

Walchand Institute of Technology, Solapur.

Mechanical Engineering Department

Vision

- To produce world class globally competent distinguished graduates/ post graduates/ doctoral, Mechanical Engineers on the basis of their capabilities, dedication and work ethic and continuously strive towards societal development

Mission

- To impart quality Mechanical Engineering education in accordance with the needs of the society.
- To produce globally competent Mechanical Engineers through research, industry institute interaction.
- To help Mechanical Engineering graduates to implement their acquired engineering knowledge for society and community development.

Program Educational Objectives (PEOs)

1. Graduate will excel in professional career in Mechanical and allied interdisciplinary areas.
2. Graduate will exhibit strong fundamentals required to pursue higher education and continue professional development in Mechanical and other fields.
3. Graduate will adhere to professional ethics, develop team spirit and effective communication skills to be successful leaders with a holistic approach.
4. Graduate will be sensitive to ethical, societal and environmental issues while serving at their professional work.

Program Outcomes:

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.

Program Specific Outcomes:

1. Graduate will be able to design and develop mechanical equipments, devices and contrivances that would be able serve the society in a sustainable manner.
2. Graduate will be able to handle the problems associated with manufacturing of goods using latest technology and tools while ensuring productivity, quality and economy.
3. Graduate will be able to analyze complex problems related to IC engines, RAC equipments, Turbo Machines for improvement of performance.

Course Outcome

S. Y. B. Tech Mechanical –I

ME211 Applied Thermodynamics

ME211.1 At the end of this course, the students will be able to apply knowledge of mathematics and science to solve real thermodynamics problems.

ME211.2 At the end of this course, the students will be able to evaluate performance of mechanical devices like boiler, compressor, steam turbine, etc.

ME211.3 At the end of this course, the students will be able to apply knowledge of basic thermodynamic concepts for analysis of vapour power cycles

ME211.4 At the end of this course, the students will be able to apply knowledge of thermodynamics concepts for analysis of flow of steam nozzles and steam condensers.

ME212 Mechanics of Materials

ME212.1 At the end of this course, students will be able to apply the concepts of stress & strain in simple & compound bars, the importance of principal stresses and principal planes.

ME212.2 At the end of this course, students will be able to Compute & draw Shear Force and Bending Moment diagrams, stress distribution due to SF & BM for determinate beams also determine slope and deflection for various loading conditions.

ME212.3 At the end of this course, students will be able to apply the basic equations of simple torsion in designing shafts and strain energy to solve the problems.

ME213 Manufacturing Processes

ME 213.1 At the end of this course, the students will be able to select appropriate manufacturing process for a given component..

ME213.2 At the end of this course, the students will be able to understand performance of each process.

ME213.3 At the end of this course, the students will be able to prepare manufacturing plan for the given component.

Course Outcome

ME214 Machine Drawing & CAD

ME214.1 At the end of this course, students will be able to create drawings as per BIS standards

ME214.2 At the end of this course, students will be able to apply technique for assembly drawing from the detail/components

ME214.3 At the end of this course, students will be able to incorporate limits, fits and tolerances for components on the working/engineering drawings

ME214.4 At the end of this course, students will be able to become familiar in using drafting software.

ME 215 Internal Combustion Engines

ME215.1 At the end of this course, students will be able to recognize and understand the reasons for differences in the construction of different types of internal combustion engines.

ME215.2 At the end of this course, students will be able to understand the reasons for differences among operating characteristics of different engine types and designs

ME215.3 At the end of this course, students will be able to select the appropriate engine for a given application.

ME215.4 At the end of this course, students will be able to conduct performance tests on engines and Compare experimental results with Theoretical Predictions.

ME215.5 At the end of this course, students will be able to compare experimental results with theoretical predictions and make proper justifications.

MEV21 Environmental Sciences

MEV21.1 At the end of this course, the student will be able to describe the natural environment and its relationships with human activities.

MEV21.2 At the end of this course, students will be able to explain the ethical means and technological methods for sustainable management of environmental systems.

MEV21.3 At the end of this course, students will be able to explain social, economical and legal policies involved in the resolution of environmental problems.

Course Outcome

S. Y. B. Tech Mechanical –II

ME221 Engineering Mathematics –III

ME221.1 At the end of this course, students will be able to, solve partial differential equation of first order

ME221.2 At the end of this course, students will be able to, express a function in terms of sine and cosine components so as to model simple periodic functions.

ME221.3 At the end of this course, students will be able to use numerical methods for evaluating definite integrals.

ME221.4 At the end of this course, students will be able to use numerical methods for solving linear and non-linear equations.

ME221.5 At the end of this course, students will be able to sketch and explain various probability distribution functions.

ME 222 Manufacturing Technology

ME222.1 At the end of this course, students will be able to exhibit knowledge of conventional, unconventional & modern machining processes and machine tools.

ME222.2 At the end of this course, students will be able to select proper manufacturing process for the typical application.

ME223 Fluid Mechanics & Fluid Machines

ME223.1 At the end of this course, the student will be able to solve problems related to fluid statics and kinematics.

ME223.2 At the end of this course, the student will be able to solve problems related to fluid dynamics.

ME223.3 At the end of this course, students will be able to select/design centrifugal pumps and water turbines.

ME224 Kinematics & Theory of Machines

ME224.1 At the end of this course, students will be able to describe the basics of mechanisms and power transmission devices, balancing of rotary masses.

Course Outcome

ME224.2 At the end of this course, students will be able to construct & determine velocity and acceleration diagram of links in mechanisms & cam profiles for various types of follower motions.

ME224.3 At the end of this course, students will be able to apply the principles of gyroscopic effects and stabilization on various transport vehicles and applications of various governors & brakes.

ME 225 A Mechatronic Systems

ME225A.1 At the end of this course, students will be able to explain mechatronic terminology

ME225A.2 At the end of this course, students will be able to explain types and applications of sensors and actuators in mechatronic systems.

ME225A.3 At the end of this course, students will be able to explain latest trends in industrial mechatronics such as IOT, industry 4.0

ME225A.4 At the end of this course, students will be able to program PLCs using ladder logic (both on simulators and actual hardware).

ME225A.5 At the end of this course, students will be able to Build and program a mechatronic system which will accept data from input and sensors and control an output/actuator using any microprocessor/ microcontroller board (Arduino or Raspberry Pi can also be used)

ME 225 B Power Plant Engineering

ME225B.1 At the end of this course, students will be able to describe sources of energy and types of power plants.

ME225B.2 At the end of this course, students will be able to define terms and factors associated with power plant performance and power plant economics.

ME225B.3 At the end of this course, students will be able to understand basic characteristics of renewable sources of energy and technologies for their utilization

MEV22 Environmental Sciences

MEV21.1 At the end of this course, the student will be able to describe the natural environment and its relationships with human activities.

Course Outcome

MEV21.2 At the end of this course, students will be able to explain the ethical means and technological methods for sustainable management of environmental systems.

MEV21.3 At the end of this course, students will be able to explain social, economical and legal policies involved in the resolution of environmental problems.

Course Outcome

T.E. Mechanical-I

ME311 Theory of Machine –II

ME311.1 At the end of this course, the student will be able to select gear & design gear trains as per requirement.

ME311.2 At the end of this course, the student will be able to design flywheel for various applications & judge the effect of gyroscopic couple on different vehicles.

ME311.3 At the end of this course, the student will be able to solve the issues related to balancing & vibration.

ME312 Metrology and Mechanical Measurement

ME312.1 At the end of this course, the student will be able to understand the design & construction of measuring instruments.

ME312.2 At the end of this course, the student will be able to setup the Instruments & accessories for measurement of properties by avoiding errors.

ME312.3 At the end of this course, the student will be able to calibrate the simple instruments using more accurate standards.

ME312.4 At the end of this course, the student will be able to use the instruments for various industrial applications such as quality control, process control etc.

ME313 Metallurgy

ME313.1 At the end of this course, the student will be able to demonstrate relevance of principles of physical Metallurgy and its significance.

ME313.2 At the end of this course, the student will be able to apply knowledge regarding selection of ferrous materials for engineering applications.

ME313.3 At the end of this course, the student will be able to get acquainted with various Non-ferrous alloys & advanced materials for selection & applications.

ME313.4 At the end of this course, the student will be able to demonstrate the significance of heat treatment processes and their applications in the field of Automotive and Machine tool industries.

ME313.5 At the end of this course, the student will be able to apply their knowledge regarding selection of suitable testing method for identifying the suitable mechanical properties.

Course Outcome

ME313.6 At the end of this course, the student will be able to understand the significance of Powder metallurgy for manufacturing of products.

ME314 Machine Design –I

ME314.1 At the end of this course, the student will be able to work on selecting proper material for mechanical components.

ME314.2 At the end of this course, the student will be able To study design process.

ME314.3 At the end of this course, the student will be able to carry out design of Mechanical Components such as springs, shafts.

ME314.4 At the end of this course, the student will be able to conduct analysis of temporary and permanent joints

ME314.5 At the end of this course, the student will be able to carry out estimation of endurance strength and calculation of the fatigue life of the mechanical component.

ME314.6 At the end of this course, the student will be able to practice the standardization in design of machine elements.

ME 315 C Fluid Machinery & Fluid Power

ME315C.1 At the end of this course, the student will be able to classify turbines and pumps. Select/design water turbines, gas turbines & centrifugal pumps to meet the specific requirements..

ME315C.2 At the end of this course, the student will be able to draw velocity triangles for turbines and pumps.

ME315C.3 At the end of this course, the student will be able to analyze different components of hydraulic and pneumatic systems.

ME315C.4 At the end of this course, the student will be able to construct different hydraulic & pneumatic circuits needed for different applications.

SLH31 Self Learning Course I –HSS

SLH31.1 At the end of this course, the student will be able to describe the environmental aspects of non-conventional energy resources in comparison with various conventional energy systems, their prospects and Limitations.

Course Outcome

SLH31.2 At the end of this course, the student will be able to understand various renewable energy technologies and systems.

SLH31.3 At the end of this course, the student will be able to compare the advantages and disadvantages of various renewable energy technologies and propose the best possible energy conversion system for a particular location.

SLH31.4 At the end of this course, the student will be able to recognize the need and ability to engage in lifelong learning for further developments in this field.

ME316 Advanced Computer Programming –I

ME316.1 At the end of this course, the student will be able to install JAVA IDE & develop simple applications using JAVA.

ME316.2 At the end of this course, the student will be able to read from and write to text and excel files and debug errors.

ME316.3 At the end of this course, the student will be able to write JAVA applet for windows based applications such as Word & Excel and JAVA scripts for CAD software such as CATIA & AutoCAD.

ME316.4 At the end of this course, the student will be able to develop a small JRE based application or applet for a mechanical engineering subject.

ME317 Workshop Practices –IV

ME317.1 At the end of this course, the student will be able to create confidence amongst the students in Production / manufacturing activities.

ME317.2 At the end of this course, the student will be able to students should get experience about manual skills required to perform machining operations.

ME317.3 At the end of this course, the student will be able to create confidence in students while designing limits, fits & tolerances during manufacturing.

ME317.3 At the end of this course, the student will be able to create awareness in students regarding time management, work study, method study & tool engineering.

Course Outcome

T.E. Mechanical-II

ME321 Heat and Mass Transfer

ME321.1 At the end of this course, the student will be able to demonstrate an understanding of the basic concepts of conduction, radiation and convection heat transfer.

ME321.2 At the end of this course, the student will be able to demonstrate an understanding of the concept of conservation of energy and its application to problems involving conduction, radiation, and/or convection heat transfer. This principle will be used to formulate appropriate mathematical models and associated thermal boundary conditions.

ME321.3 At the end of this course, the student will be able to demonstrate the ability to formulate practical conduction heat transfer problems by transforming the physical system into a mathematical model, selecting an appropriate solution technique and evaluating the significance of results.

ME321.4 At the end of this course, the student will be able to demonstrate the ability to formulate practical forced and natural conduction heat transfer problems by transforming the physical system into a mathematical model, selecting an appropriate solution technique and evaluating the significance of results. Students will also demonstrate an ability to analyze the performance.

ME322 Internal Combustion Engine

ME322.1 At the end of this course, the student will be able to recognize and understand the reasons for differences in the construction of different types of internal combustion engines.

ME322.2 At the end of this course, the student will be able to understand the reasons for differences among operating characteristics of different engine types and designs

ME322.3 At the end of this course, the student will be able to select the appropriate engine for a given application.

ME322.4 At the end of this course, the student will be able to conduct performance tests on engines and Compare experimental results with Theoretical predictions.

ME322.4 At the end of this course, the student will be able to compare experimental results with theoretical predictions and make proper justifications.

Course Outcome

ME323 CAD-CAM & CAE

ME323.1 At the end of this course, the student will be able to relate CAD applications to industry problems including Geometric modeling and advanced manufacturing technology.

ME323.2 At the end of this course, the student will be able to analyze Geometric transformations and FEA applications to 1D component.

ME323.3 At the end of this course, the student will be able to handle CAM related problems from industry and develop CNC part program.

ME324 Machine Design –II

ME324.1 At the end of this course, the student will be able to identify various modes of gear failure

ME324.2 At the end of this course, the student will be able to design various transmission system elements like spur, helical, bevel and worm gears, etc.

ME324.3 At the end of this course, the student will be able to explain different codes for design of gears and pressure vessels.

ME324.4 At the end of this course, the student will be able to provide optimum design of simple machine elements such as shaft

ME324.5 At the end of this course, the student will be able to select bearing from Manufacturer's catalogue

ME324.6 At the end of this course, the student will be able to implement the knowledge for design of a gear box and pressure vessel.

ME325 C Tool engineering

ME325C.1 At the end of this course, the student will be able to do the calculations involved in the mechanics & economics of operations.

ME325C.2 At the end of this course, the student will be able to design & draw the tools & tooling for the given situation & operation..

ME325C.3 At the end of this course, the student will be able to conceive & develop solutions, devices, contrivances to overcome present problems of the real world.

Course Outcome

ME 327 Advanced Computing Techniques'-II

ME327.1 At the end of this course, the student will be able to solve mathematical problems using Scilab and Plot 2D and 3D curves for mathematical problems.

ME327.2 At the end of this course, the student will be able to write Scilab code for various statistical applications.

ME327.3 At the end of this course, the student will be able to write Scilab Code for simple Image processing problems.

ME327.4 At the end of this course, the student will be able to use Scicos to solve simple transfer function control problems.

ME 328 Workshop Practice –V

ME328.1 At the end of this course, the student will be able to create confidence amongst the students in Production / manufacturing activities.

ME328.2 At the end of this course, the student will be able to get experience about manual skills required to perform machining operations.

ME328.3 At the end of this course, the student will be able to create confidence in students while designing limits, fits & tolerances during manufacturing.

ME328.4 At the end of this course, the student will be able to create awareness in students regarding time management, work study, method study & tool Engineering

Course Outcome

B.E. Mechanical-I

ME411 Automatic Control Engineering

ME411.1 At the end of this course, the student will be able to Formulate mathematical model for different types of control systems.

ME411.2 At the end of this course, the student will be able to compose the systems with the help of block diagram reduction rules to obtain closed loop transfer function.

ME411.3 At the end of this course, the student will be able to examine the modes of control in accordance with output of control system.

ME411.4 At the end of this course, the student will be able to analyze transient response of the systems, steady state condition and characteristics of a system when it is in equilibrium state.

ME411.5 At the end of this course, the student will be able to analyze root locus diagram, Bode plot and discuss stability of mechanical system.

ME411.6 At the end of this course, the student will be able to evaluate state space techniques for representing control systems.

ME412 Refrigeration and Air Conditioning

ME412.1 At the end of this course student will be able to explain Basic Refrigeration Processes

ME412.2 At the end of this course student will be able to analyze and Calculate Performance of Refrigeration Systems

ME412.3 At the end of this course student will be able to select proper Refrigerant for specific application

ME412.4 At the end of this course student will be able to define and Calculate Psychometric properties of air using chart and tables

ME412.5 At the end of this course student will be able to decide and Analyze Psychometric process for obtaining required air conditions

ME412.6 At the end of this course student will be able to explain Comfort chart and factors affecting human comfort.

ME412.7 At the end of this course student will be able to design Air distribution System.

Course Outcome

ME413 Operations Research

ME413.1 At the end of this course, the student will be able to knowledge of basic optimization process and OR models.

ME413.2 At the end of this course, the student will be able to apply various optimization techniques to industrial applications.

ME413.3 At the end of this course, the student will be able to develop a project plan for the industry or organization.

ME414B Production and Operational Management

ME414B.1 At the end of this course, the student will be able to explain importance, scope and need of production and operation management.

ME414B.2 At the end of this course, the student will be able to evaluate the future demands using different forecasting methods.

ME414B.3 At the end of this course, the student will be able to apply the concept of capacity planning and aggregate planning to various types of manufacturing systems.

ME414B.4 At the end of this course, the student will be able to explain the importance of production planning and control, and inventory management in production process and its elements.

ME414B.5 At the end of this course, the student will be able to apply the concept of plant maintenance.

ME414B.6 At the end of this course, the student will be able to analyze/Determine the applications of various advanced techniques such as value engineering, six sigma, Kanban, computer aided production management, etc.

ME414C Automobile Engineering

ME414C.1 At the end of this course, the student will be able to demonstrate & explain various systems in an automobile

ME414C.2 At the end of this course, the student will be able to describe importance and features of different elements like axle, differential, brakes, steering, suspension, wheel balancing etc.

Course Outcome

ME414C.3 At the end of this course, the student will be able to explain principle of operation, construction and applications of various sensors used in modern automobile and understand electric vehicles, hybrid electric vehicles and solar.

ME415A Industrial Robotics

ME415A.1 At the end of this course, the student will be able to solve simple kinematics and dynamics problems on robot motion.

ME415A.2 At the end of this course, the student will be able to select appropriate robot specifications for industrial applications.

ME415.3 At the end of this course, the student will be able to use Matlab (or equivalent) toolboxes to demonstrate machine vision concepts.

ME415.4 At the end of this course, the student will be able to use any robot simulation software to simulate a robot and its work cell.

ME416 Project Work –I

ME416.1 At the end of this course, the student will be able to analyze the Project Problem with schematic diagram

ME416.2 At the end of this course, the student will be able to write mathematical model of the Project Problem.

ME417 Industrial Training

ME417.1 At the end of this course, the student will be able to understand the Industrial culture & Organizational setup.

ME417.2 At the end of this course, the student will be able to correlate theoretical knowledge with the actual in Industry.

ME417.3 At the end of this course, the student will be able to correlate theoretical knowledge with the actual in Industry.

ME417.4 At the end of this course, the student will be able to Responsibility and role of engineer in Industry.

Course Outcome

B.E. Mechanical-II

ME421 Industrial Engineering

ME421.1 At the end of this course, the student will be able to analyze & measure productivity.

ME421.2 At the end of this course, the student will be able to perform method study and work measurement etc.

ME421.3 At the end of this course, the student will be able to develop improved method of working/process for manufacturing /service sector.

ME422 Industrial and Quality Management

ME422.1 At the end of this course, the student will be able to describe and explain various management functions.

ME422.2 At the end of this course, the student will be able to enlist general principles of management and apply them in practice.

ME422.3 At the end of this course, the student will be able to describe concepts related to total quality management

ME422.4 At the end of this course, the student will be able to enumerate different statistical quality control tools and apply them for quality management.

ME423B Mechatronics

ME423B.1 At the end of this course, the student will be able to recall applications of sensors and actuators in mechatronic systems.

ME423B.2 At the end of this course, the student will be able to program 8085 and 8051 in assembly language (and C/C++, Python) to demonstrate interfacing with sensors and actuators.

ME423B.3 At the end of this course, the student will be able to program PLCs using ladder logic (both on simulators and actual hardware).

ME423B.4 At the end of this course, the student will be able to build and program a mechatronic system which will accept data from input and sensors and control an output/actuator using any microprocessor/ microcontroller board (Arduino or Raspberry Pi can also be used)