



**ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA**



Mechanical Engineering Department

Course Outcomes (COs)

T.E. Mechanical Engineering (2019 Course)

Course Code: 302041	
Name of Course: Numerical & Statistical Methods	
C301.1	SOLVE system of equations using direct and iterative numerical methods.
C301.2	ESTIMATE solutions for differential equations using numerical techniques.
C301.3	DEVELOP solution for engineering applications with numerical integration.
C301.4	DESIGN and CREATE a model using a curve fitting and regression analysis.
C301.5	APPLY statistical Technique for quantitative data analysis.
C301.6	DEMONSTRATE the data, using the concepts of probability and linear algebra.

Course Code: 302042	
Name of Course: Heat & Mass Transfer	
C302.1	Describe basic concepts of heat transfer
C302.2	Discuss a thermal system considering fins, thermal insulation and Transient heat conduction
C302.3	Evaluate the heat transfer rate in natural and forced convection
C302.4	Interpret heat transfer by radiation between objects with simple geometries
C302.5	Understand mass diffusion in different coordinate systems
C302.6	Analyze heat transfer equipment's and investigation of its performance



**ZEAL EDUCATION SOCIETY'S
ZEAL COLLEGE OF ENGINEERING AND RESEARCH
NARHE | PUNE -41 | INDIA**



Course Code: 302043	
Name of Course: Design of Machine Elements	
C303.1	DESIGN AND ANALYZE the cotter and knuckle Joints, levers and components subjected to eccentric loading
C303.2	DESIGN shafts, keys and couplings under static loading conditions.
C303.3	ANALYZE different stresses in power screws and APPLY those in the procedure to design screw jack.
C303.4	EVALUATE dimensions of machine components under fluctuating loads
C303.5	EVALUATE & INTERPRET the stress developed on the different type of welded and threaded joints
C303.6	APPLY the design and development procedure for different types of springs

Course Code: 302044	
Name of Course: Mechatronics	
C304.1	Define the characteristics of transducers, sensors and measuring devices and Interpret the factors that contribute to errors in measurements, such as non-linearity, hysteresis and dead band.
C304.2	Understand and analyze different Data Acquisition System and Make use of interfacing systems such as ADC, DAC, Digital I/O.
C304.3	Understand basic electronics of signal conditioning and Determine the transfer function by using block diagram reduction technique.
C304.4	Evaluate Poles and Zero, frequency domain parameter for mathematical modeling for mechanical system.
C304.5	Illustrate distributed control systems, hierarchical control systems and examine its applications in the process control industry.
C304.6	Develop the concept of PLC system and its ladder programming, and significance of PLC systems in industrial application.



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Course Code: 302045-A	
Name of Course: Elective I (Advanced Forming & Joining Processes)	
C305A.1	Evaluate and identify friction in metal forming and surface defects
C305A.2	Classify various special forming processes and its applications
C305A.3	Analyze and identify the weldability of various materials
C305A.4	Analyze and identify different solid state welding processes and its applications
C305A.5	Identify the suitable advanced welding process for various applications
C305A.6	Identify the role of sustainable manufacturing in manufacturing industry

Course Code: 302045-B	
Name of Course: Elective I (Machining Science & Technology)	
C305B.1	To apply the theory of metal cutting for effective machining.
C305B.2	To understand the gear and thread manufacturing processes.
C305B.3	To explain the working of different machining processes.
C305B.4	To draw the process plan for a given component by selecting appropriate jigs and fixtures.
C305B.5	To study and understand various parameters of process planning.
C305B.6	Utilize CNC Program for various machining processes.

Course Code: 302046	
Name of Course: Digital Manufacturing Laboratory	
C306.1	DEVELOP a component using conventional machines, CNC machines and Additive Manufacturing Techniques
C306.2	ANALYZE cutting tool parameters for machining given job
C306.3	DEMONSTRATE simulation of manufacturing process using Digital Manufacturing Tools.
C306.4	SELECT and DESIGN jigs and Fixtures for a given component
C306.5	DEMONSTRATE different parameters for CNC retrofitting and reconditioning



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Course Code: 302047	
Name of Course: Skill Development	
C307.1	APPLY & DEMONSTRATE procedure of assembly & disassembly of various machines.
C307.2	DESIGN & DEVELOP a working/model of machine parts or any new product.
C307.3	EVALUATE fault with diagnosis on the machines, machine tools and home appliances
C307.4	IDENTIFY & DEMONSTRATE the various activities performed in an industry such as maintenance, design of components, material selection

Course Code: 302049	
Name of Course: Artificial Intelligence & Machine Learning	
C309.1	DEMONSTRATE fundamentals of artificial intelligence and machine learning
C309.2	APPLY feature extraction and selection techniques
C309.3	APPLY machine learning algorithms for classification and regression problems
C309.4	DEVISE AND DEVELOP a machine learning model using various steps
C309.5	EXPLAIN concepts of reinforced and deep learning
C309.6	SIMULATE machine learning model in mechanical engineering problems

Course Code: 302050	
Name of Course: Computer Aided Engineering	
C3050.1	DEFINE the use of CAE tools and DESCRIBE the significance of shape functions in finite element formulations.
C3050.2	APPLY the various meshing techniques for better evaluation of approximate results
C3050.3	APPLY material properties and boundary condition to SOLVE 1-D and 2-D element stiffness matrices to obtain nodal or elemental solution.
C3050.4	ANALYZE and APPLY various numerical methods for different types of analysis.
C3050.5	EVALUATE and SOLVE non-linear and dynamic analysis problems by analyzing the results obtained from analytical and computational method.
C3050.6	GENERATE the results in the form of contour plot by the USE of CAE tools.
Course Code: 302051	



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Name of Course: Design of Transmission Systems	
C3051.1	APPLY the principle of Spur & Helical gear design for industrial application and PREPARE a manufacturing drawing with the concepts of GD&T
C3051.2	EXPLAIN and DESIGN Bevel & Worm gear considering design parameters as per design standards
C3051.3	SELECT&DESIGN Rolling and Sliding Contact Bearings from manufacturer's catalogue for a typical application considering suitable design parameters
C3051.4	DEFINE and DESIGN various types of Clutches, Brakes, used in automobile
C3051.5	APPLY various concept to DESIGN Machine Tool Gear box, for different applications
C3051.6	ELABORATE various modes of operation, degree of hybridization and allied terms associated with hybrid electric vehicles

Course Code: 302052-A	
Name of Course: Elective II (Composite Materials)	
C3052A.1	To define & compare composites with traditional materials
C3052A.2	To identify & estimate different parameters of the polymer matrix composite
C3052A.3	To categories and apply metal matrix process from possessions landscape.
C3052A.4	To determine volume/weight fraction and strength of composites.
C3052A.5	To select appropriate testing and inspection method for composite materials
C3052A.6	To select composites materials for various applications

Course Code: 302052-B	
Name of Course: Elective II (Surface Engineering)	
C3052B.1	DEFINE the basic's principle & mechanism of surface degradation
C3052B.2	ANALYSE & SELECT correct corrosion prevention techniques for a different service condition
C3052B.3	DEMONSTRATE the role of surface engineering of materials to modify/improve the surface properties.
C3052B.4	SELECT the suitable surface heat treatments to improve the surface properties.
C3052B.5	APPLY the surface modification technique to modify surface properties.
C3052B.6	ANALYSE & EVALUTE various surface coating defects using various testing / characterization method



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Course Code: 302053	
Name of Course: Measurement Laboratory	
C3053.1	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
C3053.2	ANALYZE strain measurement parameters by taking modulus of elasticity in consideration to acknowledge its usage in failure detection and force variations
C3053.3	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
C3053.4	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.
C3053.5	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
C3053.6	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

Course Code: 302054	
Name of Course: Fluid Power & Control Laboratory	
C3054.1	DEFINE working principle of components used in hydraulic and pneumatic systems
C3054.2	IDENTIFY & EXPLAIN various applications of hydraulic and pneumatic systems
C3054.3	SELECT an appropriate component required for hydraulic and pneumatic systems using manufactures' catalogues
C3054.4	SIMULATE & ANALYSE various hydraulic and pneumatic systems for industrial/mobile applications
C3054.5	DESIGN a hydraulic and pneumatic system for the industrial applications
C3054.6	DESIGN & DEMONESTRATE various IoT, PLC based controlling system using hydraulics and pneumatics



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Course Code: 302055	
Name of Course: Internship/Mini project	
C3055.1	Understand company organizational structure, products, services, processes, departments, customers, vendors etc.
C3055.2	Apply theoretical knowledge and concepts (as acquired under mechanical engineering program courses) to solve assignments given by company mentor
C3055.3	Identify, formulate and analyze existing engineering problems in industry related to design, manufacturing, procurement, quality, maintenance, research, new product development etc.
C3055.4	Suggest solutions to assigned engineering problems considering health, safety, legal and Environmental standards/requirements.
C3055.5	Understand and demonstrate effective verbal/written communication, listening and Documentation skills.
C3055.6	Demonstrate individual responsibility, participation in teams and management of multiple assignments/projects
C3055.7	Develop and demonstrate professional work habits, attitudes, ethics and behavior