

	ASHOKRAO MANE GROUP OF INSTITUTIONS, VATHAR.	
	Doc. No.: AMGOI-ACAD-FRM-41	Rev. Dt.: 03/08/2015v03
	COURSE PLAN	

Department of Mechanical Engineering

Date: 14/06/2016

Academic Year: 2022-23

Vision of Institute:	To become a globally renowned institute of excellence in technology and management education for rural community
Mission of Institute:	<ul style="list-style-type: none"> • To achieve excellence in technical and management education through effective teaching learning process. • To develop professionals having values of ethics, lifelong learning, teamwork and social responsibility. • To inculcate research and development culture. • To enhance industry-institute interaction. • To empower the rural community. • To implement outcome based education (OBE).
Quality Policy:	We at AMGOI, are committed to impart quality technical education and managerial skills with active involvement of all stakeholders and strive hard for our students' satisfaction by continual improvement and systematic approach.

Vision of Department:	To become a center of excellence in Mechanical Engineering, producing competent, creative, employable and dynamic Mechanical Engineers.
Mission of Department:	<p>M1: To impart fundamental and advanced technology of mechanical engineering to the students.</p> <p>M2: To create an environment for the students to excel in mechanical engineering field, engage in research and development activity participate in professional activities.</p> <p>M3: To prepare the students for team building activities with good communication skills and high ethical standards.</p> <p>M4: To train and motivate the students for lifelong learning, employability and entrepreneurship.</p>

Program Educational Objective (PEOs):

The Program Educational Objectives of Mechanical Engineering Programme, within three to five years of graduation are:

- PEO 1 :-**To impart knowledge of mathematics, basic and applied sciences to tackle complex engineering problems.
- PEO 2 :-**To encourage students for applying their knowledge and skills for problem identification, formulation, analysis and design/ development of solutions to solve real life engineering problems with orientation to industrial sector.
- PEO 3 :-**To prepare the students for necessary professional skills, high ethical standards, effective oral, written communication and team building activities in diverse and multidisciplinary teams.
- PEO 4 :-**To prepare students to excel in their field, participate in professional activities and project management; get updated in current industrial trends so as to engage in research and development activities.
- PEO 5 :-**To provide sufficient training and guidance to students for improving employability, entrepreneurship skills, industrial competency and motivation for lifelong learning.

Programme Outcomes (POs)

Mechanical Engineering graduates will be able to

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
13. **PSO1:** The Mechanical Engineering Graduates will be able to utilize their knowledge in the areas of mechanical design using finite element analysis.
14. **PSO2:** The Mechanical Engineering Graduates will be able to apply their knowledge in thermal engineering fields and green technology.
15. **PSO3:** The Mechanical Engineering Graduates will be able to apply their knowledge in manufacturing technology for realization of mechanical systems.

Consistency of PEOs with Mission of department

PEO Statements	M1	M2	M3	M4
PEO 1: To Impart knowledge of mathematics, basic and applied sciences to tackle complex engineering problems.	3	2	-	-

PEO 2: To encourage students for applying their knowledge and skills for problem identification, formulation, analysis and design/ development of solutions to solve real life engineering problems with orientation to industrial sector.	3	2	-	-
PEO 3: To prepare the students for necessary professional skills, high ethical standards, effective oral, written communication and team building activities in diverse and multidisciplinary teams.	1	2	3	2
PEO 4: To prepare students to excel in their field, participate in professional activities and project management; get updated in current industrial trends so as to engage in research and development activities.	1	3	3	2
PEO 5: To provide sufficient training and guidance to students for improving employability, entrepreneurship skills, industrial competency and motivation for lifelong learning.	-	-	2	3

1=Slight (Low) correlation, 2=Moderate (Medium) correlation, 3=Substantial (High) correlation

Mapping of PEOs with PO

POs →	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
PEO1	3	3	2	2	1	-	-	-	-	1	1	-	1	1	1
PEO2	2	2	2	1	1	-	-	-	-	2	1	1	2	2	2
PEO3	1	1	1	1	-	-	1	3	3	3	1	-	1	1	1
PEO4	1	2	3	2	2	2	2	-	1	2	-	-	2	2	2
PEO5	1	-	-	-	2	-	-	1	-	2	-	3	2	2	2

Course Outcomes of Mechanical Engineering Subjects (S.Y to B.Tech)

(S.Y. ODD)

Machine Drawing and CAD

CO1	Interpret the object with the help of given sectional and orthographic views.
CO2	Construct the curve of intersection of two solids
CO3	Draw machine element using keys, cotter, knuckle, bolted and welded joint
CO4	Assemble details of any given part. i. e. valve, pump, machine tool part etc.
CO5	Represent tolerances and level of surface finish on production drawings
CO6	Understand various creating and editing commands in Auto Cad

Fluid Mechanics

CO1	Define Fluid, define and calculate various properties of fluid.
CO2	Calculate hydrostatic forces on the plane and curved surfaces and explain stability of floating bodies.
CO3	Explain various types of flow. Calculate acceleration of fluid particles.
CO4	Apply Bernoulli's equation to simple problems in fluid mechanics.
CO5	Explain laminar and turbulent flows on flat plates and through pipes.
CO6	Explain and use dimensional analysis to simple problems in fluid mechanics.
CO7	Understand centrifugal pump.

Material science and metallurgy

CO1	Study various crystal structures of materials
CO2	Understand mechanical properties of materials and calculations of using appropriate equation
CO3	Evaluate phase diagrams of various materials
CO4	Suggest appropriate heat treatment process for a given application
CO5	Prepare samples of different materials for metallography
CO6	Recommend appropriate NDT Technique for a given application

Strength of Materials

CO1	State the basic definitions of fundamental terms such as axial load, eccentric load, stress, strain, E , μ , etc
CO2	Recognize the stress state (tension, compression, bending, shear, etc.) and calculate the value of stress developed in the component in axial/eccentric static.
CO3	Distinguish between uniaxial and multiaxial stress situation and calculate principal stresses, max. shear stress, their planes and max. normal.
CO4	Analyze given beam for calculations of SF and BM
CO5	Calculate slope and deflection at a point on cantilever /simply supported beam using double integration, Macaulay's, Area-moment and superposition methods
CO6	Differentiate between beam and column and calculate critical load for a column using Euler's and Rankine's formulae

Basic Human Rights

CO1	Understand the history of human rights
CO2	Learn to respect others caste, religion, region and culture
CO3	Be aware of their rights as Indian citizen.
CO4	Understand the importance of groups and communities in the society
CO5	Realize the philosophical and cultural basis and historical perspectives of human rights
CO6	Make them aware of their responsibilities towards the nation.

(S.Y. EVEN)

Numerical Methods in Mechanical Engineering

CO1	Describe the concept of error
CO2	Illustrate the concept of various Numerical Techniques
CO3	Evaluate the given Engineering problem using the suitable Numerical Technique
CO4	Develop the computer programming based on the Numerical Techniques

Manufacturing Processes-I

CO1	Identify castings processes, working principles and applications and list various defects in metal casting
CO2	Understand the various metal forming processes, working principles and applications
CO3	Classify the basic joining processes and demonstrate principles of welding, brazing and soldering.
CO4	Study center lathe and its operations including plain, taper turning, work holding devices and cutting tool.
CO5	Understand milling machines and operations, cutters and indexing for gear cutting
CO6	Study shaping, planing and drilling, their types and related tooling's

Theory of machine - I

CO1	To explain kinematic behaviour of different machine elements and mechanisms
CO2	To determine velocity and acceleration of various mechanisms.
CO3	To analyze effect of friction based on uniform pressure and wear theory
CO4	To explain types of Clutches, Brakes and Dynamometers.
CO5	To explain types of Cam with followers and select according to their applications.
CO6	To represent force and couple polygon to determine the magnitude of unbalanced force and couple

(T.Y. ODD)

Heat Transfer

CO1	Explain the laws of heat transfer and deduce general heat conduction equation and to explain it for 1-D steady state
CO2	Describe the critical radius of insulation, overall heat transfer coefficient, thermal conductivity and lumped heat transfer
CO3	Interpret the extended surfaces
CO4	Illustrate the boundary layer concept, dimensional analysis, forced and free convection under different conditions
CO5	Describe the Boiling heat transfer, mass transfer and Evaluate the heat exchanger and examine the LMTD and NTU
CO6	Explain the thermal radiation black body, emissivity and reflectivity and evaluation of view factor and radiation shields

Theory of Machines - II

CO1	Students will be able to, identify and select type of belt and rope drive for a particular application
CO2	Students will be able to, evaluate gear tooth geometry and select appropriate gears, gear trains
CO3	Students will be able to, define governor and select/suggest an appropriate governor
CO4	Students will be able to characterize flywheels as per engine requirement
CO5	Students will be able to, understand gyroscopic effects in ships, aero planes, and road vehicles.
CO6	Students will be able to, understand free and forced vibrations of single degree freedom systems

Theory of Machine-II Laboratory

CO1	Students will be able to, identify the various types of gear boxes, gear trains, belt and rope drives
CO2	Students will be able to, interpret physical principles and phenomenon of governor, gyroscopic, flywheel
CO3	Students will be able to, measure vibration parameters in single degree of freedom systems
CO4	Students will be able to, evaluate natural frequency of 1 dof

Renewable Energy Sources

CO1	Explain the difference between renewable and non-renewable energy
CO2	Describe working of solar collectors
CO3	Explain various applications of solar energy
CO4	Describe working of other renewable energies such as wind, biomass , nuclear

Applied Thermodynamics-1

CO1	Define the terms like calorific value of fuel. Calculate minimum air required for combustion of fuel.
CO2	Classify various types of boiler, boiler Draught, used in steam power plant.
CO3	Study and Analyze gas power cycles and vapour power cycles like, carnot and Rankine cycles
CO4	Classify various types of boiler, nozzle, steam turbine and condenser used in steam power plant.
CO5	Draw P-v diagram for single-stage reciprocating air compressor, with and without clearance volume.

Automobile Engineering

CO1	Identify the different parts of the automobile
CO2	Explain the working of various parts like engine, transmission, clutch, brakes etc
CO3	Demonstrate various types of drive systems; front and rear wheels, two and four wheel drive
CO4	Apply vehicle troubleshooting and maintenance procedures
CO5	Analyze the environmental implications of automobile emissions. And suggest suitable regulatory modifications

Machine Design I

CO1	Formulate the problem by identifying customer need and convert into design specification
CO2	Understand component behavior subjected to loads and identify failure criteria
CO3	Analyze the stresses and strain induced in the component
CO4	Design of machine component using theories of failures
CO5	Design of component for finite life and infinite life when subjected to fluctuating load
CO6	Design of components like shaft, key, coupling, screw and spring

Solar Energy

CO1	Describe measurement of direct, diffuse and global solar radiations falling on horizontal and inclined surfaces.
CO2	Analyze the performance of flat plate collector, air heater and concentrating type collector.
CO3	Understand test procedures and apply these while testing different types of collectors.
CO4	Study and compare various types of thermal energy storage systems.
CO5	Analyze payback period and annual solar savings due to replacement of conventional systems.
CO6	Design solar water heating system for a few domestic and commercial applications.

Technical Project for Community Services

CO1	Visit nearby places to understand the problems of the community
CO2	Select one of the problems for the study, state the exact title of the project and define scope of the problem
CO3	Explain the motivation, objectives and scope of the project
CO4	Evaluate possible solutions of the problem
CO5	Design, produce, test and analyze the performance of product/system/process
CO6	Modify, improve the product/system/process

T.Y.(EVEN)

Machine Design

CO1	Define function of bearing and classify bearings.
CO2	Understanding failure of bearing and their influence on its selection.
CO3	Classify the friction clutches and brakes and decide the torque capacity and friction disk parameter.
CO4	Select materials and configuration for machine element like gears, belts and chain
CO5	Design of elements like gears, belts and chain for given power rating
CO6	Design thickness of pressure vessel using thick and thin criteria

Machine Design-II Laboratory

CO1	Apply design process to an open ended problems
CO2	Determine suitable material and size for structural component of machine/system
CO3	Apply iterative technique in design including making estimate of unknown values for first computation and checking or revisiting and re-computing
CO4	Choose logically and defend selection of design factors
CO5	Design of components for given part/system i.e shaft, keys, coupling, links, screws, springs etc.
CO6	Work effectively as a part of design group/team
CO7	Have good communication skill, orally, graphically as well as in writing

Quantitative Techniques in Project Management

CO1	Define and formulate research models to solve real life problems for allocating limited resources by linear programming.
CO2	Apply transportation and assignment models to real life situations
CO3	Apply queuing theory for performance evaluation of engineering and management systems.
CO4	Apply the mathematical tool for decision making regarding replacement of items in real life.
CO5	Determine the EOQ, ROP and safety stock for different inventory models.
CO6	Construct a project network and apply CPM and PERT method.

IC Engine

CO1	Define the various terms of IC Engine. Calculate engine performance.
CO2	Study the combustion in IC and CI engine
CO3	Study of various engine systems (cooling, ignition, lubrication).
CO4	Study of Calculation of engine performance.
CO5	Study of alternating fuels and systems for IC engine.

Applied Thermodynamics-II

CO1	Define the various terms of IC Engine. Calculate engine performance.
CO2	Classify various types of refrigeration systems.
CO3	Study of air conditioning systems.
CO4	Study of various energy sources for power plants
CO5	Study of Thermal, hydro electrical, Gas turbine power plant and Diesel power plant.

Manufacturing Process II

CO1	Understand the process of powder metallurgy and its applications
CO2	Calculate the cutting forces in orthogonal and oblique cutting
CO3	Evaluate the machinability of materials
CO4	Understand the abrasive processes
CO5	Explain the different precision machining processes
CO6	Understanding plastic

B.TECH (ODD)

Project Stage - I

CO1	State the exact title of the project and problem definition
CO2	Explain the motivation, objectives and scope of the project
CO3	Review the literature related to the selected topic of the project
CO4	Design the mechanism, components of the system and prepare detailed drawings.
CO5	Evaluate the cost considering different materials/manufacturing processes

Refrigeration and Air Conditioning

CO1	To understand basics of refrigeration and air conditioning.
CO2	To study various refrigeration and air conditioning systems.
CO3	To study refrigerants used, different refrigeration equipment.
CO4	To perform heating and cooling load calculations.

Wind Energy

CO1	Understand historical applications of wind energy
CO2	Understand and explain wind measurements and wind data
CO3	Determine Wind Turbine Power, Energy and Torque
CO4	Understand and explain Wind Turbine Connected to the Electrical Network AC and DC
CO5	Understand economics of wind energy

CAD CAM

CO1	List and describe the various input and output devices for a CAD work station
CO2	Carry out/calculate the 2-D and 3-D transformation positions. (2-D and 3-D transformations)
CO3	Describe various CAD modeling techniques with their relative advantages and limitations
CO4	Develop NC part program for the given component, and robotic tasks
CO5	Describe the basic Finite Element procedure
CO6	Explain various components of a typical FMS system, Robotics, GT,CAPP & CIM

Mechatronics

CO1	Define sensor, transducer and understand the applications of different sensors and transducers
CO2	Explain the signal conditioning and data representation techniques
CO3	Design pneumatic and hydraulic circuits for a given application
CO4	Write a PLC program using Ladder logic for a given application
CO5	Understand applications of microprocessor and micro controller
CO6	Analyse PI, PD and PID controllers for a given application

CAD CAM LAB

CO1	Construct CAD part models, assembly model and drafting of machine elements using CAD
CO2	Evaluate stresses in components subjected to structural loading using FEA software
CO3	Write NC programs for turning and milling
CO4	Describe case study of industrial robots

Manufacturing Processes - III

CO1	Differentiate clearly between NC and CNC machines
CO2	Prepare and execute a part program for producing a given product
CO3	Select appropriate non-traditional machining process for a given application
CO4	Compare different surface coating techniques
CO5	Explain different rapid prototyping techniques
CO6	Illustrate the working principle of various micro-manufacturing processes

Manufacturing Processes Lab -II

CO1	Study of types of chips
CO2	Explain Manufacturing Processes
CO3	To develop a manual part program of a given component on CNC Lathe using G and M codes.
CO4	examine the effect of parameters on MRR and TWR in Electro Discharge Machining (EDM)
CO5	Demonstration on Wire-EDM
CO6	Industrial visit to study manufacturing practices
CO1	To make the students aware of industrial culture and organizational setup
CO2	To create awareness about technical report writing among the student.

B.TECH (EVEN)

Project Stage - II

CO1	State the aim and objectives for this stage of the project
CO2	Construct and conduct the tests on the system/product
CO3	Analyze the results of the tests.
CO4	Discuss the findings, draw conclusions, and modify the system/product.

Fundamentals of Automotive Systems

CO1	Acquire fundamental knowledge of the various systems of an automobile,
CO2	Associate the functions of each system with its design and layout,
CO3	Depict the various systems using simple schematics, and
CO4	Apply concepts learnt in core undergraduate courses to synthesize mathematical model.