

Department of Mechanical Engineering
Course Outcome (CO)

First Year -2012 Course			
Course Code	Course Name	Course Outcomes	
Semester I			
102006	Engineering Graphics I	C102006.1	Draw the fundamental engineering objects using basic rules and able to construct the simple geometries
		C102006.2	Construct the various engineering curves using the drawing instruments
		C102006.3	Apply the concept of orthographic projection of an object to draw several 2D views and its sectional views for visualizing the physical state of the object
		C102006.4	Apply the visualization skill to draw a simple isometric projection from given orthographic views precisely using drawing equipment
		C102006.5	Draw the development of lateral surfaces for cut section of geometrical solids
Semester II			
102013	Basic Mechanical Engineering	C102013.1	Able to understand shafts keys and basic mechanical elements functions
		C102013.2	Able to understand design fundamentals and mechanisms
		C102013.3	Able to understand different manufacturing processes
		C102013.4	Able to understand machine tools and uses
		C102013.5	Able to understand thermal engineering concept
		C102013.6	Able to understand power plants, power producing devices, power absorbing devices etc.



Second Year -2012 Course			
Course Code	Course Name	Course Outcomes	
Semester I			
207002	Engineering Mathematics-III	C201.1	Find General solution of higher-order linear differential equation with constant & Variable coefficient using different Methods
		C201.2	Find Laplace transform and Fourier transform of functions using definition & properties & solve Ordinary D.E. using L.T.
		C201.3	Discuss the different techniques of statistical Analysis, Use of probability and probability distribution
		C201.4	Identify nature of vector fields, use different vector differential operators.
		C201.5	Evaluate Line, surface & Volume integrals & its application.
		C201.6	Solve boundary value problems for Laplace's equation, heat equation, the wave equation by separation of variables.
202041	Manufacturing Process-I	C202.1	Understand & Analyze foundry practices like pattern making, mold making, core making & inspection of defects.
		C202.2	Understand & analyze the hot & cold working, rolling, forging, extrusion & drawing process.
		C202.3	Understand the different plastic molding processes, extrusion of plastic and thermoforming process
		C202.4	Understand the different welding & joining processes & its defects.
		C202.5	Understand, design & analyze the different sheet metal working processes.
202043	Thermodynamics	C203.1	Apply various laws of thermodynamics to various processes and real systems.
		C203.2	Apply the concept of entropy, Calculate heat and work transfer, entropy change for thermodynamic systems.
		C203.3	Analyze performance of various Thermodynamic gas power cycles and gas refrigeration cycle and availability in each case.
		C203.4	Estimate the condition of steam and performance of vapour power cycle and vapour compression cycle.
		C203.5	Estimate Stoichiometric air required for combustion, performance of steam generators and natural draught requirements in boiler plants.
		C203.6	To understand the chemistry of combustion and analysis of combustion products.

202044	Material Science	C204.1	Able to understand and apply the fundamentals of materials (structure, properties and processing), for selecting, developing new material and process for real world problems.
		C204.2	Analyze different types of crystal structure, crystal imperfections and its effect on material properties.
		C204.3	To understands and analyze mechanical properties using destructive and nondestructive material testing techniques.
		C204.4	To develop futuristic insight into Materials and their application in real world.
		C204.5	To recognize how metals can be strengthened by cold-working and hot working process and their applications
202045	Fluid Mechanics	C205.1	Determine various properties of fluid
		C205.2	Apply the laws of fluid statics and concepts of buoyancy
		C205.3	Identify types of fluid flow and terms associated in fluid kinematics
		C205.4	Apply principles of fluid dynamics to laminar flow
		C205.5	Estimate friction and minor losses in internal flows and Determine boundary layer formation over an external surface
		C205.6	Construct mathematical correlation considering dimensionless parameters, also ABLE to predict the performance of prototype using model laws
202016	Workshop Practice	C206.1	Understand & Analyze foundry practices like pattern making, mold making, core making & inspection of defects.
		C206.2	Apply the knowledge of different plastic molding and thermoforming process to manufacture the actual component.
		C206.3	Apply the knowledge of different welding & joining processes to join the two plates.
		C206.4	Understand, design & analyze the different sheet metal working processes.
202047	Soft Skills	C207.1	To analyse strength, weaknesses, opportunities and threats.
		C207.2	To learn communication, interaction and presentation of ideas.
		C207.3	To frame resumes and to understand corporate etiquettes.
		C207.4	To develop right attitudinal and behavioural change.
		C207.5	To learn working in team and to achieve team goals.
Semester II			
202048	Theory of Machines-I	C208.1	Identify mechanisms in real life applications
		C208.2	Perform kinematic analysis of simple mechanisms
		C208.3	Perform static and dynamic force analysis of slider crank mechanism
		C208.4	Determine moment of inertia of rigid bodies experimentally
		C208.5	Analyze velocity and acceleration of mechanisms by vector and graphical methods
202049	Engineering	C209.1	Able to describe how metals and alloys formed & how the

	Metallurgy		properties change due to microstructure
		C209.2	To select materials for design and construction.
		C209.3	Able to recognizes how metals can be strengthened by alloying, cold-working, and heat Treatment
		C209.4	apply core concepts in Engineering Metallurgy to solve engineering problems
202050	Applied Thermodynamics	C210.1	Classify various types of Engines, to compare Air standard, Fuel Air and Actual cycles also make out various losses in real cycles.
		C210.2	Understand theory of carburetion, types of carburetors, modern carburetor.
		C210.3	To understand the main theory behind Internal Combustion Engine along with the understanding of all the components and systems used in the automotive systems and carry out the performance and emission in IC Engines. To understand Stages of Combustion in S. I. Engines and Theory of Detonation, Pre-ignition and factors affecting detonation.
		C210.4	Understand Fuel Supply system, Types of Injectors and Injection Pumps, Stages of Combustion in CI Engines, Criteria for good combustion chamber and types.
		C210.5	Carry out testing of I. C. Engines and analyze its performance also various harmful gases Emitted from exhaust and different devices to control pollution and emission norms for pollution control.
		C210.6	Describe construction and working of various I. C. Engine systems (Cooling, Lubrication, ignition, Governing, and Starting) also various types of reciprocating and rotary compressors with performance calculations of positive displacement compressors.
202051	Strength of Material	C211.1	Determine various strength properties of Material
		C211.2	Apply the concept of stress and strain and understand various stress and strain
		C211.3	Identify various types of stress and terms associated in elastic constants.
		C211.4	Apply transverse force on beam and understand SFD, BMD, bending and shear stresses.
		C211.5	Estimate torsional stresses and Determine critical load on column.
		C211.6	Construct geometrical Mohr's circle to predict the Principal stresses and predict behaviour of material under complex load.
202052	Electrical and Electronics Engineering	C212.1	Understand and apply different types of DC Machines And Speed control Methods
		C212.2	Distinguish and Analyse between different types of 3 phase IM And Characteristics
		C212.3	Understand the working of different measuring devices and their application in real life.
		C212.4	Apply programming concept to understand role of Microprocessor and Microcontroller in embedded systems

		C212.5	Develop interfacing of different types of sensors and other motor devices with 8051 microcontroller.
202053	Machine Shop	C213.1	Utilize the Engineering knowledge to Perform welding using TIG/ MIG/ Resistance/Gas welding technique
		C213.2	Make Fibre-reinforced Composites by hand lay-up process or spray lay-up techniques
		C213.3	Take a part in Performing cylindrical/surface grinding operation and Evaluate its machining time
		C213.4	Determine number of indexing movements required and acquire skills to Produce a spur gear on a horizontal milling machine.
		C213.5	Elaborate industry visit report
		C213.6	Understand procedure of plastic processing



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College of Engineering Ahmednagar



DTE College Code: EN-5161

Third Year -2012 Course			
Course Code	Course Name	Course Outcomes	
Semester I			
302041	Design of Machine Element-1	C301.1	Students shall understand and apply the design steps, its considerations, and standards in designing of simple machine elements.
		C301.2	Ability to analyze the stress and strain of mechanical components and understand, identify and quantify failure modes for mechanical part.
		C301.3	Students shall understand and apply the geometric, dimensional tolerances and create the assembly and detailed drawing of different machine elements like cotter and knuckle joints, couplings, screw jacks and springs.
		C301.4	Enhancement in proficiency of CAD software for designing Mechanical systems and to generate production drawing.
		C301.5	Ability to design mechanical system for fluctuating loads.
302042	Heat Transfer	C302.1	Formulate basic equations of heat transfer and apply to heat transfer problems.
		C302.2	Apply heat transfer principles to design and evaluate performance of thermal systems.
		C302.3	Calculate the effectiveness and rating of heat exchangers.
		C302.4	Calculate heat transfer by radiation and apply between objects with simple geometries.
		C302.5	Calculate and evaluate the impact of boundary conditions on the solutions of heat transfer
		C302.6	Evaluate the contribution of different modes of heat transfer.
302043	Theory of Machine- II	C303.1	The students will understand the gear theory which will be the prerequisite for gear design.
		C303.2	The student will conversant with working principle of control mechanism.
		C303.3	The students to analyze speed and torque in Epicyclic gear trains, which will be the prerequisite for gear box design
		C303.4	The student will understand design of mechanism and cam profile.
		C303.5	The students will synthesize a four bar mechanism with analytical and graphical method
		C303.6	Student will analyze the Gyroscopic couple for stabilization of ship, Aeroplane and four wheeler vehicle and can select appropriate drive for given application.
302044	Metrology and Quality Control	C304.1	Understand the methods of measurement, selection of measuring instruments / standards of measurement, carryout data collection and its analysis.

		C304.2	An ability to design gauges to meet desired needs within realistic constraints.
		C304.3	An ability to metrology of threads, gears and advanced metrology and to perform experiments, as well as to analyse and interpret data.
		C304.4	Understand and use/apply Quality Control Techniques/ Statistical Tools appropriately.
		C304.5	Develop an ability of problem solving and decision making by identifying and analyzing the cause for variation and recommend suitable corrective actions for quality improvement.
302045	Hydraulics and Pneumatics	C305.1	Working principle of various components used for hydraulic & pneumatic systems.
		C305.2	Identify various components of hydraulic & pneumatic systems.
		C305.3	Ability to select appropriate components required for hydraulic and pneumatic systems.
		C305.4	Ability to design hydraulic and pneumatic system for industrial applications.
		C305.5	Ability to understand industrial applications of hydraulic and pneumatic system.
		C305.6	Troubleshooting of hydraulic & pneumatic circuits.
302046	Skill Development	C306.1	To understand & apply theoretical knowledge in practice.
		C306.2	To have knowledge of the different appropriate tools and tackles used in machine assembly shop.
		C306.3	To know & utilize practical aspect of the each component in the assembly of the machine
		C306.4	To learn & apply geometric dimensioning & tolerancing (GD &T) to mechanical components.
		C306.5	To develop the skills for holding, dismantling and assembly of mechanical systems.
		C306.6	To expose the students to leadership and team- building skills of shop floor activities with safe working practices and conducive environments.
Semester II			
302047	Numerical Methods and Optimization	C307.1	Evaluate the roots of equations and simultaneous equation by using numerical methods
		C307.2	Generate Solutions for real life problem using optimization techniques.
		C307.3	Solve & apply numerical differential, partial differential & Integration equations.
		C307.4	Apply least square and interpolation technique for analysis of engineering problems
		C307.5	Develop flowchart and impliment using suitable solver software
302048	Design of Machine	C308.1	Apply the knowledge and fundamental concept for designing a spur gear, helical gear, bevel gear and worm gear pair.

	Elements - II	C308.2	Select belt drive, wire ropes and chain drive from manufacturer's catalogue.
		C308.3	Ability to design and select different types of bearings from manufacturer's catalogue.
		C308.4	Design a gear box for practical applications.
		C308.5	Ability to design and analyze Mechanical transmission systems
302049	Turbo machines	C304.1	To Apply fluid mechanics and thermodynamics principles to turbo machines
		C304.2	To Design and calculate different parameters for turbo machines
		C304.3	Ability to formulate design criteria
		C304.4	To Predict performance of turbo machine using model analysis
		C304.5	Prerequisite to CFD and Industrial fluid power courses
302050	Mechatronics	C310.1	Understand principles of sensors /Actuators, its characteristics also its interfacing with DAQ microcontroller & apply this knowledge for different industrial application
		C310.2	Recognize key elements of Mechatronics system, representation into block diagram & Understand concept of transfer function, block diagram reduction and analysis
		C310.3	Understand the concept of PLC system and its ladder programming, and significance of PLC systems in industrial application
		C310.4	PID control implementation on real time systems
		C310.5	Development of PLC ladder programming and implementation of real life system
302051	Manufacturing Process II	C311.1	Student will able to apply the knowledge of various manufacturing processes.
		C311.2	To analyze the various process parameters and their effect on processes.
		C311.3	Student will able to understand the application of modern machining.
		C311.4	To learn and apply the knowledge of Jigs and Fixtures for variety of operations.
		C311.5	To create knowledge about the working and programming techniques for various machines and tools
302052	Machine Shop II	C312.1	Utilize the Engineering knowledge to Perform welding using TIG/MIG/ Resistance/Gas welding technique
		C312.2	Make Fibre-reinforced Composites by hand lay-up process or spray lay-up techniques
		C312.3	Take a part in Performing cylindrical/surface grinding operation and Evaluate its machining time
		C312.4	Determine number of indexing movements required and acquire skills to Produce a spur gear on a horizontal milling machine

		C312.5	Elaborate industry visit report
		C312.6	Understand procedure of plastic processing
302053	Seminar	C313.1	Identify topic of interest and develop a thought process for technical presentation.
		C313.2	Organize a detailed literature survey and build a document with respect to technical publications
		C313.3	Analysis and comprehension of proof-of-concept and related data.
		C313.4	Effective presentation and improve soft skills



Fourth Year -2012 Course			
Course Code	Course Name	Course Outcomes	
Semester I			
402041	Refrigeration and Air Conditioning	C401.1	Illustrate the fundamental principles and applications of refrigeration and air conditioning system
		C401.2	Obtain cooling capacity and coefficient of performance of vapour compression refrigeration systems
		C401.3	Understand the properties, applications and environmental issues of different refrigerants
		C401.4	Calculate cooling load for air conditioning systems used for various applications
		C401.5	Operate and analyze the refrigeration and air conditioning systems.
		C401.6	Understand, analyse and design of air distribution system
402042	CAD/CAM Automation	C402.1	Apply geometrical transformations, mapping and projections for editing and manipulation of basic geometric entities and verify using MATLAB
		C402.2	Illustrate the mathematical representation of curves and surfaces and methods of solid modeling.
		C402.3	Evaluate the performance of simple mechanical elements like beams, trusses, plates etc. using analytical method and FEA software tool
		C402.4	Develop CNC part program for turning and milling operations manually and using CAM software.
		C402.5	Demonstrate the understanding of various rapid Prototyping manufacturing techniques and apply it to produce suitable component
		C402.6	Understand the types of automation and robot system, group technology and their applications in manufacturing industries.
402043	Dynamics of Machinery	C403.1	Apply balancing techniques to solve the static and dynamic balancing problems of rotary system, single Cylinder engine and multi cylinder inline, radial and v engines.
		C403.2	Identify the type of vibration in the given system; formulate the equations to determine the natural frequencies and mode shapes of freely vibrating longitudinal and torsional vibration systems of single degree and two degrees of freedom.
		C403.3	Ability to calculate natural frequencies, Eigen values & Eigen vectors.
		C403.4	Evaluate effect of damping; determine the response of forced vibration due to harmonic excitation, excitation

			Due to unbalanced forces and base excitation.
		C403.5	Explain the noise concepts, methods of measurement of vibration and noise; Demonstrate the techniques for Vibration control and noise control of the industrial as well as day today life problems.
		C403.6	Solve the balancing problem of a wheel using computerized balancing machine; utilize the FFT vibration analyzer tool for measurement and analysis of vibration and noise.
402044 A	Energy Audit Management (Elective-I)	C404A.1	Understand the General Aspects of Energy Management
		C404A.2	Carry out Energy Audit of there residence / society / college where they are studying.
		C404A.3	Understand Energy Economics and Determination of cost of steam, natural gas, compressed air.
		C404A.4	Carry out electrical tariff calculation and accurately predict the electricity bill required for the installation.
		C404A.5	Suggest various methods to reduce energy consumption of the equipment / office / premises.
402044B	Tribology (Elective-I)	C404B.1	To understand the importance of tribology in industry.
		C404B.2	To create the mathematical model for friction and wear measurement.
		C404B.3	To apply the knowledge of different lubrication process in various industrial application.
		C404B.4	To evaluate the performance of different types of bearings and analysis thereof.
		C404B.5	To apply the principles of surface engineering for different applications of tribology
402045 C	Operation Research (Elective-II)	C405C.1	Formulate linear programming problems and understand their limitations.
		C405C.2	Solve complicated problems of management science using appropriate techniques and models, interpret the results obtained and translate solutions into directives for action
		C405C.3	Construct variety of problems such as assignment, transportation, travelling salesman etc. and solve these problems using linear programming approach
		C405C.4	Select appropriate model for queuing situations and replacement situations and find the optimal solutions using models for different situations
		C405C.5	Evaluate various situations of Games theory and Sequencing models and apply them to solve them in real life for decision making
		C405C.6	Plan optimum project schedule for network models arising from a wide range of applications.
402045 D	Advanced Manufacturing Processes (Elective-II)	C405D.1	To Classify and analyze special forming processes.
		C405D.2	Analyze and identify applicability of advanced joining processes.
		C405D.3	Understand and apply various additive manufacturing technology for product development.
		C405D.4	Understand material characterization techniques to

			analyze effects of chemical composition, composition variation, crystal structure, etc.
		C405D.5	Understand Measurement Techniques in Micro machining.
402046	Project- I	C406.1	Ability to identify the community that shall benefit through the solution to the identified engineering problem and also demonstrate concern for environment.
		C406.2	Ability to engage in independent study to research literature in the identified domain and to consolidate the literature search to identify and formulate the engineering problem.
		C406.3	Ability to engage in independent study to identify the mathematical concepts, science concepts, engineering concepts, management principles and select the engineering tools/components necessary for solving the identified engineering problem.
		C406.4	Ability to apply the identified concepts and engineering tools to arrive at design solution(s) for the identified engineering problem.
		C406.5	Ability to prepare the Gantt Chart for scheduling the project work and designate responsibility of every member in the team.
		C406.6	Ability to perform in the team, contribute to the team and mentor/lead the team.
		C406.7	Ability to engage in effective oral communication through presentation of the project stage-1 work, demonstration of the project concept, effective written communication through the project stage-1 report.
Semester II			
402047	Power Plant Engineering	C407.1	To analyze the steam condenser and recognize the environmental impacts of thermal power plant and methods to control pollution.
		C407.2	Ability to have adequacy with Design, erection and development of energy conversion plants.
		C407.3	To recognize the layout, component details of hydroelectric and Nuclear power plant.
		C407.4	To understand details of diesel & Gas power plant and able to prepare the layout and analyze gas and diesel power plant
		C407.5	To emphasis the fundamentals of non-conventional power plants.
		C407.6	Describe the different power plant instruments and able to do economics of power generation.
402048	Mechanical System Design	C408.1	To understand the difference between component level design and system level design.
		C408.2	To design various mechanical systems like pressure vessels, machine tool gear boxes, material handling systems, I.C. Engine Components for the specifications stated/ formulated.
		C408.3	To learn and apply the optimum design principles to

			mechanical components.
		C408.4	To handle system level projects from concept to product.
402049 B	Robotics (Elective - III)	C409B.1	Identify different type of robot configuration with relevant terminology.
		C409B.2	Select suitable sensors, actuators and drives for robotic systems stated/formulated.
		C409B.3	Select correct mechanism for operation of the robot.
		C409B.4	Understand the complete design procedure of the robot.
		C409B.5	Select appropriate robot programming for given application.
		C409B.6	Understand Artificial Intelligence and Image Processing technology in robotics.
402049 C	Industrial Engineering (Elective - III)	C409C.1	To apply the Industrial Engineering concept in the industrial environment.
		C409C.2	To manage and implement different concepts involved in methods study and understanding of work content in various situations.
		C409C.3	To describe different aspects of work system design and facilities design related to Manufacturing and service industries
		C409C.4	Identify various cost accounting and financial management practices widely applied in industries
		C409C.5	To undertake the project work based on modeling & simulation area
402050 B	Finite Element Analysis (Elective - IV)	C410B.1	Understand the concept of finite element method for solving machine design problems
		C410B.2	Formulate and solve manually problems in 1-D structural systems involving bars, trusses, beams.
		C410B.3	Develop 2-D finite element formulations involving triangular, quadrilateral elements and higher order elements.
		C410B.4	Apply the knowledge of FEM for stress analysis, modal analysis, heat transfer analysis.
		C410B.5	Develop algorithms and write finite element code for solving simple design problems and understand the use of commercial packages for complex problems.
402050 C	Design of Pumps, Blowers and Compressors (Elective - IV)	C410C.1	Understand the used of Pump, Blower, fan or compressor.
		C410C.2	Select suitable Pump, Blower, fan or compressor for a given application.
		C410C.3	Design and optimization of Pumps for given application.
		C410C.4	Design and optimization of Fans and Blowers with airfoil theory, vortex theory for given application.
		C410C.5	Design of Compressors based on enthalpy-entropy diagrams.
402051	Project- II	C411.1	Ability to transform the design solution(s) for the identified engineering problem into a full-scale model/prototype/virtual model using CAD tools by following manufacturing process sheets/CAD tool

			procedure for virtual model creation.
		C411.2	Ability to demonstrate compliance to the prescribed standards/ safety norms through implementation of the identified engineering problem.
		C411.3	Ability to analyze and interpret results of testing and validation of full-scale model/prototype/virtual model and to arrive at valid conclusions.
		C411.4	Ability to perform the budget analysis of the project through the utilization of resources (finance, power, area, bandwidth, weight, size, any other)
		C411.5	Ability to engage in effective oral communication through presentation of the project stage-II work, demonstration of the project full-scale model/prototype/virtual model, effective written communication through the project stage-II report, journal publication and the one-page poster presentation of the project work.
		C411.6	Ability to abide by the norms of professional ethics.

M.E. DESIGN ENGINEERING (2013 Pattern) Course Outcomes

Course Code	Course Name	Course Outcomes-on the completion of this course student will be able to	
SEMESTER - I			
507201	Advanced Mathematics	CO1	Develop knowledge of numerical methods applicable for mechanical engineering.
		CO2	Formulate and obtain the numerical solution of mechanical engineering problems.
		CO3	Able to compare different numerical schemes.
		CO4	Understand the algorithms of mechanical engineering related software packages.
502202	Material Science and Mechanical Behaviour of Materials	CO1	Summarize ductile and brittle type fractures using different theories.
		CO2	Integrate design considerations in mechanical behaviour of advanced materials.
		CO3	Review strengthening mechanisms of materials and selection of materials
502203	Advanced Stress Analysis	CO1	Solve the problems related to the theory of elasticity.
		CO2	Analyse two dimensional problems in rectangular as well as polar co-ordinates.
		CO3	Find shear centre for various cross section.
		CO4	Determine membrane stresses in shell and storage vessel.
		CO5	Interrupt torsion of bars with various cross sections.
		CO6	Solve problem based on contact stresses.
502104	Research Methodology	CO1	Conduct literature survey by using various research considerations.
		CO2	Formulate the problem statement using research considerations.
		CO3	Demonstrate knowledge and understanding of data analysis in relation to the research process.
		CO4	Interpret the analysis performed in relation to the research process.
502205	Elective I		
	Energy Audit & Management	CO1	Compare energy scenario of India and World.
		CO2	Carry out Energy Audit of the Residence / Institute/ Organization.
		CO3	Identify and evaluate energy conservation opportunities in Thermal Utilities.
		CO4	Identify and evaluate energy conservation opportunities in Electrical Utilities.
	Project Management	CO1	Understand the importance of projects and its phases.
		CO2	Analyse projects from marketing, operational and financial perspectives.
		CO3	Evaluate projects based on discount and non-discount methods.

		CO4	Develop network diagrams for planning and execution of a given project.
		CO5	Apply crashing procedures for time and cost optimization
	Intellectual Property Rights	CO1	Appreciate the significance of Intellectual Property as a very important driver of growth and development.
		CO2	Statutorily acquire and use different types of intellectual property in their professional life.
SEMESTER-II			
502207	Analysis and Synthesis of Mechanisms	CO1	Synthesize and analyse four bar mechanisms.
		CO2	Use computers for mechanism animation and analysis.
		CO3	Apply kinematic theories to real-world problems of mechanism design and synthesis.
502208	Advanced Mechanical Vibrations	CO1	Knowledge of fundamentals of Vibrations
		CO2	Considerably more in-depth knowledge of the major subject and ability to solve problems on Two degree freedom system, Multi degree freedom system
		CO3	Knowledge of Experimental Methods in Vibration Analysis.
		CO4	Understand and apply the methodology for dynamic Analysis.
		CO5	Understand Non-Linear Vibrations and Random Vibrations.
502209	Finite Element Method	CO1	Identify the concepts of idealization, discretisation and able to define the boundary conditions.
		CO2	Formulate element and global stiffness matrices.
		CO3	Evaluate results of finite element analysis.
		CO4	Identify sources of computational and physical errors of finite element analysis and its scope applicability.
		CO5	Implement the methodology of finite element analysis and Interpret numerical results.
		CO6	Use commercial finite element analysis software.
502210	Elective II		
	Acoustics & Noise Control – I&II	CO1	Knowledge of design for noise and vibration.
		CO2	Knowledge of signal process.
		CO3	Understanding hydrostatic and hydrodynamic lubrication.
		CO4	Understanding of NVH control strategies.
	Process Equipment Design	CO1	Understand the basic concepts in process design, block diagrams for flow of processes, material flow balance, design pressures and temperatures
		CO2	Able to do cost and profitability estimation
		CO3	Able to use optimization technique such as Lagrange's multiplier and golden section method.
		CO4	Able to implement different design codes like IS-2825, ASME-SECT, EIGHT-DIV-II TEMA.API-650, BS-1500 & 1515 in various PED.

SEMESTER-III			
602213	Optimization Techniques	CO1	Develop the ability to obtain the optimal solution for engineering problems.
		CO2	Model engineering problems and pose it as an optimisation problem.
		CO3	Apply the optimisation methods to design a mechanical system.
602214	Mechanical Measurements and Controls	CO1	Classify various types of static characteristics and types of errors occurring in the system.
		CO2	Classify and select proper measuring instrument for linear and angular displacement.
		CO3	Classify and select proper measuring instrument for pressure and temperature measurement.
		CO4	Design mathematical model of system/process for standard input responses.
		CO5	Analyse error and differentiate various types of control systems and time domain specifications.
		CO6	Analyse the problems associated with stability.
602215	Elective III		
	Industrial Tribology-I & II	CO1	Understand the role of Tribology in mechanical system design.
		CO2	Understanding of friction and wear phenomenon.
		CO3	Apply the concepts of tribology for design and operations of bearings and lubrication requirements.
		CO4	Insights into performance of Hydrostatic (externally-pressurized) & Elasto-Hydrodynamic Lubrication
		CO5	Knowledge of Rheodynamic (static) Lubrication
	Product Life Cycle	CO1	Understanding of product structure and architecture of the product families and similar products.
		CO2	Integrate lifecycle management strategies and knowledge to develop new and/or formulate appropriate engineering design solutions in engineering environment.
		CO3	Acquired engineering knowledge related to each phase of the life cycle through which the product passes with the usage of integrated software for monitoring and management.
		CO4	Incorporate preventive approaches concentrating on minimizing waste, hazard and risk associated with product design, development and manufacturing.