plants
					Co-2	Apply the laws of Thermodynamics to analyze thermodynamic cycles
					Co-3	Differentiate between vapour power cycles and gas power cycles
					Co-4	Infer from property charts and tables and to apply the data for the evaluation of performance parameters of the steam and gas turbine plants
					Co-5	Understand the functionality of major components of steam and gas turbine plants and to do the analysis of these components



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32	III/II	R16	Design of Machine Members-II	ME602PC	Co-1	To gain knowledge about designing the commonly used important machine members such as bearings, engine parts, springs , belts, gears etc.
					Co-2	To design the components using the data available in design data books
33	III/II	R16	Heat Transfer	ME603PC	Co-1	Understand the basic modes of heat transfer
					Co-2	Compute one dimensional steady state heat transfer with and without heat generation
					Co-3	Understand and analyze heat transfer through extended surfaces
					Co-4	Understand one dimensional transient conduction heat transfer
					Co-5	Understand concepts of continuity, momentum and energy equations
					Co-6	Interpret and analyze forced and free convective heat transfer
					Co-7	Understand the principles of boiling, condensation and radiation heat transfer
					Co-8	Design of heat exchangers using LMTD and NTU methods
34	III/II	R16	Heat Transfer Lab	ME604PC	Co-1	Perform steady state conduction experiments to estimate thermal conductivity of different materials
					Co-2	Perform transient heat conduction experiment
					Co-3	Estimate heat transfer coefficients in forced convection, free convection , condensation and correlate with theoretical values
					Co-4	Obtain variation of temperature along the length of the pin fin under forced and free convection
					Co-5	Perform radiation experiments: Determine surface emissivity of a test plate and Stefan- Boltzmann's constant and compare with theoretical value
35	III/II	R16	CADD and MATLAB	ME605PC	Co-1	Students should be able to apply computer methods for solving a wide range of engineering problems.
					Co-2	Students should be able to use computer engineering software to solve and present problem solutions in a technical format.
					Co-3	Students should be able to utilize computer skills to enhance learning and performance in other engineering and science courses.
					Co-4	And finally, students should be able to demonstrate professionalism in interactions with Colleagues, faculty, and staff.



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36	III/II	R16	Advanced English Communication Skills Lab	EN606HS	Co-1	Acquire vocabulary and use it contextually
					Co-2	Listen and speak effectively
					Co-3	Develop proficiency in academic reading and writing
					Co-4	Increase possibilities of job prospects
					Co-5	Communicate confidently in formal and informal contexts
37	IV/I	R16	CAD/CAM	ME701PC	Co-1	Understand geometric transformation techniques in CAD.
					Co-2	Develop mathematical models to represent curves and surfaces.
					Co-3	Model engineering components using solid modeling techniques.
					Co-4	Develop programs for CNC to manufacture industrial components.
					Co-5	To understand the application of computers in various aspects of Manufacturing viz., Design, Proper planning, Manufacturing cost, Layout & Material Handling system.
38	IV/I	R16	Instrumentation and Control System	ME702PC	Co-1	To identify various elements and their purpose in typical instruments, to identify various errors that would occur in instruments
					Co-2	Analysis of errors so as to determine correction factors for each instrument.
					Co-3	To understand static and dynamic characteristics of instrument and should be able to determine loading response time.
					Co-4	For given range of displacement should be able to specify transducer, its accurate and loading time of that transducer.
39	IV/I	R16	CAD/CAM Lab	ME703PC	Co-1	To be able to understand and handle design problems in a systematic manner.
					Co-2	To be able to apply CAD in real life applications.
					Co-3	To be understand the basic principles of different types of analysis.
40	IV/I	R16	Instrumentation and Control Systems Lab	ME704PC	Co-1	The student will be able to Characterize and calibrate measuring devices.
					Co-2	Identify and analyze errors in measurement.



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					Co-3	Analyze measured data using regression analysis.
					Co-4	Calibration of Pressure Gauges, temperature, LVDT, capacitive transducer, rotameter.
41		R16	Industry Oriented Mini Project	ME705PC	Co-1	Demonstrate a sound technical knowledge of their selected project topic
					Co-2	Design engineering solutions to complex problems utilizing a systems approach
					Co-3	Conduct an experiments in the engineering project and analysis the data results
					Co-4	Communicate with engineers and the community at large in written an oral form
					Co-5	Demonstrate the knowledge, skills and attitudes of a professional engineer
42	IV/I	R16	Seminar	ME706PC	Co-1	Establish motivation for any topic of interest and develop a thought process for technical presentation
					Co-2	Organize a detailed literature survey and build a document with respect to technical publications
					Co-3	Analysis and comprehension of proof-of-concept and related data
					Co-4	Effective presentation and improve soft skills
					Co-5	Make use of new and recent technology (e.g. Latex) for creating technical reports
43	IV/I	R16	AUTOMATION IN MANUFACTURING (PE – II)	ME712PE/ MT821PE	Co-1	Illustrate the basic concepts of automation in machine tools.
					Co-2	Analyze various automated flow lines, Explain assembly systems and line balancing methods
					Co-3	Describe the importance of automated material handling and storage systems.
					Co-4	Interpret the importance of adaptive control systems, automated inspection systems.
44	IV/I	R16	MEMS (PE – II)	ME713PE	Co-1	Students will be able to understand working principles of currently available micro sensors, actuators, and motors, valves, pumps, and



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					fluidics used in Microsystems.
					Co-2 Students will be able to apply scaling laws that are used extensively in the conceptual design of micro devices and systems. Students will be able to differentiate between the positive and negative consequences of scaling down certain physical quantities that are pertinent to Microsystems.
					Co-3 Students will be able to use materials for common micro components and devices.
					Co-4 Students will be able to choose a micromachining technique, such as bulk micromachining and surface micromachining for a specific MEMS fabrication process.
					Co-5 Students will be able to understand the basic principles and applications of micro-fabrication processes, such as photolithography, ion implantation, diffusion, oxidation, CVD, PVD, and etching.
45	IV/I	R16	POWER PLANT ENGINEERING (PE – III)	ME721PE	Co-1 Understand the concept of Rankine cycle.
					Co-2 Understand working of boilers including water tube, fire tube and high pressure boilers and determine efficiencies.
					Co-3 Analyze the flow of steam through nozzles
					Co-4 Evaluate the performance of condensers and steam turbines
					Co-5 Evaluate the performance of gas turbines
46	IV/I	R16	AUTOMOBILE ENGINEERING (PE – III)	MT701PC/ ME722PE	Co-1 Explain and compare the construction, working, feature, relative merits and application of different types of chassis, bodies, frames, clutches and brakes of automobile and use suitable diagram to support their description.
					Co-2 Explain construction, working and features of different elements of power transmission in automobile namely gear boxes, fluid coupling, hydraulic torque convertor, overdrive, front and rear wheel drive, propeller shaft, differential, power transmission through rear and front axle and automatic transmission system.
					Co-3 Explain the concept of steering geometry including camber/



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						caster, king pin inclination, toe in/ toe out, tyre threads and retreading, causes of tyre wear and tear, construction and features of different types of tyres, wheels, steering mechanism and suspension systems with neat sketches as required.
					Co-4	Explain the construction, features and working of automotive electrical and electronics system of an automobile and their different parts, namely battery, alternator, starter, ignition systems, electric wiring, head lamps and electric horn.
					Co-5	Explain the importance and working of automobile air conditioning system and different safety devices such as Night Vision System, Global Positioning System, Antilock Braking System, Air Bags and Belts with reference to automotive safety requirements.
47	IV/I	R16	RENEWABLE ENERGY SOURCES (PE – III)	ME723PE	Co-1	Understanding of renewable energy sources
					Co-2	Knowledge of working principle of various energy systems
					Co-3	Capability to carry out basic design of renewable energy systems
48	IV/I	R16	COMPUTATIONAL FLUID DYNAMICS (PE – IV)	ME731PE	Co-1	Differentiate between different types of Partial Differential Equations and to know and understand appropriate numerical techniques.
					Co-2	Solve the simple heat transfer and fluid flow problems using different numerical techniques, viz., FDM.
					Co-3	Understand and to appreciate the need for validation of numerical solution.
49	IV/I	R16	TURBO MACHINERY (PE – IV)	ME732PE	Co-1	Ability to design and calculate different parameters for turbo machines
					Co-2	Prerequisite to CFD and Industrial fluid power courses
					Co-3	Ability to formulate design criteria
					Co-4	Ability to understand thermodynamics and kinematics behind turbo machines
50	IV/I	R16	FLUID POWER SYSTEMS (PE – IV)	ME733PE	Co-1	Understand the Properties of fluids, Fluids for hydraulic systems governing laws
					Co-2	Distribution of fluid power, Design and analysis of typical hydraulic circuits
					Co-3	Know accessories used in fluid power system, Filtration systems



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					Co-4	Maintenance of system.
51	IV/I	R16	Engineering Tribology	ME731PE	Co-1	Understanding friction characteristics in journal bearings
					Co-2	Knowledge about different theories of lubrication to reduce friction and wear.
52	IV/I	R16	Computational Fluid Dynamics	ME732PE	Co-1	Differentiate between different types of Partial Differential Equations and to know and understand appropriate numerical techniques.
					Co-2	Solve the simple heat transfer and fluid flow problems using different numerical techniques, viz., FDM
					Co-3	Understand and to appreciate the need for validation of numerical solution.
53	IV/I	R16	Robotics	ME733PE	Co-1	Make the students acquainted with the theoretical aspects of Robotics
					Co-2	Enable the students to acquire practical experience in the field of Robotics through design projects and case studies.
					Co-3	Make the students to understand the importance of robots in various fields of engineering.
					Co-4	Expose the students to various robots and their operational details.
54	IV/I	R16	CNC Technology	ME734PE	Co-1	At the end course, one should be able to select tooling method, control mechanism and do part programming for a given product
55	IV/I	R16	Mechanical Vibrations	ME741 PE	Co-1	Understand the causes and effects of vibration in mechanical systems.
					Co-2	Develop schematic models for physical systems and formulate governing equations of motion.
					Co-3	Understand the role of damping, stiffness and inertia in mechanical systems Analyze rotating and reciprocating systems and compute critical speeds.
					Co-4	Analyze and design machine supporting structures, vibration isolators and absorbers.
56	IV/I	R16	Turbo Machines	ME742PE	Co-1	Ability to design and calculate different parameters for turbo machines
					Co-2	Prerequisite to CFD and Industrial fluid power courses



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					Co-3	Ability to formulate design criteria
					Co-4	Ability to understand thermodynamics and kinematics behind turbo machines
57	IV/I	R16	MEMS	ME743PE	Co-1	Integrate the knowledge of semiconductors and solid mechanics to fabricate MEMS devices
					Co-2	Understand the rudiments of Micro fabrication techniques.
					Co-3	identify and understand the various sensors and actuators'
					Co-4	different materials used for MEMS
					Co-5	applications of MEMS to disciplines beyond Electrical and Mechanical engineering
58	IV/I	R16	Additive Manufacturing Technology	ME744PE	Co-1	Describe various CAD issues for 3D printing and rapid prototyping and related operations for STL model manipulation.
					Co-2	Formulate and solve typical problems on reverse engineering for surface reconstruction from physical prototype models through digitizing and spline-based surface fitting
					Co-3	Formulate and solve typical problems on reverse engineering for surface reconstruction from digitized mesh models through topological modelling and subdivision surface fitting.
					Co-4	Explain and summarize the principles and key characteristics of additive manufacturing technologies and commonly used 3D printing and additive manufacturing systems
					Co-5	Explain and summarize typical rapid tooling processes for quick batch production of plastic and metal parts.
59	IV/I	R16	Automation in Manufacturing	ME851PE	Co-1	Illustrate the basic concepts of automation in machine tools.
					Co-2	Analyze various automated flow lines, Explain assembly systems and line balancing methods
					Co-3	Describe the importance of automated material handling and storage systems.
					Co-4	Interpret the importance of adaptive control systems, automated inspection systems.



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60	IV/I	R16	Fluid Power System	ME852PE	Co-1	Understand the Properties of fluids, Fluids for hydraulic systems,
					Co-2	Governing laws. distribution of fluid power, Design and analysis of typical hydraulic circuits
					Co-3	Know accessories used in fluid power system, Filtration systems and
					Co-4	Maintenance of system.
61	IV/I	R16	Renewable Energy Sources	ME853PE	Co-1	Understanding of renewable energy sources
					Co-2	Knowledge of working principle of various energy systems
					Co-3	Capability to carry out basic design of renewable energy systems
62	IV/I	R16	Production Planning and Control	ME854PE	Co-1	Understand production systems and their characteristics. Evaluate MRP and JIT systems against traditional inventory control systems.
					Co-2	Understand basics of variability and its role in the performance of a production system. Analyze aggregate planning strategies.
					Co-3	Apply forecasting and scheduling techniques to production systems.
					Co-4	Understand theory of constraints for effective management of production systems
63	IV/I	R16	Automobile Engineering	ME861PE	Co-1	To acquire a core knowledge in physics, including the major premises of classical mechanics, quantum mechanics, electromagnetic theory, electronics, optics, Oscillation, Waves and Optics.
					Co-2	To design and conduct an experiment (or series of experiments) demonstrating their understanding of the scientific method and processes. Not only that they are expected to have an understanding of the analytical methods required to interpret and analyze results and draw conclusions as supported by their data
					Co-3	To Develop problem solving methods that will include mathematical as well as numerical computations and solutions.
					Co-4	To Build connections between mathematical development and



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						conceptual understanding.
64	IV/I	R16	Advanced Mechanics of Solids	ME862PE	Co-1	Determined the point of location of applied load to avoid twisting in thin sections used in aerospace applications.
					Co-2	Understand the concept of distinguish between neutral and centroidal axes in curved beams
					Co-3	Understanding the analogy models developed for analyzing the non circular bars subjected to torsion, and also analyzing the stresses developed between rolling bodies and stress in three dimensional bodies.
65	IV/I	R16	Unconventional Machining Processes	ME863PE	Co-1	To teach the modeling technique for machining processes
					Co-2	To teach interpretation of data for process selection
					Co-3	To teach the mechanics and thermal issues associated with chip formatio
					Co-4	To teach the effects of tool geometry on machining force components and surface finish
					Co-5	To teach the machining surface finish and material removal rate
66	IV/I	R16	Advanced Materials Technology	ME864PE	Co-1	To select appropriate advanced materials processes for a given product or component recognizing material, size, precision, and surface quality requirements.
					Co-2	To conduct theoretical and experimental analysis for advanced materials removal and laser processing technologies.
67	IV/II	R16	Major Project	ME801PC	Co-1	To be able to formulate a practical problem in real life to explore for its possible solution after suitable review of literature.
					Co-2	To be able to analyze the given problem and suggest suitable solution on the basis of background engineering knowledge.
					Co-3	To be able to synthesize the outcome of the problem and validate findings on the basis of experimentation.
					Co-4	To produce scientific content in the form of report writing as per the standard norms.
68	IV/II	R16	Finite	ME811PE	Co-1	At the end of the course, the student will be able to, Apply finite element method



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			Element Methods		Co-2	To solve problems in solid mechanics, fluid mechanics and heat transfer.
					Co-3	Formulate and solve problems in one dimensional structures including trusses, beams and frames.
					Co-4	Formulate FE characteristic equations for two dimensional elements and analyze plain stress, plain strain, axisymmetric and plate bending problems. ANSYS, ABAQUS, NASTRAN, etc.
69	IV/II	R16	Refrigeration and Air Conditioning	ME812PE	Co-1	The student should be able to Differentiate between different types of refrigeration systems with respect to application as well as conventional and unconventional refrigeration systems.
					Co-2	Thermodynamically analyse refrigeration and air conditioning systems and evaluate performance parameters. Apply the principles of Psychometrics to design the air conditioning loads for the industrial applications.
70	IV/II	R16	Machine Tool Design	MM813PE	Co-1	Implement the tool design process when designing tooling for the manufacturing of a product
					Co-2	Apply Geometric Tolerancing principles in the designs of tooling
					Co-3	Evaluate and select appropriate materials for tooling applications
					Co-4	Design, develop and evaluate cutting tools and work holders for a manufactured product.
					Co-5	Design, develop and evaluate appropriate Gauging systems to define limits and specifications of a work piece during the manufacturing process.
71	IV/II	R16	IC Engines and Gas Turbines	ME814PE	Co-1	Explain basic concepts of actual cycles with analysis and to describe the fundamental concepts of IC engines along with its working principles
					Co-2	Describe the combustion phenomenon in SI and CI engines
					Co-3	Evaluate the performance of IC engines and the importance of alternate fuels.
					Co-4	Classify the essential components of gas turbine along with its performance Improving methods
					Co-5	Illustrate the working principle of different types of Jet propulsive engines and Rockets.



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72	IV/II	R16	Composite materials	ME821PE	Co-1	Knowledge of the crystal structures of a wide range of ceramic materials and glasses.
					Co-2	Able to explain how common fibers are produced and how the properties of the fibers are related to the internal structure.
					Co-3	Able to select matrices for composite materials in different applications
					Co-4	Able to describe key processing methods for fabricating composites.
73	IV/II	R16	Industrial Management	ME822PE	Co-1	Able to apply principles of management
					Co-2	Able to design the organization structure
					Co-3	Able to apply techniques for plant location, design plant layout and value analysis
					Co-4	Able to carry out work study to find the best method for doing the work and establish standard time for a given method
					Co-5	Able to apply various quality control techniques and sampling plans
					Co-6	Able to do job evaluation and network analysis
74	IV/II	R16	Power Plant Engineering	ME823PE	Co-1	Understand the concept of Rankine cycle.
					Co-2	Understand working of boilers including water tube, fire tube and high pressure boilers and determine efficiencies.
					Co-3	Analyze the flow of steam through nozzles
					Co-4	Evaluate the performance of condensers and steam turbines
					Co-5	Evaluate the performance of gas turbines