Sinhgad Technical Education Society's

SINHGAD ACADEMY OF ENGINEERING

(Affiliated to University of Pune and Approved by, AICTE, New Delhi.)
S. No. 40/4 A. Near octroi Post, Kondhwa –Saswad Road, Pune – 411048.
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Department of Mechanical Engineering

Course Outcomes

SEM-I				
Sr.No.	**Class**	**Subject Code**	**Subject Name**	**Course outcomes**
1	SE	202041	Solid Mechanics	1 define various types of stresses and strain developed on determinate and indeterminate members. 2 draw shear force and bending moment diagram for various types of transverse loading and support. 3 compute the slope & deflection, bending stresses and shear stresses on a beam. 4 calculate torsional shear stress in shaft and buckling on the column. 5 apply the concept of principal stresses and theories of failure to determine stresses on a 2-d element. 6 utilize the concepts of sfd & bmd, torsion and principal stresses to solve combined loading application based problems.
2	SE	202042	Solid Modeling and Drafting	1 UNDERSTAND basic concepts of CAD system, need and scope in Product Lifecycle Management 2 UTILIZE knowledge of curves and surfacing features and methods to create complex solid geometry 3 CONSTRUCT solid models, assemblies using various modeling techniques & PERFORM mass property analysis, including creating and using a coordinate system 4 APPLY geometric transformations to simple 2D geometries 5 USE CAD model data for various CAD based engineering applications viz. production drawings, 3D printing, FEA, CFD,

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				MBD, CAE, CAM, etc. 6 USE PMI & MBD approach for communication
3	SE	202043	**Engineering Thermodynamics**	1 DESCRIBE the basics of thermodynamics with heat and work interactions. 2 APPLY laws of thermodynamics to steady flow and non-flow processes. 3 APPLY entropy, available and non available energy for an Open and Closed System, 4 DETERMINE the properties of steam and their effect on performance of vapour power cycle. 5 ANALYSE the fuel combustion process and products of combustion. 6 SELECT various instrumentations required for safe and efficient operation of steam generator.
4	SE	202044	**Engineering Materials and Metallurgy**	1 COMPARE crystal structures and ASSESS different lattice parameters 2 CORRELATE crystal structures and imperfections in crystals with mechanical behaviour of materials. 3 DIFFERENTIATE and DETERMINE mechanical properties using destructive and non-destructive testing of materials. 4 IDENTIFY & ESTIMATE different parameters of the system viz., phases, variables, component, grains, grain boundary, and degree of freedom. etc. 5 ANALYSE effect of alloying element & heat treatment on properties of ferrous & nonferrous alloy. 6 SELECT appropriate materials for various applications.
5	SE	203156	**Electrical and Electronics Engineering**	1 APPLY programming concepts to UNDERSTAND role of Microprocessor and Microcontroller in embedded systems 2 DEVELOP interfacing of different types of sensors and other hardware devices with Atmega328 based Arduino Board 3 UNDERSTAND the operation of DC motor, its speed control methods and braking 4 DISTINGUISH between types of three phase induction motor and its characteristic features 5 EXPLAIN about emerging technology of Electric

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				Vehicle (EV) and its modular subsystems 6 CHOOSE energy storage devices and electrical drives for EVs
6	SE	202045	**Geometric dimensioning and tolerancing lab**	1 SELECT appropriate IS and ASME standards for drawing 2 READ & ANALYSE variety of industrial drawings 3 APPLY geometric and dimensional tolerance, surface finish symbols in drawing 4 EVALUATE dimensional tolerance based on type of fit, etc. 5 SELECT an appropriate manufacturing process using DFM, DFA, etc.
SEM-II				
7	SE	207002	**Engineering MAthematics III**	1 SOLVE higher order linear differential equations and its applications to model and analyze mass spring 2 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. 3 APPLY Statistical methods like correlation, regression in analyzing and interpreting experimental data applicable to reliability engineering and probability theory in testing and quality control. 4 PERFORM Vector differentiation & integration, analyze the vector fields and APPLY to fluid flow problems. 5 SOLVE Partial differential equations such as wave equation, one and two dimensional heat flow equations.
8	SE	202047	**Kinematics of machinery**	1 APPLY kinematic analysis to simple mechanisms 2 ANALYZE velocity and acceleration in mechanisms by vector and graphical method 3 SYNTHESIZE a four bar mechanism with analytical and graphical methods 4 APPLY fundamentals of gear theory as a prerequisite for gear design 5 CONSTRUCT cam profile for given follower motion

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9	SE	202048	Applied Thermodynamics	1 DETERMINE COP of refrigeration system and ANALYZE psychrometric processes. 2 DISCUSS basics of engine terminology,air standard, fuel air and actual cycles. 3 IDENTIFY factors affecting the combustion performance of SI and CI engines. 4 DETERMINE performance parameters of IC Engines and emission control. 5 EXPLAIN working of various IC Engine systems and use of alternative fuels. 6 CALCULATE performance of single and multi stage reciprocating compressors and DISCUSS rotary positive displacement compressors
10	SE	202049	Fluid Mechanics	1 DETERMINE various properties of fluid 2 APPLY the laws of fluid statics and concepts of buoyancy 3 IDENTIFY types of fluid flow and terms associated in fluid kinematics 4 APPLY principles of fluid dynamics to laminar flow 5 ESTIMATE friction and minor losses in internal flows and DETERMINE boundary layer formation over an external surface 6 CONSTRUCT mathematical correlation considering dimensionless parameters, also ABLE to predict the performance of prototype using model laws
13	SE	202050	Manufacturing Processes	1 SELECT appropriate moulding, core making and melting practice and estimate pouring time, solidification rate and DESIGN riser size and location for sand casting process 2 UNDERSTAND mechanism of metal forming techniques and CALCULATE load required for flat rolling 3 DEMONSTRATE press working operations and APPLY the basic principles to DESIGN dies and tools for forming and shearing operations 4 CLASSIFY and EXPLAIN different welding processes and EVALUATE welding characteristics 5 DIFFERENTIATE thermoplastics and thermosetting and EXPLAIN polymer processing techniques 6 UNDERSTAND the principle of manufacturing

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				of fibre-reinforce composites and metal matrix composites
			SEM-I	
14	TE	302041	**Numerical and statistical methods**	1 Solve system of equations using direct and iterative numerical methods. 2 Estimate solutions for differential equations using numerical techniques. 3 Develop solution for engineering applications with numerical integration. 4 Design and create a model using a curve fitting and regression analysis. 5 Apply statistical Technique for quantitative data analysis. 6 Demonstrate the data, using the concepts of probability and linear algebra
15	TE	302042	**Heat and Mass Transfer**	1 Analyze & apply the modes of heat transfer equations for one dimensional thermal system 2 Design a thermal system considering fins, thermal insulation and & Transient heat conduction. 3 Evaluate the heat transfer rate in natural and forced convection & validate with experimentation results. 4 Interpret heat transfer by radiation between objects with simple geometries, for black and grey surfaces. 5 Ability to analyse the rate of mass transfer using Fick's Law of Diffusion and understands mass diffusion in different coordinate systems. 6 Design & analysis of heat transfer equipment's and investigation of its performance.
16	TE	302043	**Design of Machine Elements**	1 Design and analyse the cotter and knuckle Joints, levers and components subjected to eccentric loading. 2 Design shafts, keys and couplings under static loading conditions 3 Analyse different stresses in power screws and APPLY those in the procedure to design screw jack. 4 Evaluate dimensions of machine components under fluctuating loads. 5 Evaluate & interpret the stress developed on

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				the different type of welded and threaded joints. 6 Apply the design and development procedure for different types of springs.
17	TE	302044	**Mechatronics**	1 Define key elements of mechatronics, principle of sensor and its characteristics. 2 Utilize concept of signal processing and MAKE use of interfacing systems such as ADC, DAC, Digital I/O. 3 Determine the transfer function by using block diagram reduction technique. 4 Evaluate Poles and Zero, frequency domain parameter for mathematical modelling for mechanical system. 5 Apply the concept of different controller modes to an industrial application 6 Develop the ladder programming for industrial application.
18	TE	302045-A	**Advanced forming and joining processes**	1 Analyse the effect of friction in metal forming deep drawing and identification of surface defects and their remedies in deep drawing operations 2 Assess the parameters for special forming operation and select appropriate special forming operation for particular applications 3 Analyse the effect of HAZ on microstructure and mechanical properties of materials 4 Classify various solid state welding process and select suitable welding processes for particular applications 5 Classify various advanced welding process and select suitable welding processes for particular applications. 6 Interpret the principles of sustainable manufacturing and its role in manufacturing industry
19	TE	302045-B	**Machining Science and Technology**	1 Define metal cutting principles and mechanics of metal cutting and tool life. 2 Describe features of gear and thread manufacturing processes. 3 Select appropriate grinding wheel and demonstrate the various surface finishing processes 4 Select appropriate jigs/fixtures and to draw the process plan for a given component. 5 Select & evaluate various parameters of

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				process planning. 6 Generate CNC program for Turning / Milling processes and generate tool path using CAM software.
20	TE	302046	**Digital Manufacturing Laboratory**	1 Develop a component using conventional machines, CNC machines and Additive Manufacturing Techniques. 2 Analyse cutting tool parameters for machining given job. 3 Demonstrate simulation of manufacturing process using Digital Manufacturing Tools. 4 Select and design jigs and Fixtures for a given component. 5 Demonstrate different parameters for CNC retrofitting and reconditioning.
21	TE	302047	**Skill Development**	1 Apply & demonstrate procedure of assembly & disassembly of various machines. 2 Design & develop a working/model of machine parts or any new product. 3 Evaluate fault with diagnosis on the machines, machine tools and home appliances. 4 Identify & demonstrate the various activities performed in an industry such as maintenance, design of components, material selection
SEM-II				
22	TE	302049	**Artificial Intelligence and Machine Learning**	1 Demonstrate fundamentals of artificial intelligence and machine learning 2 Apply feature extraction and selection techniques 3 Apply machine learning algorithms for classification and regression problems 4 Devise and develop a machine learning model using various steps 5 Explain concepts of reinforced and deep learning 6 Simulate machine learning model in mechanical engineering problems
23	TE	302050	**Computer aided Engineering**	1 Define the use of CAE tools and describe the significance of shape functions in finite element formulations 2 Apply the various meshing techniques for better evaluation of approximate results 3 Apply material properties and boundary condition to solve 1-D and 2-D element

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				stiffness matrices to obtain nodal or elemental solution 4 Analyze and apply various numerical methods for different types of analysis 5 Evaluate and solve non-linear and dynamic analysis problems by analyzing the results obtained from analytical and computational method 6 Generate the results in the form of contour plot by the use of CAE tools
24	TE	302051	**Design of Transmission systems**	1 Apply the principle of Spur & Helical gear design for industrial application and prepare a manufacturing drawing with the concepts of G D & T 2 Explain and design Bevel & Worm gear considering design parameters as per design standards 3 Select & design Rolling and Sliding Contact Bearings from manufacturer's catalogue for a typical application considering suitable design parameters 4 Define and design various types of Clutches, Brakes, used in automobile 5 Apply various concept to design Machine Tool Gear box, for different applications 6 Elaborate various modes of operation, degree of hybridization and allied terms associated with hybrid electric vehicles.
25	TE	302052-A	**Composite Materials**	1 Define & compare composites with traditional materials. 2 Identify & estimate different parameters of the Polymer Matrix Composite 3 Categorize and apply Metal Matrix Process from possessions landscape 4 Determine volume/weight fraction and strength of Composites 5 Select appropriate testing and inspection method for composite materials 6 Select composites materials for various applications
26	TE	302052-B	**Surface Engineering**	1 Define the basic's principle & mechanism of surface degradation. 2 Analyze & select correct corrosion

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				prevention techniques for a different service condition 3 Demonstrate the role of surface engineering of materials to modify/improve the surface properties. 4 Select the suitable surface heat treatments to improve the surface properties 5 Apply the surface modification technique to modify surface properties 6 Analyze & evaluate various surface coating defects using various testing/characterization method
27	**TE**	**302053**	**Measurement Laboratory**	1 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. 2 Analyze strain measurement parameters by taking modulus of elasticity in consideration to acknowledge its usage in failure detection and force variations 3 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.. 4 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. 5 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 6 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

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28	TE	302054	**Fluid power and control laboratory**	1 Define working principle of components used in hydraulic and pneumatic systems. 2 Identify & explain various applications of hydraulic and pneumatic systems. 3 Select an appropriate component required for hydraulic and pneumatic systems using manufactures' catalogues. 4 Simulate & analyze various hydraulic and pneumatic systems for industrial/mobile applications 5 Design a hydraulic and pneumatic system for the industrial applications 6 Design & demonstrate various IOT, PLC based controlling system using hydraulics and pneumatics
29	TE	302055	**Internship/ Mini project**	1 Demonstrate professional competence through industry internship. 2 Apply knowledge gained through internships to complete academic activities in a professional manner. 3 Choose appropriate technology and tools to solve given problem. 4 Demonstrate abilities of a responsible professional and use ethical practices in day to day life. 5 Develop network and social circle, and developing relationships with industry people 6 Analyze various career opportunities and decide career goals
30	TE	302055	**Internship/ Mini project**	1 Explain plan and execute a Mini Project with team. 2 Implement hardware/software/analytical/numerical techniques, etc. 3 Develop a technical report based on the Mini project. 4 Deliver technical seminar based on the Mini Project work carried out.
SEM-I				
31	BE	402041	**Hydraulics and pneumatics**	1 Students should be able to understand basic working principle of hydraulic & pneumatic systems. 2 Students should be able to select appropriate

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				pump required for hydraulic Power transmission. 3 Students should be able to understand working of hydraulic actuatorsand select appropriate hydraulic actuatorsrequired for hydraulic system. 4 Students should be able to understand industrial circuits of hydraulic and pneumatic system. 5 Students should be able to understand operation of different components of pneumatic system. 6 Students should be able to design hydraulic and pneumatic circuit for industrial applications.
32	BE	402042	CAD/CAM Automation	1 Students will be able to understand transformations and its formulation for geometric entities. 2 Students will be able to represent curves in parametric and non parametric form. 3 Student will able to calculate the deflection and stresses induced in the body due to applied force using FEA techniques. 4 Student will be able to generate a part programs for milling and lathe operations. 5 Students will able to understand Rapid prototyping systems. 6 Student will be able to know about basic components of robots and automation.
33	BE	402043	Dynamics of Machinery	1 The students should able to understand static balancing, dynamic balancing and balancing of inline, v engine. 2 The students should able to understand the basic terminology of wavelength, amplitude frequency and resonance. 3 The students should able to understand concepts of single DOF with free undamped/ damped and forced Vibration. 4 The students should able to understand concepts of Two DOF systems with free undamped Vibration. 5 The students should able to understand concepts of working of accelerometer, microphone and FFT analyser instrument. 6 The students should able to understand concepts latest trends in vibration and noise control.

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34	BE	402044 A	Finite Element Analysis	1 Student should be acquainted Basic Procedure of FEA 2 Student should be have with fundamental knowledge of Strength of Materials, Applied Mechanics 3 Student should have knowledge of Numerical Method adopted for FEA solution 4 Student should know fundamentals of Element Matrix Formulation by classical, energy methods 5 Student should be acquainted with solution of strength of material problems using FEA tools 6 Student should have fundamental knowledge of real-life application of FEA tools in various domains such as Stress analysis, thermal analysis
35	BE	402044 C	Heating, Ventilation, Air conditioning and Refrigeration Engineering	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.
36	BE	402045 A	Automobile Engineering	1 Students should have basic understanding of various layouts of power transmission and overview of frame and chassis construction 2 Students will have knowledge about different systems used in automobiles like clutch, transmission system, steering, brakes, suspension systems, Vehicle safety:, etc. should be able to carry out vehicle

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				performance calculations. 3 Students should understand Principles and construction of battery, Electrical system and accessories Types of vehicle maintenance, servicing/overhauling
37	BE	402045 C	**Energy Audit and Management**	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 WHR. Use a CFD tool effectively for practical problems and research
38	BE	402046	**Project work I**	1 Students should be able to demonstrate basic knowledge of design and fabrication of models, machines and prototypes based on new ideas, robot and machines based on advanced systems. 2 Students should able to design the project and develop experimental set up 3 Student should be able to find out real life application of the project
SEM-II				
39	BE	402047	**Energy Engineering**	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 an 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 fundaments of non-conventional power plants 6 Describe the different power plant electrical instruments and basic principles of economics of power generation

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40	BE	402048	Mechanical system design	1 Student should be able to design assemblies of mechanical systems such as machine tool gear box, material handling systems, pressure vessels, and I.C. engine 2 Student should be able to optimize the components based on cost, weight and strength criteria 3 Student should be able to understand the concepts and importance of value engineering, aesthetics, ergonomics in product design.
41	BE	402050 A	Advanced manufacturing processes	1 To analyze and identify applications of special forming processes 2 To analyze and identify applications of advanced joining processes 3 To understand and analyze the basic mechanisms of hybrid non-conventional machining techniques 4 To understand various applications and methods of micro and nano fabrication techniques 5 To understand advanced Additive Manufacturing (AM) technology for innovations in product development 6 To understand various material characterization techniques.
42	BE	402050 B	Solar and Wind Energy	1 Student should be able to understand practical applications of solar energy thermal system. 2 Student should be able to implement procedure to design solar food drier for domestic purpose referring existing system 3 Student should be able to implement procedure to design parabolic dish solar cooker for domestic purpose referring existing system 4 Student should be able to apply basic principle to design solar photo voltaic system for domestic purpose referring existing system 5 Student should be able to understand design consideration of wind energy conversion system. 6 Student should be able to apply basic principle to design miniature wind mill for domestic purpose referring existing system
43	BE	402051	Project Work	1 Students should able present the experimental or simulated data in the form of graphs, charts and interpret the results.

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				2 Students should relate the project for society applications and effect of model/project on the environment
				3 Student should be able to present the project using modern presentation techniques.
				4 To understand the methodology of writing a project report/technical report.
				Students should publish their project work in project competitions ,research
				Journals