

Course Outcomes

Class: S.E.

Pattern: 2015

Semester: III

On completion of this course, the successful students should be able to:	
C202 (207002: Engineering Mathematics III)	
CO	Statement
1	Solve higher order linear differential equations and apply to modeling and analyzing mass spring systems.
2	Apply Laplace transform and Fourier transform techniques to solve differential equations involved in Vibration theory, Heat transfer and related engineering applications.
3	Apply statistical methods like correlation, regression analysis in analyzing, interpreting experimental data and probability theory in testing and quality control.
4	Perform vector differentiation and integration, analyze the vector fields and apply to fluid flow problems.
5	Solve various partial differential equations such as wave equation, one and two dimensional heat flow equations.
C241 (202041: Manufacturing Process- I)	
CO	Statement
1	Understand and analyze foundry practices like pattern making, mold making, Core making and Inspection of defects.
2	Understand and analyze Hot and Cold Working, Rolling, Forging, Extrusion and Drawing Processes.
3	Understand different plastic molding processes, Extrusion of Plastic and Thermoforming.
4	Understand different Welding and joining processes and its defects.
5	Understand, Design and Analyze different sheet metal working processes.
6	Understand the constructional details and Working of Centre Lathe.
C242 (202042: Computer Aided Machine Drawing)	
CO	Statement
1	Understand the importance of CAD in the light of allied technologies such as CAM, CAE, FEA, CFD, PLM.
2	Understand the significance of parametric technology and its application in 2D sketching.
3	Understand the significance of parametric feature-based modeling and its application in 3D machine components modeling.
4	Ability to create 3D assemblies that represent static or dynamic Mechanical Systems.
5	Ability to ensure manufacturability and proper assembly of components and assemblies.
6	Ability to communicate between Design and Manufacturing using 2D drawings.
C243 (202043: Thermodynamics)	
CO	Statement
1	Apply various laws of thermodynamics to various processes and real systems.
2	Apply the concept of Entropy, Calculate heat, work and other important thermodynamic properties for various ideal gas processes.
3	Estimate performance of various Thermodynamic gas power cycles and gas refrigeration cycle and availability in each case.
4	Estimate the condition of steam and performance of vapour power cycle and vapour compression cycle.
5	Estimate Stoichiometric air required for combustion, performance of steam generators and natural draught requirements in boiler plants.
6	Use Psychrometric charts and estimate various essential properties related to Psychrometry and processes

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Semester: III

C244 (202044: Material Science)	
CO	Statement
1	Understand the basic concepts and properties of Material.
2	Understand about material fundamental and processing.
3	Select proper metal, alloys, nonmetal and powder metallurgical component for specific requirement.
4	Detect the defects in crystal and its effect on crystal properties.
5	Evaluate the different properties of material by studying different test.
6	Recognize how metals can be strengthened by cold-working and hot working.
C251 (202051: Strength of Materials)	
CO	Statement
1	Apply knowledge of mathematics, science for engineering applications.
2	Design and conduct experiments, as well as to analyze and interpret data.
3	Design a component to meet desired needs within realistic constraints of health and safety.
4	Identify, formulate, and solve engineering problems.
5	Practice professional and ethical responsibility.
6	Use the techniques, skills, and modern engineering tools necessary for engineering practice.
C254 (202054: Value Education)	
CO	Statement
1	Understood human values, their significance and role in life.
2	Promote self-reflection and critical inquiry that foster critical thinking of one's value and the values of others.
3	Practice respect for human rights and democratic principles.
4	Familiarized with various living and non-living organisms and their interaction with environment.
5	Understood the basics regarding the leadership and to become a conscious professional.

Course Outcomes

Class: S.E.

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Semester: IV

On completion of this course, the successful students should be able to:	
C245 (202045: Fluid Mechanics)	
CO	Statement
1	Use of various properties in solving the problems in fluids.
2	Use of Bernoulli's equation for solutions in fluids.
3	Determination of forces drag and lift on immersed bodies.
C247 (202047: Soft Skills)	
CO	Statement
1	Improved communication, interaction and presentation of ideas.
2	Right attitudinal and behavioural change.
3	Developed right-attitudinal and behavioral change.
C248 (202048: Theory of Machines – I)	
CO	Statement
1	Identify mechanisms in real life applications.
2	Perform kinematic analysis of simple mechanisms.
3	Perform static and dynamic force analysis of slider crank mechanism.
4	Determine moment of inertia of rigid bodies experimentally.
5	Analyze velocity and acceleration of mechanisms by vector and graphical methods.
C249 (202049: Engineering Metallurgy)	
CO	Statement
1	Describe how metals and alloys formed and how the properties change due to microstructure.
2	Apply core concepts in Engineering Metallurgy to solve engineering problems.
3	Conduct experiments, as well as to analyze and interpret data.
4	Select materials for design and construction.
5	Possess the skills and techniques necessary for modern materials engineering practice.
6	Recognize how metals can be strengthened by alloying, cold-working, and heat treatment.

Course Outcomes

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Semester: IV

C250 (202050: Applied Thermodynamics)	
CO	Statement
1	Classify various types of Engines, Compare Air standard, Fuel Air and Actual cycles and make out various losses in real cycles.
2	Understand Theory of Carburetion, Modern Carburetor, Stages of Combustion in S. I. Engines and Theory of Detonation, Pre-ignition and factors affecting detonation.
3	Understand Fuel Supply system, Types of Injectors and Injection Pumps, Stages of Combustion in CI Engines, Theory of Detonation in CI Engines and Comparison of SI and CI Combustion and Knocking and Factors affecting, Criteria for good combustion chamber and types.
4	Carry out Testing of I. C. Engines and analyze its performance.
5	Describe construction and working of various I. C. Engine systems (Cooling, Lubrication, Ignition, Governing, and Starting) also various harmful gases emitted from exhaust and different devices to control pollution and emission norms for pollution control.
6	Describe construction, working of various types of reciprocating and rotary compressors with performance calculations of positive displacement compressors.
C252 (203152: Electrical and Electronics Engineering)	
CO	Statement
1	Develop the capability to identify and select suitable DC motor / induction motor / special purpose motor and its speed control method for given industrial application.
2	Program Arduino IDE using conditional statements.
3	Interfacing sensors with Arduino IDE.

Course Outcomes

Class: T.E.

Pattern: 2015

Semester: V

On completion of this course, the successful students should be able to:	
C341 (302041: Design of Machine Elements-I)	
CO	Statement
1	Identify and understand failure modes for mechanical elements and design of machine elements based on strength.
2	Design Shafts, Keys and Coupling for industrial applications.
3	Design machine elements subjected to fluctuating loads.
4	Design Power Screws for various applications.
5	Design fasteners and welded joints subjected to different loading conditions.
6	Design various Springs for strength and stiffness.
C342 (302042: Heat Transfer)	
CO	Statement
1	Analyze the various modes of heat transfer and implement the basic heat conduction equations for steady one dimensional thermal system.
2	Implement the general heat conduction equation to thermal systems with and without internal generation and transient heat conduction.
3	Analyze the heat transfer rate in natural and forced convection and evaluate through experimentation investigation.
4	Interpret heat transfer by radiation between objects with simple geometries.
5	Analyze the heat transfer equipment and investigate the performance.
C343 (302043: Theory of Machines-II)	
CO	Statement
1	Understand fundamentals of gear theory which will be the prerequisite for gear design.
2	Perform force analysis of Spur, Helical, Bevel, Worm and Worm gear.
3	Analyze speed and torque in epi-cyclic gear trains which will be the prerequisite for gear box design.
4	Design cam profile for given follower motions and understand cam Jump phenomenon, advance cam curves.
5	Synthesize a four bar mechanism with analytical and graphical methods.
6	A) Analyze the gyroscopic couple or effect for stabilization of Ship Aeroplane and Four wheeler vehicle. B) Choose appropriate drive for given application (stepped / step-less).
C344 (302044: Turbo Machines)	
CO	Statement
1	Apply thermodynamics and kinematics principles to turbo machines.
2	Analyze the performance of turbo machines.
3	Ability to select turbo machine for given application.
4	Predict performance of turbo machine using model analysis.

Course Outcomes

Class: T.E.

Pattern: 2015

Semester: V

C345 (302045: Metrology and Quality Control)	
CO	Statement
1	Understand the methods of measurement, selection of measuring instruments / standards of measurement, carryout data collection and its analysis.
2	Explain tolerance, limits of size, fits, geometric and position tolerances and gauge design
3	Understand and use/apply Quality Control Techniques/ Statistical Tools appropriately.
4	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.
C346 (302046: Skill Development)	
CO	Statement
1	Develop the skill for required in shop floor working.
2	Have knowledge of the different tools and tackles used in machine assembly shop.
3	Use of theoretical knowledge in practice.
4	Practical aspect of the each component in the assembly of the machine.

Course Outcomes

Class: T.E.

Pattern: 2015

Semester: VI

On completion of this course, the successful students should be able to:	
C347 (302047: Numerical Methods and Optimization)	
CO	Statement
1	Use appropriate Numerical Methods to solve complex mechanical engineering problems.
2	Formulate algorithms and programming.
3	Use Mathematical Solver.
4	Generate Solutions for real life problem using optimization techniques.
5	Analyze the research problem.
C348 (302048: Design of Machine Elements-II)	
CO	Statement
1	Understand and apply principles of gear design to spur gears and industrial spur gear boxes.
2	Become proficient in Design of Helical and Bevel Gear.
3	Develop capability to analyse Rolling contact bearing and its selection from manufacturer's Catalogue.
4	Learn a skill to design worm gear box for various industrial applications.
5	Inculcate an ability to design belt drives and selection of belt, rope and chain drives.
6	Achieve an expertise in design of Sliding contact bearing in industrial applications.
C349 (302049: Refrigeration and Air Conditioning)	
CO	Statement
1	Illustrate the fundamental principles and applications of refrigeration and air conditioning system
2	Obtain cooling capacity and coefficient of performance by conducting test on vapour compression refrigeration systems
3	Present the properties, applications and environmental issues of different refrigerants
4	Calculate cooling load for air conditioning systems.
5	Operate and analyze the refrigeration and air conditioning systems.
C350 (302050: Mechatronics)	
CO	Statement
1	Identification of key elements of mechatronics system and its representation in terms of block diagram.
2	Understanding the concept of signal processing and use of interfacing systems such as ADC, DAC, digital I/O.
3	Interfacing of Sensors, Actuators using appropriate DAQ micro-controller.
4	Time and Frequency domain analysis of system model (for control application).
5	PID control implementation on real time systems.
6	Development of PLC ladder programming and implementation of real life system.
C351 (302051: Manufacturing Process-II)	
CO	Statement
1	Apply the knowledge of various manufacturing processes.
2	Identify various process parameters and their effect on processes.
3	Figure out application of modern machining.
4	Get the knowledge of Jigs and Fixtures for variety of operations.
C352 (302052: Machine Shop-II)	
CO	Statement
1	Develop knowledge about the working and programming techniques for various machines and tools.

Course Outcomes

Class: T.E.

Pattern: 2015

Semester: VI

C353 (302053: Seminar)	
CO	Statement
1	Establish motivation for any topic of interest and develop a thought process for technical presentation.
2	Organize a detailed literature survey and build a document with respect to technical publications.
3	Analysis and comprehension of proof-of-concept and related data.
4	Effective presentation and improve soft skills.
5	Make use of new and recent technology (e.g. Latex) for creating technical reports
C353 (302053: Seminar)	
CO	Statement
1	Establish motivation for any topic of interest and develop a thought process for technical presentation.
2	Organize a detailed literature survey and build a document with respect to technical publications.
3	Analysis and comprehension of proof-of-concept and related data.
4	Effective presentation and improve soft skills.
5	Make use of new and recent technology (e.g. Latex) for creating technical reports
C354 (302054: Audit Course I - Fire & Safety Technology)	
CO	Statement
1	Create and sustain a community of learning in which students acquire knowledge in fire, safety and hazard management and learn to apply it professionally with due consideration for ethical, human life & property safety issues.
2	Pursue research and development in fire safety engineering, hazard management and disseminate its findings.
3	Meet the challenges of today and tomorrow in the most effective, efficient and contemporary educational manner.
4	Help in building national capabilities in fire safety engineering, disaster management, hazard management, industrial safety education through practical training to ensure a fire safe nation.
C354 (302054: Audit Course II - Entrepreneurship Development)	
CO	Statement
1	Appreciate the concept of Entrepreneurship
2	Identify entrepreneurship opportunity.
3	Develop winning business plans
C354 (302054: Audit Course IV - Lean Management)	
CO	Statement
1	Do practice Lean Management at the workplace
2	Contribute in Continuous Improvement program of the Organization
C354 (302054: Audit Course V - Smart Manufacturing)	
CO	Statement
1	Comfortable with terminology and practices in Smart Manufacturing
2	Able to face the challenges in Industry & also contribute towards advancement.
3	Active part of Industry 4.0 (Fourth Industrial Revolution)

Course Outcomes

Class: B.E.

Pattern: 2015

Semester: VII

On completion of this course, the successful students should be able to:	
C441 (402041: Hydraulics and Pneumatics)	
CO	Statement
1	Understand working principle of components used in hydraulic & pneumatic systems.
2	Identify various applications of hydraulic & pneumatic systems.
3	Selection of appropriate components required for hydraulic and pneumatic systems.
4	Analyse hydraulic and pneumatic systems for industrial/mobile applications.
5	Design a system according to the requirements.
6	Develop and apply knowledge to various applications.
C442 (402042: CAD/ CAM Automation)	
CO	Statement
1	Apply homogeneous transformation matrix for geometrical transformations of 2D CAD entities for basic geometric transformations.
2	Use analytical and synthetic curves and surfaces in part modeling.
3	Do real times analysis of simple mechanical elements like beams, trusses, etc. and comment on safety of engineering components using analysis software.
4	Generate CNC program for Turning / Milling and generate tool path using CAM software.
5	Demonstrate understanding of various rapid manufacturing techniques and develop competency in designing and developing products using rapid manufacturing technology.
6	Understand the robot systems and their applications in manufacturing industries.
C443 (402043: Dynamics of Machinery)	
CO	Statement
1	Apply balancing technique for static and dynamic balancing of multi cylinder inline and radial engines.
2	Estimate natural frequency for single DOF undamped & damped free vibratory systems.
3	Determine response to forced vibrations due to harmonic excitation, base excitation and excitation due to unbalance forces.
4	Estimate natural frequencies, mode shapes for 2 DOF undamped free longitudinal and torsional vibratory systems.
5	Describe vibration measuring instruments for industrial / real life applications along with suitable method for vibration control.
6	Explain noise, its measurement & noise reduction techniques for industry and day today life problems.

Course Outcomes

Class: B.E.

Pattern: 2015

Semester: VII

C444A (402044A: Elective – I Finite Element Analysis)	
CO	Statement
1	Understand the different techniques used to solve mechanical engineering problems.
2	Derive and use 1-D and 2-D element stiffness matrices and load vectors from various methods to solve for displacements and stresses.
3	Apply mechanics of materials and machine design topics to provide preliminary results used for testing the reasonableness of finite element results.
4	Explain the inner workings of a finite element code for linear stress, displacement, temperature and modal analysis.
5	Use commercial finite element analysis software to solve complex problems in solid mechanics and heat transfer.
6	Interpret the results of finite element analyses and make an assessment of the results in terms of modeling (physics assumptions) errors, discretization (mesh density and refinement toward convergence) errors, and numerical (round-off) errors.
C444B (402044B: Elective – I Computational Fluid Dynamics)	
CO	Statement
1	Analyze and model fluid flow and heat transfer problems.
2	Generate high quality grids and interpret the correctness of numerical results with physics.
3	Conceptualize the programming skills.
4	Use a CFD tool effectively for practical problems and research.
C444C (402044C: Elective – I Heating, Ventilation, Air Conditioning and Refrigeration Engineering)	
CO	Statement
1	Determine the performance parameters of trans-critical & ejector refrigeration systems
2	Estimate thermal performance of compressor, evaporator, condenser and cooling tower.
3	Describe refrigerant piping design, capacity & safety controls and balancing of vapour compressor system.
4	Explain importance of indoor and outdoor design conditions, IAQ, ventilation and air distribution system.
5	Estimate heat transmission through building walls using CLTD and decrement factor & time lag methods with energy-efficient and cost-effective measures for building envelope.
6	Explain working of types of desiccant, evaporative, thermal storage, radiant cooling, clean room and heat pump air-conditioning systems.
C445A (402045A: Elective – II Automobile Engineering)	
CO	Statement
1	Compare and select the proper automotive system for the vehicle.
2	Analyse the performance of the vehicle.
3	Diagnose the faults of automobile vehicles.
4	Apply the knowledge of EVs, HEVs and solar vehicles

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Semester: VII

C445B (402045B: Elective – II Operation Research)	
CO	Statement
1	Apply LPP and Decision Theory to solve the problems
2	Apply the concept of transportation models to optimize available resources.
3	Decide optimal strategies in conflicting situations.
4	Implement the project management techniques.
5	Minimize the process time
6	Optimize multi stage decision making problems
C445C (402045C: Elective – II Energy Audit and Management)	
CO	Statement
1	Compare energy scenario of India and World.
2	Carry out Energy Audit of the Residence / Institute/ Organization.
3	Evaluate the project using financial techniques
4	Identify and evaluate energy conservation opportunities in Thermal Utilities.
5	Identify and evaluate energy conservation opportunities in Electrical Utilities.
6	Identify the feasibility of Cogeneration and WHRUse a CFD tool effectively for practical problems and research.
C447 (402046: Project-I)	
CO	Statement
1	Find out the gap between existing mechanical systems and develop new creative new mechanical system.
2	Learn about the literature review
3	Get the experience to handle various tools, tackles and machines.

Course Outcomes

Class: B.E.

Pattern: 2015

Semester: VIII

On completion of this course, the successful students should be able to:	
C447 (402047: Energy Engineering)	
CO	Statement
1	Describe the power generation scenario, the layout components of thermal power plant and analyze the improved Rankin cycle, Cogeneration cycle.
2	Analyze the steam condensers, recognize the environmental impacts of thermal power plant and method to control the same.
3	Recognize the layout, component details of hydroelectric power plant and nuclear power plant.
4	Realize the details of diesel power plant, gas power plant and analyze gas turbine power cycle.
5	Emphasize the fundamentals of non-conventional power plants.
6	Describe the different power plant electrical instruments and basic principles of economics of power generation.
C448 (402048: Mechanical System Design)	
CO	Statement
1	Understand the difference between component level design and system level design.
2	Design various mechanical systems like pressure vessels, machine tool gear boxes, material handling systems, etc. for the specifications stated/formulated.
3	Learn optimum design principles and apply it to mechanical components.
4	Handle system level projects from concept to product.
C449A (402049A: Elective – III Tribology)	
CO	Statement
1	Know the importance of Tribology in Industry.
2	Know the basic concepts of Friction, Wear, Lubrications and their measurements.
3	Know the performance of different types of bearings and analytical analysis thereof.
4	Apply the principles of surface engineering for different applications of tribology.
C449B (402049B: Elective – III Industrial Engineering)	
CO	Statement
1	Apply the Industrial Engineering concept
2	Understand, analyze and implement different concepts involved in method study.
3	Design and Develop different aspects of work system and facilities.
4	Understand and Apply Industrial safety standards, financial management practices.
5	Undertake project work based on modeling & simulation area.
C449C (402049C: Elective – III Robotics)	
CO	Statement
1	Identify different type of robot configuration with relevant terminology.
2	Select suitable sensors, actuators and drives for robotic systems.
3	Understand kinematics in robotic systems.
4	Design robot with desired motion with suitable trajectory planning.
5	Select appropriate robot programming for given application.
6	Understand need of IoT, machine learning, simulation in robotics.

Course Outcomes

Class: B.E.

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Semester: VIII

C450A (402050A: Elective – IV Advanced Manufacturing Processes)	
CO	Statement
1	Classify and analyze special forming processes.
2	Analyze and identify applicability of advanced joining processes..
3	Understand and analyze the basic mechanisms of hybrid non-conventional machining techniques.
4	Select appropriate micro and nano fabrication techniques for engineering applications.
5	Understand and apply various additive manufacturing technology for product development.
6	Understand material characterization techniques to analyze effects of chemical composition, composition variation, crystal structure, etc.
C450B (402050B: Elective – IV Solar and Wind Energy)	
CO	Statement
1	Design of solar food drier for domestic purpose referring existing system.
2	Design of parabolic dish solar cooker for domestic purpose referring existing system.
3	Design of solar photovoltaic system for domestic purpose referring existing system.
4	Design miniature wind mill for domestic purpose referring existing system.
C450C (402050C: Elective – IV Product Design and Development)	
CO	Statement
1	Understand essential factors for product design.
2	Design product as per customer needs and satisfaction.
3	Understand Processes and concepts during product development.
4	Understand methods and processes of Forward and Reverse engineering.
5	Carry various design processes as DFA, DFMEA, design for safety.
6	Understand the product life cycle and product data management.