

RAMCO INSTITUTE OF TECHNOLOGY

Department of Mechanical Engineering

Course Outcomes

Semester / Year, Branch: 01-08, I-IV, B.E. Mechanical Engineering

Regulations: 2021

I Year (Odd Semester)

C101:1HS3152 Professional English -I, Year of Study 2023-2024

C101.1	Communicate clearly both in written and oral forms using appropriate vocabulary and comprehend written text to make inferences.
C101.2	Speak persuasively in academic/work contexts and write biographical details and technical documents cohesively, coherently, and flawlessly using appropriate words.
C101.3	Read, write and speak effectively in a variety of professional and social settings.
C101.4	Comprehend descriptive, narrative, expository and interpretive texts and write using creative, critical, analytical, and evaluative methods.
C101.5	Understand and respond to different spoken and written discourses/excerpts in different accents and write different genres of text adopting various writing strategies.
C101.6	Detect paralinguistic cues such as postures, gestures, facial expressions, and eye contact.

C102: MA3151 Matrices and Calculus, Year of Study 2023-2024

C102.1	Use the matrix algebra methods for solving practical problems.
C102.2	Apply differential calculus tools in solving various application problems.
C102.3	Use differential calculus ideas on several variable functions.
C102.4	Apply different methods of integration in solving practical problems.
C102.5	Apply multiple integral ideas in solving areas, volumes and other practical problems.
C102.6	Use MATLAB for finding eigenvalues of a Matrix, derivative and integration of functions.

C103: PH3151 Engineering Physics, Year of Study 2023-2024

C103.1	Understand the importance of mechanics.
C103.2	Express their knowledge in electromagnetic waves.
C103.3	Demonstrate strong foundational knowledge in oscillations, optics and lasers.
C103.4	Understand the importance of quantum physics.
C103.5	Comprehend and apply quantum mechanical principles towards the formation of energy bands.

C104: CY3151 Engineering Chemistry, Year of Study 2023-2024

C104.1	Illustrate the importance of water quality parameters, water treatment methods and boiler troubles for domestic and industrial use.
C104.2	Explain the types of nanomaterials, synthesis and its applications in modern day devices.
C104.3	Apply the use of phase rule in metallurgy and describe the basics of composites and its industrial applications.
C104.4	Articulate the fuel types, synthesis and its combustion characteristics
C104.5	Portray the working principle of alternate energy resources, storage devices and their application in electric vehicles and the impacts of carbon footprint.
C104.6	Analyze the water quality parameters of water samples collected in and around the native area

C105: GE3171 Problem solving and Python Programming, Year of Study 2023-2024

C10.1	Develop algorithmic solutions to simple computational problems
C105.2	Develop and execute simple Python programs.
C105.3	Apply control structures, functions and string to write simple program for solving problems.
C105.4	Use Python data structures - lists, tuples, dictionaries to represent complex data.
C105.5	Illustrate read and write data from/to files in Python programs.

C106 (L) : BS3171 Problem solving and Python Programming, Year of Study 2023-2024

C106.1	Develop diagrammatic solutions to simple computational problems
C106.2	Develop and execute simple Python programs.
C106.3	Implement simple python programs using control structures, functions and strings
C106.4	Use python lists, tuples, sets and dictionaries to represent complex data for solving real life problems.
C106.5	Utilize Python packages, file operations in developing software applications.

C107 (L) : GE3172 Physics and Chemistry Laboratory, Year of Study 2023-2024

C107.1	Understand the functioning of various physics laboratory equipment.
C107.2	Use graphical models to analyze laboratory data.
C107.3	Use mathematical models as a medium for quantitative reasoning and describing physical reality.
C107.4	Access, process and analyze scientific information.
C107.5	Solve problems individually and collaboratively.

C108 (L) : English Laboratory , Year of Study 2023-2024

C108.1	Listen and comprehend complex academic texts
C108.2	Speak fluently and accurately in formal and informal communicative contexts
C108.3	Respond to and express opinions effectively in Oral mediums of communication such as debates, Group Discussions, classroom discussions.

C108.4	Differentiate among various types of listening and adopt various speaking strategies to present on different topics or excerpts.
C108.5	Identify paralinguistic cues such as postures, gestures, facial expressions, and eye contact and speak effectively in debates and discussions.

I Year (Even Semester)

C109 : HS3252 Professional English - II, Year of Study 2023-2024

C109.1	Compare and contrast products and ideas in technical texts and write relevant texts.
C109.2	Identify and report cause and effects in events, industrial processes through technical texts.
C109.3	Analyse problems in order to arrive at feasible solutions and communicate them in the written format
C109.4	Present their ideas and opinions in a planned and logical manner.
C109.5	Draft effective resumes in the context of job search.
C109.6	Detect paralinguistic cues such as postures, gestures, facial expressions, and eye contact.

C110 : MA3251 Statistics and Numerical Methods, Year of Study 2023-2024

C110.1	Apply the concept of testing of hypothesis for small and large samples in real life problems.
C110.2	Apply the basic concepts of classifications of design of experiments in the field of designing engineering problems.
C110.3	Apply the numerical techniques for solving algebraic, transcendental equations, system of linear equations and eigenvalue problems.
C110.4	Make use the numerical techniques of interpolation in various intervals and apply the numerical techniques of differentiation and integration for engineering problems
C110.5	Apply the knowledge of various techniques and methods for solving first order ordinary differential equations with initial and boundary conditions in engineering problems.
C110.6	Demonstrate the usage of MATLAB Software for solving algebraic and transcendental equations and Numerical Integration.

C111: PH3251 Materials Science, Year of Study 2023-2024

C111.1	At the end of the course, the students should be able to Know basics of crystallography and its importance for varied materials properties
C111.2	Gain knowledge on the electrical and magnetic properties of materials and their applications
C111.3	Understand the optical properties of materials and working principles of various optical devices
C111.4	Appreciate the importance of functional nanoelectronic devices.

C112: BE3251 Basic Electrical and Electronics Engineering, Year of Study 2023-2024

C112.1	Calculate the electric circuit parameters for simple problems.
C112.2	Explain the construction, working principle and applications of various electrical machines.
C112.3	Draw the characteristics of analog electronic devices.
C112.4	Discuss the basic concepts of digital electronics.
C112.5	Describe the operating principles of measuring instruments.

C113: GE3251 Engineering Graphics, Year of Study 2023-2024

C113.1	Construct the conic sectional curves, cycloidal and involute curves.
C113.2	Solve practical problems involving projection of lines.
C113.3	Construct the projection of simple solids and free hand sketches of multiple views from pictorial views of objects.
C113.4	Sketch the Section of Solids and Development of lateral Surfaces of solids.
C113.5	Illustrate the isometric and perspective projections of simple solids.
C113.6	Sketch the real components of machine / building / circuit drawing based on the basic concept learned from the topics.

C114: GE3271 Engineering Practices Laboratory, Year of Study 2023-2024

C114.1	Draw pipe line plan; lay and connect various pipe fittings used in common household plumbing work; Saw; plan; make joints in wood materials used in common household wood work.
C114.2	Construct various electrical joints in common household electrical wire work.
C114.3	Perform welding various joints in steel plates using arc welding work; Machine various simple processes like turning, drilling, tapping in parts; Assemble simple mechanical assembly of common household equipments; Make a tray out of metal sheet using sheet metal work.
C114.4	Perform soldering and test simple electronic circuits; Assemble and test simple electronic components on PCB.
C114.5	Demonstrate assemble and dismantle of LED TV and computer/ laptop components.
C114.6	Attempt to fabricate any useable households using carpentry, welding and sheet metal
C114.7	Model a circuit design using passive and active component in virtual lab.

C115: BE3271 Basic Electrical and Electronics Engineering Laboratory, Year of Study 2023-2024

C115.1	Use experimental methods to verify the Ohms law and Kirchhoff's law.
C115.2	Display load characteristics of various electrical machines by conducting suitable experiment
C115.3	Trace the characteristics of basic electronic devices
C115.4	Build and test Half wave and Full wave rectifier circuits
C115.5	Implement and test the Binary adder and subtractors circuit
C115.6	Use DSO to measure the various parameters

C116: GE3272 Communication Laboratory /Foreign Language, Year of Study 2023-2024

C116.1	Speak effectively in group discussions held in a formal / semi-formal context
C116.2	Discuss, analyse and present concepts and problems from various perspectives to arrive at suitable solutions
C116.3	Write emails, letters and effective job applications
C116.4	Write critical reports to convey data and information with clarity and precision
C116.5	Give appropriate instructions and recommendations for safe execution of tasks
C116.6	Identify paralinguistic cues such as postures, gestures, facial expressions, and eye contact and speak effectively in discussions and debates.

II Year (odd Semester)

C201: MA3351 Transforms and Partial Differential Equations, Year of Study 2023-2024

C201.1	Formulate and solve the standard partial differential equations.
C201.2	Express a function as a Fourier series.
C201.3	Apply the physical significance of Fourier series techniques in solving one and two dimensional heat flow and one-dimensional wave equations.
C201.4	Change the time domain function into a frequency domain function through Fourier Transform.
C201.5	Use the Z transform techniques for the solutions of difference equations.
C201.6	Demonstrate the usage of MATLAB Software for Fourier Series and Z-transform.

C202: ME3351 Engineering Mechanics, Year of Study 2023-2024

C202.1	Illustrate the vector and scalar representation of forces and moments.
C202.2	Examine the rigid body in equilibrium.
C202.3	Determine the properties of distributed forces.
C202.4	Determine the friction and the effects by the laws of friction.
C202.5	Calculate dynamic forces exerted in rigid body.
C202.6	Demonstrate Virtual lab for verification of newton Second law and angular acceleration of a fly wheel https://vlab.amrita.edu/

C203: ME3391 Engineering Thermodynamics, Year of Study 2023-2024

C203.1	Apply the zeroth and first law of thermodynamics by formulating temperature scales and calculating the property changes in closed and open engineering systems.
C203.2	Apply the second law of thermodynamics in analysing the performance of thermal devices through energy and entropy calculations.
C203.3	Perform exergy analysis on closed and open system.
C203.4	Calculate the properties of pure substances using steam tables and Mollier chart.
C203.5	Identify the deviation in behaviour of real gases from ideal gas.
C203.6	Calculate the II law efficiency for an open system and closed system

C204: CE3391 Fluid Mechanics and Machinery, Year of Study 2023-2024

C204.1	To apply the conservation laws to fluids and its application through fluid kinematics and dynamics.
C204.2	Estimate losses in pipelines for both laminar and turbulent conditions and boundary layer thickness on the flat solid surface
C204.3	Predict the relationship among the parameters involved in the given fluid phenomenon and to the performances of prototype by model studies.
C204.4	Analyze the performance of various turbines
C204.5	Design the centrifugal and reciprocating pumps
C204.6	Calculate the flow characteristics and performance of hydraulic machines for real time applications

C205: ME3392 Engineering Materials and Metallurgy, Year of Study 2023-2024

C205.1	Explain alloys and phase diagram, Iron-Iron carbon diagram and steel classification.
C205.2	Express the isothermal transformation, continuous cooling diagrams and different heat treatment processes.
C205.3	Interpret the effect of alloying elements on ferrous and non-ferrous metals
C205.4	Illustrate the properties and applications of non-metallic materials.
C205.5	Explain the testing of mechanical properties.
C205.6	Estimate the mechanical characterizations for Stir Casting specimen.

C206: ME3393 Manufacturing Processes, Year of Study 2023-2024

C206.1	Explain the principle of different metal casting processes.
C206.2	Describe the various metal joining processes.
C206.3	Illustrate the different bulk deformation processes.
C206.4	Apply the various sheet metal forming process.
C206.5	Apply suitable molding technique for manufacturing of plastics components.
C206.6	Choose appropriate welding processes and its technique for joining similar and dissimilar materials.

C207: ME3381 Computer Aided Machine Drawing, Year of Study 2023-2024

C207.1	Acquire the knowledge of Indian Standards on drawing practices and standard components.
C207.2	Practice the drawing standards, Fits and Tolerances.
C207.3	Prepare standard drawing layout for modelled assemblies with BoM.
C207.4	Model orthogonal views of machine components
C207.5	Prepare standard drawing layout for modelled parts
C207.6	Assemble the 3D model of machine components.

C208: ME3382 Manufacturing Technology Laboratory, Year of Study 2023-2024

C208.1	Demonstrate the safety precautions exercised in the mechanical workshop
C208.2	Perform moulding process Using different moulding tools, patterns and prepare sand moulds.

C208.3	Make the work piece as per given shape and size using Lathe.
C208.4	Demonstrate the different machine tools to manufacturing gears
C208.5	Investigate the different machine tools to manufacturing gears
C208.6	Prepare different machine tools for finishing operations
C208.7	Demonstrate the manufacture tools using cutter grinder

C209: GE3361 Professional Development\$, Year of Study 2023-2024

C209.1	On successful completion the students will be able to Use MS Word to create quality documents, by structuring and organizing content for their day to day technical and academic requirements
C209.2	Use MS EXCEL to perform data operations and analytics, record, retrieve data as per requirements and visualize data for ease of understanding
C209.3	Use MS PowerPoint to create high quality academic presentations by including common tables, charts, graphs, interlinking other elements, and using media objects.

II Year (Even Semester)

C210: ME3491 Theory of Machines, Year of Study 2023-2024

C210.1	Discuss the basics of mechanism
C210.2	Solve problems on gears and gear trains
C210.3	Examine friction in machine elements
C210.4	Calculate static and dynamic forces of mechanisms
C210.5	Calculate the balancing masses and their locations of reciprocating and rotating masses. Computing the frequency of free vibration, forced vibration and damping coefficient
C210.6	Calculate the balancing masses required for rotating systems & Compute frequency of free vibration using simulation/Virtual lab

C211: ME3451 Thermal Engineering, Year of Study 2023-2024

C211.1	Apply thermodynamic concepts to different air standard cycles and solve problems.
C211.2	Solve problems in steam nozzle and calculate critical pressure ratio
C211.3	Explain the flow in steam turbines, draw velocity diagrams, flow in Gas turbines and solve problems
C211.4	Explain the functioning and features of IC engine, components and auxiliaries
C211.5	Calculate the various performance parameters of IC engines
C211.6	Identify the engine components in a real time engine and explain its function.

C212: ME3492 Hydraulics and Pneumatics, Year of Study 2023-2024

C212.1	Explain the Fluid power and operation of different types of pumps.
C212.2	Apply the features and functions of motors, actuators and Flow control valves in Hydraulic System
C212.3	Classify the different types of Hydraulic circuits and systems

C212.4	Compare the working of different pneumatic circuits and systems
C212.5	Summarize the various trouble shooting methods and applications of hydraulic and pneumatic systems
C212.6	Construct a ladder diagram for Pneumatics and Electro Pneumatics System

C213: ME3493 Manufacturing Technology, Year of Study 2023-2024

C213.1	Apply the mechanism of metal removal process and to identify the factors involved in improving machinability.
C213.2	Describe the constructional and operational features of centre lathe and other special purpose lathes.
C213.3	Describe the constructional and operational features of reciprocating machine tools.
C213.4	Apply the constructional features and working principles of CNC machine tools.
C213.5	Demonstrate the Program CNC machine tools through planning, writing codes and setting up CNC machine tools to manufacture a given component.
C213.6	Perform machining complex geometrical shapes of the components using CNC programming.

C214: CE3491 Strength of Materials, Year of Study 2023-2024

C214.1	Compute the stress and strain in simple and compound bars and the importance of principal stresses and principal planes.
C214.2	Calculate the load transferring mechanism in beams and stress distribution due to shearing force and bending moment.
C214.3	Apply basic equation of simple torsion in designing of shafts and helical spring
C214.4	Calculate the slope and deflection in beams using different methods.
C214.5	Analyze and design thin and thick shells for the applied internal and external pressures.
C214.6	Analyze the various types of beams subjected to different types of loads acting on it.

C215: GE3451 Environmental Sciences and Sustainability, Year of Study 2023-2024

C215.1	Illustrate the importance of environment, biodiversity and its impact on human life.
C215.2	Correlate the causes, effect and control measures of various types of pollution and its case studies.
C215.3	Educate the availability of renewable energy resources and scientific concepts/principles behind them.
C215.4	Articulate the concept of sustainability and management.
C215.5	Gain knowledge on sustainability practices and socio-economical change.
C215.6	Analyze the integrated themes of biodiversity, pollution control, waste management, energy resources, and sustainable approaches.

C216: CE3481 Strength of Materials and Fluid Machinery Laboratory, Year of Study 2023-2024

C216.1	Compare different destructive testing and Characteristics of material.
C216.2	Calculate the stresses of structural members subjected to tension, compression, torsion, bending and combined stresses using the fundamental concepts of stress, strain and elastic behavior of materials.
C216.3	Perform Tension, Torsion, Hardness, Compression, and Deformation tests on Solid materials.
C216.4	Measure the discharge of fluid flow in a pipe by using different flow measurement devices and Calculate the energy losses of friction in a pipe flow for various flow conditions.
C216.5	Constructs the characteristics of positive displacement and dynamic pumps.
C216.6	Measure the efficiency of impulse and reaction turbines in various load conditions.

C217: ME3461 Thermal Engineering Laboratory, Year of Study 2023-2024

C217.1	Demonstrate the difference in the theoretical and actual valve / port timing diagram of a given IC engine
C217.2	Follow and conduct performance tests for an IC engine
C217.3	Measure the flash and fire point for a given fuel
C217.4	Follow and conduct the performance tests for an Air compressor, steam generator and turbine
C217.5	Illustrate the working and components in a steam generator and turbine.
C217.6	Compute the way through which the heat gets lost from an IC engine

III Year (Odd Semester)

C301: ME3591 Design of Machine Elements, Year of Study 2023-2024

C301.1	Explain the design machine members subjected to static and variable loads.
C301.2	Apply the concepts design to shafts, key and couplings.
C301.3	Apply the concepts of design to bolted, Knuckle, Cotter, riveted and welded joints.
C301.4	Apply the concept of design helical, leaf springs, flywheels, connecting rods and crank shafts.
C301.5	Apply the concepts of design and select sliding and rolling contact bearings, seals and gaskets.
C301.6	Evaluate the various stresses available in shaft elements using MATLAB and Analyzing the Flange coupling using ANSYS

C302: ME3592 Metrology and Measurements, Year of Study 2023-2024

C302.1	Describe the concepts of measurements to apply in various metrological instruments.
C302.2	Capture the principles of linear and angular measurement tools used for industrial applications.
C302.3	Explain the process for tolerance symbols and procedure for tolerance analysis in industrial applications

C302.4	Demonstrate the principles and methods for surface metrology.
C302.5	Illustrate the advances in measurements for quality control in manufacturing industries
C302.6	Ensure suitable mechanical measuring instruments for basic and special requirement in the industries.

C303: CME362 Energy conservation in Industries , Year of Study 2023-2024

C303.1	Describe the energy scenario, impact of energy consumption in environment.
C303.2	Explain the concept of energy billing and the factors impact the energy billing
C303.3	Compute energy performance of major thermal utilities
C303.4	Illustrate the energy performance of major electrical utilities and ENCON measures
C303.5	Apply the financial evaluation techniques to quantify the ENCON measures in terms of financial benefits
C303.6	Perform the energy audit for a given location or condition

C304: CME385 Refrigeration and Air Conditioning, Year of Study 2023-2024

C304.1	Explain the basic concepts of Refrigeration
C304.2	Explain the Vapor compression Refrigeration systems and to solve problems
C304.3	Discuss the various types of Refrigeration systems
C304.4	Calculate the Psychrometric properties and its use in psychrometric processes
C304.5	Explain the concepts of Air conditioning and to solve problems
C304.6	Measure the power consumption and calculate the COP of refrigerator.

C305: CME380 Automobile Engineering, Year of Study 2023-2024

C305.1	Identify the various parts of the automobile and their functions and materials.
C305.2	Discuss the engine auxiliary systems and engine emission control.
C305.3	Distinguish the working of different types of transmission systems.
C305.4	Explain the Steering, Brakes and Suspension Systems.
C305.5	Predict possible alternate sources of energy for IC Engines.
C305.6	Assembling and Dismantling of Engine and transmission systems

C306: CME365 Renewable Energy Technologies, Year of Study 2023-2024

C306.1	Discuss about the Indian and world energy scenario
C306.2	Describe the methods of power generation from Solar Energy
C306.3	Analyze different parameters of consideration for designing a Wind Turbine
C306.4	Explain the methods of power generation from bio – energy
C306.5	Elaborate other minor renewable energy sources for power generation
C306.6	Build a solar PV system plan for a given condition

C307: CME387 Non-traditional Machining Process, Year of Study 2023-2024

C307.1	Evaluate mechanical energy based non-traditional machining processes.
C307.2	Illustrate chemical and electro chemical energy based processes.
C307.3	Evaluate thermo-electric energy based processes
C307.4	Interpret Nano finishing processes.
C307.5	Analyze hybrid non-traditional machining processes and differentiate non-traditional machining processes.
C307.6	Choose the appropriate non-traditional machining processes for machining a glass.

C308: CME397 Surface Engineering, Year of Study 2023-2024

C308.1	Describe the fundamentals of surface features and different types of friction associated with metals and non-metals
C308.2	Analyze the different types of wear mechanism and its standard measurement.
C308.3	Analyze the different types of corrosion and its preventive measures
C308.4	Analyze the different types of surface properties and surface modification techniques
C308.5	Analyze the various types of materials used in the friction and wear applications.
C308.6	Classify the various types of alloys with suitable applications.

C309: MX3084 Disaster Risk Reduction and Management, Year of Study 2023-2024

C309.1	To define the concepts of Disaster, Vulnerability and Disaster Risk reduction (DRR)
C309.2	To explain Hazards, Vulnerability and Disaster Risk Assessment prevention and risk reduction
C309.3	To develop disaster response skills by adopting relevant tools and technology
C309.4	To extend the awareness of institutional processes for Disaster response in the country
C309.5	To Develop rudimentary ability to respond to their surroundings with potential Disaster response in areas where they live, with due sensitivity
C309.6	To prepare themselves to face the real time disasters.

C310: ME3581 Metrology and Dynamics Laboratory, Year of Study 2023-2024

C310.1	Calibrate the measuring instruments and measure the gear tooth dimensions, angle using angular instruments, screw thread and gear parameters
C310.2	Demonstrate the functions of Coordinate measuring machine and surface roughness tester optical measurement system and measuring the form parameters
C310.3	Explain gear parameters, gear trains, gyroscopic effect and Dynamic analysis of cam mechanism
C310.4	Determine mass moment of inertia of mechanical element, governor effort and range sensitivity and compare for different governors.

C310.5	Calculate the natural frequency and damping coefficient, torsional frequency and critical speeds of shafts.
C310.6	Calibrate the balancing mass of rotating masses. (Virtual lab & Experimentation)

C310: CME340 CAD/CAM, Year of Study 2023-2024

C311.1	Discuss the basics of the design and concepts.
C311.2	Develop the two dimensional drafting and projection views.
C311.3	Discuss the three dimensional modeling, parametric and Non-parametric modeling
C311.4	Discuss the assembly modeling and top down, bottom up approaches.
C311.5	Develop the computer aided machining and writing part programming.
C311.6	Demonstrate the ability to create and interpret 2D and 3D engineering drawings using various projections, scales, and GD&T symbols, while adhering to customer-specific requirements and reading title block information.

C312: MR3691– Robotics, Year of Study 2023-2024

C312.1	Apply the basic concepts and terminologies of robots
C312.2	Acquire the procedures for Forward and Inverse Kinematics, Dynamics for Various Robots
C312.3	Derive the Forward and Inverse Kinematics, Dynamics for Various Robots
C312.4	Explore the various programming techniques in industrial applications
C312.5	Analyze the use of various types of robots in different applications
C312.6	Construct a transformation matrix for robotic arm movement.