

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

(A Govt. Aided UGC Autonomous & NAAC Accredited Institute Affiliated to RGPV, Bhopal, MP)

MECHANICAL ENGINEERING DEPARTMENT

Flexible Scheme: Course Outcomes (COs) The course outcomes of the courses of 2018 admitted batch from 1st year to 4th year of the undergraduate course of mechanical Engineering Program are given below:

Course	Course Outcomes	
100105: Engineering Graphics	CO1	Visualize the geometric details of engineering objects
	CO2	Translate the geometric information of engineering objects into engineering drawings
	CO3	Draw orthographic projections and sections
	CO4	Develop knowledge to read, understand and explain drawing
	CO5	Improve their skills so that they can apply these skills in developing new products
	CO6	Prepare simple layout of factory, machine and buildings
100106: Manufacturing Practices	CO1	Discuss the hand tools, machine tools and power tools
	CO2	Utilize appropriate tools required for specific operation.
	CO3	Apply safety measures required to be taken while using the tools in floor shops, Machine shops and carpentry shop
	CO4	Use the techniques, skills, and modern engineering tools necessary for manufacturing and production engineering
	CO5	Conduct experiments in the field of Production engineering
	CO6	Design a system, components, or process to meet desired needs, ethical, health and safety, manufacturability and sustainability
100204: Basic Mechanical Engineering	CO1	Define the essential concepts of thermal, design and production used in Mechanical Engineering
	CO2	Summarize fundamental techniques and process used in power generating machines
	CO3	Solve the various problems based on basic concepts of Mechanical Engineering
	CO4	Analyze the various gas, steam and air cycles
	CO5	Evaluate the problems of Steam Generator, Thermodynamics, Steam and I.C. engines
	CO6	Generate the skills to demonstrate steam Generator and reciprocating machine in depth
120301: Material Science	CO1	State the principles of diffusion theory and various types of defects in materials
	CO2	Discuss mechanical properties of materials
	CO3	Compare the different processes to alter the material properties
	CO4	Determine the effect of different phases, impurities on the behavior of materials
	CO5	Analyze crystal structure and composition of different materials
	CO6	Create the different engineering materials and alloys

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120302: Mechanics of Materials-I	CO1	Identify various structural elements and its application
	CO2	Illustrate different types of stress and strain on various types of structural elements like beam, shaft column etc
	CO3	Calculate principal stresses, maximum shearing stress, and the different stresses acting on a structural member.
	CO4	Analyse stresses and deflection for beam, shaft, long columns, thin cylinder etc
	CO5	Select appropriate materials in design considering engineering properties, sustainability, cost and weight
	CO6	Design simple bars, beams, and circular shafts to meet desired needs in terms of strength and deformation
120302(P): Mechanics of Materials-I lab	CO1	Evaluate the values of yield stress, breaking stress and ultimate stress of the given specimen under tension test
	CO2	Conduct the torsion test to determine the modulus of rigidity of given specimen
	CO3	Perform compression tests on spring and wood
	CO4	Justify the Rockwell hardness test over with Brinell hardness and measure the hardness of the given specimen
	CO5	Determine elastic constants using flexural and torsion tests
	CO6	Examine the stiffness of the open coil and closed coil spring and grade them
120303: Theory of Machines-I	CO1	Identify basic mechanisms in real life applications
	CO2	Discuss about mechanics of various machines
	CO3	Apply fundamental principles of statics and dynamics to machinery.
	CO4	Analyse various types of motions and mechanisms of machinery
	CO5	Compare various components suitable for different applications. e.g. different types of governor, clutch, brakes, flywheel etc
	CO6	Create the mechanism or components to justify the demands of work
120303(P): Theory of Machines-I lab	CO1	Design and analyze mechanism required for the specified type of motion
	CO2	Draw inversions and determine velocity and acceleration of different mechanisms
	CO3	Construct different types of cam profile for a given data.
	CO4	Analyze various motion transmission elements like gears, gear trains, cams, belt drive and rope drive.
	CO5	Compare the various components related to machines and mechanism
	CO6	Determine the degrees-of-freedom (mobility) of a mechanism

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120304: Fluid Mechanics and Hydraulic Machines	CO1	Define the fundamental properties of fluids
	CO2	Relate the concepts of mechanics with various laws of fluid mechanics.
	CO3	Identify the laws of fluid mechanics applicable for the body in various fluids under different conditions
	CO4	Analyse various forces and their effects, related to fluids mechanics
	CO5	Measure and compare losses in different fluid flow conditions
	CO6	Compare different turbo machines depending on their behaviour and their merits and demerits
120304(P): Fluid Mechanics and Hydraulic Machines lab	CO1	Experiment with flow measurement devices like venturimeter and orifice meter
	CO2	Estimate the friction and measure the frictional losses in fluid flow.
	CO3	Predict the coefficient of discharge for flow through pipes
	CO4	Evaluate pressure drop in pipe flow using Hagen-Poiseuille's equation for laminar flow in a pipe
	CO5	Calculate the Critical Reynolds's Number through Pipe Set Apparatus
	CO6	Compare the overall efficiency of various types of turbines
120305: Software Lab	CO1	Describe AutoCAD and CATIA toolbars
	CO2	Summarize 2D and 3D commands
	CO3	Solve real time problems using AutoCAD and CATIA software
	CO4	Analyse various mechanical engineering problems
	CO5	Evaluate technical drawings of machine assemblies as a design engineer
	CO6	Generate 2D and 3D solid models with new features in machine elements
120401: Theory of Machines-II	CO1	Identify the motion and the dynamical forces acting on mechanical systems composed of linkages, gears and cams
	CO2	Classify various components of machines like gear, gear train cam etc
	CO3	Solve numerical problems of various components of machines like gear, gear train cam etc
	CO4	Analyze the forces and motion of complex systems of linkages, gears and cams
	CO5	Evaluate the applications of components e.g. gear, gear train, balancing, cam etc. and select appropriate machine elements for the required applications
	CO6	Design the mechanism or components to justify the demands of work such as linkage, cam, gear, gear train mechanism etc

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120401(P): Theory of Machines-II lab	CO1	Identify the kinematic chain and mobility, and perform the kinematic analysis of a given mechanism
	CO2	Analyze various motion transmission elements like gears, gear trains, cams, belt drive and rope drive
	CO3	Determine the degrees-of-freedom (mobility) of a mechanism
	CO4	Apply the fundamental principles of statics and dynamics to machinery
	CO5	Evaluate the dynamic forces for various machines
	CO6	Analyze the fundamentals of machines for desired kinematic or dynamic performance.
120402: Design of Machine Elements	CO1	Describe the basic design process and function of Permanent and temporary joints used in Machine Design
	CO2	Summarize the design techniques, skills and tools used in design
	CO3	Solve the various design engineering problems by formulate and proper assumptions for practice
	CO4	Analyze the stress and strain on mechanical components; and understand, identify and quantify failure modes for mechanical parts
	CO5	Evaluate the cases of Temporary and permanent joints problems successfully
	CO6	Create design techniques for a mechanical component under variety of environmental and service conditions
120402(P): Design of Machine Elements lab	CO1	Design and analysis the different part of an I.C Engine like Piston, cylinder, connecting rod , crank shafts , flywheel
	CO2	Compare the materials used in designing the automobile engine parts
	CO3	Use the software like AUTO CAD , CATIA , PRO/E, SOLID WORKS
	CO4	Select the spring for a proper application also can select the proper material of spring
	CO5	Design the different types of gear like spur gear, helical gear , worm gear , bevel gear and also able to know their practical applications.
	CO6	Create a gear box for modern Automotive vehicles and can use this for the benefits of society.
120403: Manufacturing Processes	CO1	Describe the different types of manufacturing processes and their applications
	CO2	Identify suitable manufacturing process to achieve the required product shape with the aim of avoid defects, material and time wastage
	CO3	Illustrate the advantage and limitations of various manufacturing processes with regard to shape formation and surface quality.
	CO4	Analyse the manufacturing processes for given problem and able to select an appropriate process according to a specific requirement.
	CO5	Evaluate the procedures and techniques involved for the manufacturing of components for its optimization.

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	CO6	Propose a simplified manufacturing processes with the aim of reduction of cost and manpower.
120404: Engineering Thermodynamics	CO1	Define energy interactions between system and surroundings
	CO2	Correlate the law of thermodynamics to real life applications
	CO3	Apply the laws of thermodynamics to analyze boilers, heat pumps, refrigerators, heat engines, compressors and nozzles
	CO4	Investigate the effectiveness of energy conversion device in mechanical power generation
	CO5	Analyze air standard cycles applied in prime movers
	CO6	Describe benefits of improvements to thermodynamic systems
120405: Production Lab	CO1	Define the different conventional method of material removal and function of different parts
	CO2	Apply the theory of metal cutting in experiments
	CO3	Perform step, taper turning, knurling and threading
	CO4	Produce stepped surface using shaper and keyway using milling machine
	CO5	Demonstrate knowledge of different machine tools used in machine shop
	CO6	Evaluate the chip thickness ratio, shear angle and material removal rate
120501: Industrial Engineering	CO1	Analyze and measure productivity
	CO2	Acquire the knowledge and understanding regarding Production planning and controlled required for industry to analyze the engineering problems
	CO3	Utilize the operation research techniques as a problem solving techniques
	CO4	Gives practice through various Management and Operation Tools for Improving Quality and Quantity
	CO5	Solve various kinds of problems or issue faced by service and manufacturing industries like economic consideration, optimum utilization of resources, productivity.
	CO6	Get the solutions for materials requirement planning
120502: Metal Cutting and Machine Tools	CO1	Apply cutting mechanics to metal machining based on cutting force and power consumption
	CO2	Operate lathe, milling machines, drill press, grinding machines, etc
	CO3	Select cutting tool materials and tool geometries for different metals
	CO4	Choose appropriate machining processes and conditions for different metals
	CO5	Optimize parameters for material removal in unconventional machining processes

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	CO6	Identify the process parameters, their effect and applications of different processes
120503: Heat and Mass Transfer	CO1	State principles of heat and mass transfer to basic engineering systems
	CO2	Develop basic concepts of heat transfer, differentiate between heat transfer and thermodynamics, modes of heat transfer (rates) i.e. Conduction, Radiation and convection.
	CO3	Analyze and solve heat transfer problem of conduction, convection and radiation
	CO4	Apply physics of heat transfer in the processes like Condensation and 'Boiling' and in applications like 'Fins' and 'Heat-Exchangers'. Analyze and design heat exchangers
	CO5	Formulate and solve one dimensional conduction with and without heat generation, convection and radiation heat transfer problems
	CO6	Create solution techniques which include both closed form and numerical methods of heat conduction and Convection
120504: Thermal Engineering	CO1	Selection of various types of fuels based on required applications
	CO2	Outlining the basics of Refrigeration and Air conditioning
	CO3	Solve analytical problems of thermal engineering
	CO4	Compare different turbo machines depending on their behaviour and their merits and demerits
	CO5	Select proper fluid machines for appropriate operation
	CO6	Design of various types of combustion chambers for Internal Combustion Engines
120505: Machine Design	CO1	Describe the design procedure used in automotive industry to design the engine parts
	CO2	Classify the different types of spring, bearing and Gears
	CO3	Choose the right strategy for designing the machine components based on material and methods
	CO4	Apply the design procedure for solving and drafting the different design of machine elements
	CO5	Compare the various curves and design procedure used
	CO6	Selection of machine elements under various loading and environmental conditions
120601: Advanced Production Technology	CO1	Illustrate the concepts/components of computer integrated manufacturing and integrate them in a coordinated fashion
	CO2	Demonstrate the machining operations, programming languages and its control system used for solving practical problems of automation based
	CO3	Compare the components of computer integrated manufacturing and integrate them in a coordinated manner

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	CO4	Decide between the various trade-offs when selecting AM processes, devices and materials to suit particular engineering requirements
	CO5	Designing Flexible manufacturing cell after carrying out Group technology study, Automated Material Handling Systems, Automated Inspection Systems and finally creating FMS
	CO6	Knowledge in the broad spectrum of Production Engineering
120611: Vibration and Noise Engineering	CO1	Understand basics of vibration and noise
	CO2	Define the physical systems in to spring-mass-damper systems
	CO3	Use different methods and principles applicable to dynamic systems
	CO4	Determine responses of vibrating systems
	CO5	Analyse the behaviours of physical systems
	CO6	Design the mechanical systems by considering vibration and noise.
120612: Statistical Quality Control	CO1	Draw the histogram, bar charts
	CO2	State various techniques including various variable and attribute control charts
	CO3	Relate mathematical standard plots for defect analysis
	CO4	Justify the life cycle of component on the basis of Reliability and Quality
	CO5	Compare various statistical quality control tools
	CO6	Solve quality-related problems using these SQC tools and methods
120613: Work Study and Ergonomics	CO1	Identify potential and current OH&S hazards in the workplace relating to ergonomics issue
	CO2	Describe relation between human motion and industry
	CO3	Calculate the production capacity of man power of an organization
	CO4	Analyze the level of risk in a job causing stress, fatigue and musculoskeletal disorders and design appropriate work systems
	CO5	Devise appropriate wage and incentive plan for the employees of an organization
	CO6	Design physical and psychosocial work system and work places
120614: Turbo Machinery	CO1	Understand the working principles of rotating machines
	CO2	Describe the velocity triangles, thermodynamic plots and losses in turbo-machinery
	CO3	Demonstrate the knowledge of working, stages, performance characteristics, governing and selection of turbo machinery
	CO4	Analyze energy transfer through graphical and analytical methods in turbo machines
	CO5	Design different type of rotating machines
	CO6	Evaluate the performance characteristics of different kinds of turbo machines

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900101 (OC-1): Robotics	CO1	Understand importance of robotics and its impact on human safety, quality of life, economy, environment, etc.; basics of open-ended type of Robotic manipulators
	CO2	Discuss Kinematics and dynamics of open-ended robotic mechanisms; Fixing frames
	CO3	Ability to formulate , derive, analyse, design and synthesize kinematics and dynamics of open-ended robotic mechanisms
	CO4	Apply detailed concepts relating to various actuators, sensors, and their integration with drives and signal conditioning for robotics
	CO5	Impart knowledge on the basic concepts of measurement, static and dynamic characteristics of measurement systems. control theory and applying them to design and development of robots
900102 (OC-1): Product Design	CO1	Analyze the demands and needs of customers to conceptualize product
	CO2	Describe the different steps involved in the product design
	CO3	Analyze the shortcoming in the product development
	CO4	Identify the opportunities to develop the product
	CO5	Utilize the recourses available in efficient manner for maximum productivity
	CO6	Forecast the impact of product on the surrounding environment
120711: Refrigeration and Air-conditioning	CO1	Understand vapour compression refrigeration system
	CO2	Describe the working principles of air, vapour absorption, thermoelectric and steam-jet refrigeration systems
	CO3	Obtain cooling capacity and coefficient of performance by conducting test on vapor compression refrigeration systems
	CO4	Analyze the basic air conditioning processes on psychometric charts, calculate cooling load for its applications in comfort and industrial air conditioning
	CO5	Develop thermal comfort conditions with respect to temperature and humidity
	CO6	Estimate cooling and heating loads in an air-conditioning system
120712: Basic of Finite Element Analysis	CO1	Understand the basics of finite element formulation
	CO2	Define discrete and continuous models
	CO3	Use variational Formulation of Boundary Value Problems
	CO4	Apply finite element formulations to solve one dimensional Problem
	CO5	Analyse finite element formulations to solve 2D scalar Problems and vector problems
	CO6	Design finite element method to solve problems on Isoparametric element and dynamic Problem

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120713: Metrology, Measurement and Control	CO1	State the basic of standards of measurement, limits, fits & tolerances
	CO2	Compare quality in engineering products
	CO3	Apply the principle of measurement in QC & QA aspects and calibration of measuring instruments
	CO4	Analysis the accuracy in the measurement
	CO5	Evaluate the product quality in manner of dimensional accuracy.
	CO6	Design limit gauges
120714: Total Quality Management	CO1	Discuss about quality measures, Quality control techniques
	CO2	Describe various theories of Total quality management.
	CO3	Determine the cost of poor quality and process effectiveness and efficiency to track performance quality
	CO4	Apply appropriate techniques in identifying customer needs, as well as the quality impact that will be used as inputs in TQM methodologies
	CO5	Evaluate the performance excellence of an organization, and determine the set of performance indicators
	CO6	Enhance management processes, such as benchmarking and business process reengineering
900203: INDUSTRIAL AUTOMATION	CO1	Identify potential areas for automation and justify need for automation
	CO2	Select suitable major control components required to automate a process or an activity
	CO3	Translate and simulate a real time activity using modern tools and discuss the benefits of automation
	CO4	Decide suitable automation hardware for the given application
	CO5	Design appropriate modelling and simulation tool for the given manufacturing application
900204: SOLAR ENERGY	CO1	Define the basic terms used in solar systems and various sun-earth angles
	CO2	Establish the energy balance and develop the thermal model of different solar systems
	CO3	Investigate the effectiveness of utilizing the solar energy by different solar systems
	CO4	Analyze the life cycle cost and other economic aspects of solar systems
	CO5	Describe the application of solar systems and find out the areas of improvement

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900214: ENGINEERING MATERIALS FOR INDUSTRIAL APPLICATIONS	CO1	State the properties of engineering materials
	CO2	Understand the material composition and their effects
	CO3	Classify different engineering material.
	CO4	Discuss the production and fabrication techniques of Engineering Materials
	CO5	Select different types of materials as per requirement.
900215: Maintenance Engineering	CO1	Describe the fundamental concepts of maintenance engineering noise and vibration, measurement techniques of Condition Monitoring
	CO2	Show skills of fault diagnosis
	CO3	Demonstrate the need of instrumentation and signal processing for condition monitoring
	CO4	Examine the condition of machine parts through Failure analysis of plant machineries
	CO5	Apply correct usage of a method or procedure of maintenance