JIT
JAWAHAR INSTITUTE OF TECHNOLOGY, NASHIK

Jawahar Education Society's
Institute of Technology,Management & Research,Nashik

Approved by AICTE and DTE,Goverment of Maharashtra, Affiliated to University of Pune

SE Mechanical 2019 Pattern

Course Outcomes

Department of Mechanical Engineering

Course Outcomes (CO)

Syllabus Pattern:-2019

Class:-SE Semester:- I

Sr. No	Subject	Course Outcomes (CO)
1	Solid Mechanics	CO1. DEFINE various types of stresses and strain developed on determinate and indeterminate members. CO2. DRAW Shear force and bending moment diagram for various types of transverse loading and support. CO3. COMPUTE the slope & deflection, bending stresses and shear stresses on a beam. CO4. CALCULATE Torsional shear stress in shaft and buckling on the column. CO5. APPLY the concept of principal stresses and theories of failure to determine stresses on a 2-D element. CO6. UTILIZE the concepts of SFD & BMD, torsion and principal stresses to solve combined loading application based problems.
2	Solid Modeling and Drafting	CO1. UNDERSTAND basic concepts of CAD system, need and scope in Product Lifecycle Management CO2. UTILIZE knowledge of curves and surfacing features and methods to create complex solid geometry CO3. CONSTRUCT solid models, assemblies using various modeling techniques & PERFORM mass property analysis, including creating and using a coordinate system CO4. APPLY geometric transformations to simple 2D geometries CO5. USE CAD model data for various CAD based engineering applications viz. production drawings, 3D printing, FEA, CFD, MBD, CAE, CAM, etc. CO6. USE PMI & MBD approach for communication
3	Engineering Thermo dynamics	CO1. DESCRIBE the basics of thermodynamics with heat and work interactions. CO2. APPLY laws of thermodynamics to steady flow and non-flow processes. CO3. APPLY entropy, available and non available energy for an Open and Closed System, CO4. DETERMINE the properties of steam and their effect on performance of vapour power cycle. CO5. ANALYSE the fuel combustion process and products of combustion. CO6.SELECT various instrumentations required for safe and efficient operation of steam generator.

Sr. No	Subject	Course Outcomes (CO)
4	Engineering Materials and Metallurgy	CO1. COMPARE crystal structures and ASSESS different lattice parameters. CO2. CORRELATE crystal structures and imperfections in crystals with mechanical behaviour of materials. CO3. DIFFERENTIATE and DETERMINE mechanical properties using destructive and non-destructive testing of materials. CO4. IDENTIFY & ESTIMATE different parameters of the system viz., phases, variables, component, grains, grain boundary, and degree of freedom. etc. CO5. ANALYSE effect of alloying element & heat treatment on properties of ferrous & nonferrous alloy. CO6. SELECT appropriate materials for various applications.
5	Electrical and Electronics Engineering	CO1. APPLY programming concepts to UNDERSTAND role of Microprocessor and Microcontroller in embedded systems CO2. DEVELOP interfacing of different types of sensors and other hardware devices with Atmega328 based Arduino Board CO3. UNDERSTAND the operation of DC motor, its speed control methods and braking CO4. DISTINGUISH between types of three phase induction motor and its characteristic features CO5. EXPLAIN about emerging technology of Electric Vehicle (EV) and its modular subsystems CO6. CHOOSE energy storage devices and electrical drives for EVs
6	Geometric Dimensioning and Tolerancing Lab	CO1. SELECT appropriate IS and ASME standards for drawing CO2. READ & ANALYSE variety of industrial drawings CO3. APPLY geometric and dimensional tolerance, surface finish symbols in drawing CO4. EVALUATE dimensional tolerance based on type of fit, etc. CO5. SELECT an appropriate manufacturing process using DFM, DFA, etc.

Department of Mechanical Engineering

Course Outcomes (CO)

Syllabus Pattern:-2019

Class:-SE Semester:- II

Sr. No	Subject	Course Outcomes (CO)
1	Engineering Mathematics - III	CO1. SOLVE higher order linear differential equations and its applications to model and analyze mass spring systems. CO2. APPLY Integral transform techniques such as Laplace transform and Fourier transform to solve differential equations involved in vibration theory, heat transfer and related mechanical engineering applications. CO3. APPLY Statistical methods like correlation, regression in analyzing and interpreting experimental data applicable to reliability engineering and probability theory in testing and quality control. CO4. PERFORM Vector differentiation & integration, analyze the vector fields and APPLY to fluid flow problems. CO5. SOLVE Partial differential equations such as wave equation, one and two dimensional heat flow equations.
2	Kinematics of Machinery	CO1. APPLY kinematic analysis to simple mechanisms CO2. ANALYZE velocity and acceleration in mechanisms by vector and graphical method CO3. SYNTHESIZE a four bar mechanism with analytical and graphical methods CO4. APPLY fundamentals of gear theory as a prerequisite for gear design CO5. CONSTRUCT cam profile for given follower motion
3	Applied Thermodynamics	CO1. DETERMINE COP of refrigeration system and ANALYZE psychrometric processes. CO2. DISCUSS basics of engine terminology,air standard, fuel air and actual cycles. CO3. IDENTIFY factors affecting the combustion performance of SI and CI engines. CO4. DETERMINE performance parameters of IC Engines and emission control. CO5. EXPLAIN working of various IC Engine systems and use of alternative fuels. CO6. CALCULATE performance of single and multi stage reciprocating compressors and DISCUSS rotary positive displacement compressors

Sr. No	Subject	Course Outcomes (CO)
4	Fluid Mechanics	CO1. DETERMINE various properties of fluid CO2. APPLY the laws of fluid statics and concepts of buoyancy CO3. IDENTIFY types of fluid flow and terms associated in fluid kinematics CO4. APPLY principles of fluid dynamics to laminar flow CO5. ESTIMATE friction and minor losses in internal flows and DETERMINE boundary layer formation over an external surface CO6. CONSTRUCT mathematical correlation considering dimensionless parameters, also ABLE to predict the performance of prototype using model laws
5	Manufacturing Processes	CO1. SELECT appropriate moulding, core making and melting practice and estimate pouring time, solidification rate and DESIGN riser size and location for sand casting process CO2. UNDERSTAND mechanism of metal forming techniques and CALCULATE load required for flat rolling CO3. DEMONSTRATE press working operations and APPLY the basic principles to DESIGN dies and tools for forming and shearing operations CO4. CLASSIFY and EXPLAIN different welding processes and EVALUATE welding characteristics CO5. DIFFERENTIATE thermoplastics and thermosetting and EXPLAIN polymer processing techniques CO6. UNDERSTAND the principle of manufacturing of fibre-reinforce composites and metal matrix composites
6	Machine Shop	CO1. PERFORM welding using TIG/ MIG/ Resistance/Gas welding technique CO2. MAKE Fibre-reinforced Composites by hand lay-up process or spray lay-up techniques CO3. PERFORM cylindrical/surface grinding operation and CALCULATE its machining time CO4. DETERMINE number of indexing movements required and acquire skills to PRODUCE a spur gear on a horizontal milling machine CO5. PREPARE industry visit report CO6. UNDERSTAND procedure of plastic processing
7	Project Based Learning - II	CO1. IDENTIFY the real-world problem (possibly of interdisciplinary nature) through a rigorous literature survey and formulate / set relevant aims and objectives. CO2. ANALYZE the results and arrive at valid conclusions. CO3. PROPOSE a suitable solution based on the fundamentals of mechanical engineering by possibly integration of previously acquired knowledge. CO4. CONTRIBUTE to society through proposed solutions by strictly following professional ethics and safety measures. CO5. USE of technology in proposed work and demonstrate learning in oral and written form. CO6. DEVELOP ability to work as an individual and as a team member.

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TE Mechanical 2019 Pattern

Course Outcomes

Department of Mechanical Engineering

Course Outcomes (CO)

Syllabus Pattern:-2019

Class:-TE Semester:- I

Sr. No	Subject	Course Outcomes (CO)
1	Numerical and Statistical Methods	CO1: SOLVE system of equations using direct and iterative numerical methods. CO2: ESTIMATE solutions for differential equations using numerical techniques. CO3: DEVELOP solution for engineering applications with numerical integration. CO4: DESIGN and CREATE a model using a curve fitting and regression analysis. CO5: APPLY statistical Technique for quantitative data analysis. CO6: DEMONSTRATE the data, using the concepts of probability and linear algebra.
2	Heat and Mass Transfer	CO1. ANALYZE & APPLY the modes of heat transfer equations for one dimensional thermal system. CO2. DESIGN a thermal system considering fins, thermal insulation and & Transient heat conduction. CO3. EVALUATE the heat transfer rate in natural and forced convection & validate with experimentation results. CO4. INTERPRET heat transfer by radiation between objects with simple geometries, for black and grey surfaces. CO5. ABILITY to analyze the rate of mass transfer using Fick's Law of Diffusion and understands mass diffusion in different coordinate systems. CO6. DESIGN & ANALYSIS of heat transfer equipments and investigation of its performance.
3	Design of Machine Elements	CO1. DESIGN AND ANALYZE the cotter and knuckle Joints, levers and components subjected to eccentric loading. CO2. DESIGN shafts, keys and couplings under static loading conditions. CO3. ANALYZE different stresses in power screws and APPLY those in the procedure to design screw jack. CO4. EVALUATE dimensions of machine components under fluctuating loads. CO5. EVALUATE & INTERPRET the stress developed on the different type of welded and threaded joints. CO6. APPLY the design and development procedure for different types of springs.

Sr. No	Subject	Course Outcomes (CO)
4	Mechatronics	CO1. DEFINE key elements of mechatronics, principle of sensor and its characteristics. CO2. UTILIZE concept of signal processing and MAKE use of interfacing systems such as ADC, DAC, Digital I/O. CO3. DETERMINE the transfer function by using block diagram reduction technique. CO4. EVALUATE Poles and Zero, frequency domain parameter for mathematical modeling for mechanical system. CO5. APPLY the concept of different controller modes to an industrial application. CO6. DEVELOP the ladder programming for industrial application.
5	Advanced Forming & Joining Processes	CO1. ANALYSE the effect of friction in metal forming deep drawing and IDENTIFICATION of surface defects and their remedies in deep drawing operations CO2. ASSESS the parameters for special forming operation and SELECT appropriate special forming operation for particular applications CO3. ANALYSE the effect of HAZ on microstructure and mechanical properties of materials CO4. CLASSIFY various solid state welding process and SELECT suitable welding processes for particular applications CO5. CLASSIFY various advanced welding process and SELECT suitable welding processes for particular applications. CO6. INTERPRET the principles of sustainable manufacturing and its role in manufacturing industry.
6	Machining Science &Technology	CO1. DEFINE metal cutting principles and mechanics of metal cutting and tool life. CO2. DESCRIBE features of gear and thread manufacturing processes. CO3. SELECT appropriate grinding wheel and demonstrate the various surface finishing processes. CO4. SELECT appropriate jigs/fixtures and to draw the process plan for a given component. CO5. SELECT & EVALUATE various parameters of process planning. CO6. GENERATE CNC program for Turning / Milling processes and generate tool path using CAM software.
7	Digital Manufacturing Laboratory	CO1. DEVELOP a component using conventional machines, CNC machines and Additive Manufacturing Techniques. CO2. ANALYZE cutting tool parameters for machining given job. CO3. DEMONSTRATE simulation of manufacturing process using Digital Manufacturing Tools. CO4. SELECT and DESIGN jigs and Fixtures for a given component. CO5. DEMONESTRATE different parameters for CNC retrofitting and reconditioning.
8	Skill Development	CO1. APPLY& DEMONSTRATE procedure of assembly & disassembly of various machines. CO2. DESIGN & DEVELOP a working/model of machine parts or any new product. CO3. EVALUATE fault with diagnosis on the machines, machine tools and home appliances. CO4. IDENTIFY & DEMONSTRATE the various activities performed in an industry such as maintenance, design of components, material selection.

Department of Mechanical Engineering

Course Outcomes (CO)

Syllabus Pattern:-2019

Class:-TE Semester:- II

Sr. No	Subject	Course Outcomes (CO)
1	Artificial Intelligence & Machine Learning	CO1. DEMONSTRATE fundamentals of artificial intelligence and machine learning. CO2. APPLY feature extraction and selection techniques. CO3. APPLY machine learning algorithms for classification and regression problems. CO4. DEVISE AND DEVELOP a machine learning model using various steps. CO5. EXPLAIN concepts of reinforced and deep learning. CO6. SIMULATE machine learning model in mechanical engineering problems.
2	Computer Aided Engineering	CO1: DEFINE the use of CAE tools and DESCRIBE the significance of shape functions in finite element formulations. CO2: APPLY the various meshing techniques for better evaluation of approximate results. CO3: APPLY material properties and boundary condition to SOLVE 1-D and 2-D element stiffness matrices to obtain nodal or elemental solution. CO4: ANALYZE and APPLY various numerical methods for different types of analysis. CO5: EVALUATE and SOLVE non-linear and dynamic analysis problems by analyzing the results obtained from analytical and computational method. CO6: GENERATE the results in the form of contour plot by the USE of CAE tools.
3	Design of Transmission Systems	CO1. APPLY the principle of Spur & Helical gear design for industrial application and PREPARE a manufacturing drawing with the concepts of GD&T. CO2. EXPLAIN and DESIGN Bevel & Worm gear considering design parameters as per design standards. CO3. SELECT&DESIGN Rolling and Sliding Contact Bearings from manufacturer's catalogue for a typical application considering suitable design parameters. CO4. DEFINE and DESIGN various types of Clutches, Brakes, used in automobile. CO5. APPLY various concept to DESIGN Machine Tool Gear box, for different applications CO6. ELABORATE various modes of operation, degree of hybridization and allied terms associated with hybrid electric vehicles.

Sr. No	Subject	Course Outcomes (CO)
4	Composite Materials	CO1. DEFINE & COMPARE composites with traditional materials. CO2. IDENTIFY & ESTIMATE different parameters of the Polymer Matrix Composite CO3. CATEGORISE and APPLY Metal Matrix Process from possessions landscape. CO4. DETERMINE volume/weight fraction and strength of Composites. CO5. SELECT appropriate testing and inspection method for composite materials. CO6. SELECT composites materials for various applications.
5	Surface Engineering	CO1. DEFINE the basic's principle & mechanism of surface degradation. CO2. ANALYSE & SELECT correct corrosion prevention techniques for a different service condition. CO3. DEMONSTRATE the role of surface engineering of materials to modify/improve the surface properties. CO4. SELECT the suitable surface heat treatments to improve the surface properties. CO5. APPLY the surface modification technique to modify surface properties. CO6. ANALYSE & EVALUTE various surface coating defects using various testing/characterization method.
6	Measurement Laboratory	CO1. EVALUATE causes of errors in Vernier calipers, micrometers by performing experiments in standard metrological conditions, noting deviations at actual and by plotting cause and effect diagram, to reduce uncertainty in measurement. CO2. ANALYZE strain measurement parameters by taking modulus of elasticity in consideration to acknowledge its usage in failure detection and force variations. CO3. EXAMINE surface Textures, surface finish using equipment's like Talysurf and analyze surface finish requirements of metrological equipment's like gauges, jaws of vernier calipers, micrometers, magnifying glasses of height gauge and more, to optimize surface finish accuracy requirements and cost of measurement. CO4. MEASURE the dimensional accuracy using Comparator and limit gauges and appraise their usage in actual measurement or comparison with standards set to reduce measurement lead time. CO5. PERFORM Testing of Flow rate, speed and temperature measurements and their effect on performance in machines and mechanisms like hydraulic or pneumatic trainers, lathe machine etc. to increase repeatability and reproducibility. CO6. COMPILE the information of opportunities of entrepreneurships/business in various sectors of metrology like calibrations, testing, coordinate and laser metrology etc in an industry visit report.
7	Fluid Power & Control Laboratory	CO1. DEFINE working principle of components used in hydraulic and pneumatic systems. CO2. IDENTIFY & EXPLAIN various applications of hydraulic and pneumatic systems. CO3. SELECT an appropriate component required for hydraulic and pneumatic systems using manufactures' catalogues. CO4. SIMULATE & ANALYSE various hydraulic and pneumatic systems for industrial/mobile applications. CO5. DESIGN a hydraulic and pneumatic system for the industrial applications. CO6. DESIGN & DEMONESTRATE various IoT, PLC based controlling system using hydraulics and pneumatics.

Sr. No	Subject	Course Outcomes (CO)
8	Internship/Mini project	CO1. DEMONSTRATE professional competence through industry internship. CO2. APPLY knowledge gained through internships to complete academic activities in a professional manner. CO3. CHOOSE appropriate technology and tools to solve given problem. CO4. DEMONSTRATE abilities of a responsible professional and use ethical practices in day to day life. CO5. DEVELOP network and social circle, and DEVELOPING relationships with industry people. CO6. ANALYZE various career opportunities and DECIDE career goals.

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BE Mechanical 2015 Pattern

Course Outcomes

Department of Mechanical Engineering

Course Outcomes (CO)

Syllabus Pattern:-2015

Class:-BE Semester:- I

Sr. No	Subject	Course Outcomes (CO)
1	Hydraulics and Pneumatics	· Understand working principle of components used in hydraulic & pneumatic systems · Identify various applications of hydraulic & pneumatic systems · Selection of appropriate components required for hydraulic and pneumatic systems · Analyse hydraulic and pneumatic systems for industrial/mobile applications · Design a system according to the requirements · Develop and apply knowledge to various applications
2	CAD CAM and Automation	· Apply homogeneous transformation matrix for geometrical transformations of 2D CAD entities for basic geometric transformations. · Use analytical and synthetic curves and surfaces in part modeling. · Do real times analysis of simple mechanical elements like beams, trusses, etc. and comment on safety of engineering components using analysis software. · Generate CNC program for Turning / Milling and generate tool path using CAM software. · Demonstrate understanding of various rapid manufacturing techniques and develop competency in designing and developing products using rapid manufacturing technology. · Understand the robot systems and their applications in manufacturing industries.
3	Dynamics of Machinery	· Apply balancing technique for static and dynamic balancing of multi cylinder inline and radial engines. · Estimate natural frequency for single DOF undamped & damped free vibratory systems. · Determine response to forced vibrations due to harmonic excitation, base excitation and excitation due to unbalance forces. · Estimate natural frequencies, mode shapes for 2 DOF vibratory systems.

Sr. No	Subject	Course Outcomes (CO)
3	Dynamics of Machinery	· Describe vibration measuring instruments for industrial / real life applications along with suitable method for vibration control. · Explain noise, its measurement & noise reduction techniques for industry and day today life problems.
4	Finite Element Analysis	· Understand the different techniques used to solve mechanical engineering problems. · Derive and use 1-D and 2-D element stiffness matrices and load vectors from various methods to solve for displacements and stresses. · Apply mechanics of materials and machine design topics to provide preliminary results used for testing the reasonableness of finite element results. · Explain the inner workings of a finite element code for linear stress, displacement, temperature and modal analysis. · Use commercial finite element analysis software to solve complex problems in solid mechanics and heat transfer. · 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.
5	Automobile Engineering	· To compare and select the proper automotive system for the vehicle. · To analyse the performance of the vehicle. · To diagnose the faults of automobile vehicles. · To apply the knowledge of EVs, HEVs and solar vehicles
6	Energy Audit and Management	· Compare energy scenario of India and World. · Carry out Energy Audit of the Residence / Institute/ Organization. · Evaluate the project using financial techniques · Identify and evaluate energy conservation opportunities in Thermal Utilities. · Identify and evaluate energy conservation opportunities in Electrical Utilities. · Identify the feasibility of Cogeneration and WHRUse a CFD tool effectively for practical problems and research.
7	Project – I	· Find out the gap between existing mechanical systems and develop new creative new mechanical system. · Learn about the literature review · Get the experience to handle various tools, tackles and machines.

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Department of Mechanical Engineering

Course Outcomes (CO)

Syllabus Pattern:-2015

Class:-BE Semester:- II

Sr. No	Subject	Course Outcomes (CO)
1	Energy Engineering	· Describe the power generation scenario, the layout components of thermal power plant and analyze the improved Rankin cycle, Cogeneration cycle · Analyze the steam condensers, recognize the an environmental impacts of thermal power plant and method to control the same · Recognize the layout, component details of hydroelectric power plant and nuclear power plant · Realize the details of diesel power plant, gas power plant and analyze gas turbine power cycle · Emphasize the fundaments of non-conventional power plants · Describe the different power plant electrical instruments and basic principles of economics of power generation.
2	Mechanical System Design	· Understand the difference between component level design and system level design. · Design various mechanical systems like pressure vessels, machine tool gear boxes, material handling systems, etc. for the specifications stated/formulated. · Learn optimum design principles and apply it to mechanical components. · Handle system level projects from concept to product.
3	Industrial Engineering	· Apply the Industrial Engineering concept · Understand, analyze and implement different concepts involved in method study. · Design and Develop different aspects of work system and facilities. · Understand and Apply Industrial safety standards, financial management practices. · Undertake project work based on modelling & simulation area.

Sr. No	Subject	Course Outcomes (CO)
4	Advanced Manufacturing Processes	· Classify and analyze special forming processes · Analyze and identify applicability of advanced joining processes · Understand and analyze the basic mechanisms of hybrid non-conventional machining techniques · Select appropriate micro and nano fabrication techniques for engineering applications · Understand and apply various additive manufacturing technology for product development · Understand material characterization techniques to analyze effects of chemical composition, composition variation, crystal structure, etc.