

SIES Graduate School of Technology, Nerul
Department of Mechanical Engineering

Course Outcomes (CBGS)

Second Year: Sem-III

Subject: Applied Mathematics-III

- MEC301.1 Obtain the Laplace Transform and Inverse Laplace transform using standard results and properties.
- MEC301.2 Solve ODE using inverse Laplace Transform.
- MEC301.3 Find the harmonic conjugate, orthogonal trajectory of an analytic function
- MEC301.4 Evaluate integral using Cauchy's theorem, residue theorem.
- MEC301.5 Expand the periodic function using Fourier series and complex form of Fourier series, understand the concept of half range sine and cosine series.
- MEC301.6 Solve Partial Differential Equation using Fourier series and find numerical solution using Crank-Nickelson, Brander-Smith methods.

Subject: Thermodynamics

- MEC302.1 Demonstrate understanding of basic concepts of thermodynamics.
- MEC302.2 Derive steady flow energy equation for various flow and non flow thermodynamics systems.
- MEC302.3 Compute heat and work interaction in thermodynamics system.
- MEC302.4 Demonstrate the interrelation between thermodynamics functions to solve practical problems.
- MEC302.5 Use steam table and mollier chart to compute thermodynamics interaction.
- MEC302.6 Compute efficiencies of heat engine and power cycle etc.

Subject: Strength of Materials

- MEC303.1 Demonstrate fundamental knowledge about various types of loading and stresses..
- MEC303.2 Analyze the SFD & BMD for different types of loads and support conditions.
- MEC303.3 Analyze the stresses induced in basic mechanical components.
- MEC303.4 Estimate the strain energy in beams.
- MEC303.5 Analyze the deflection in beams.
- MEC303.6 Analyze buckling and bending phenomena in column, struts and beams

Subject: Production Process-I

- MEC304.1 Demonstrate understanding of non-chip forming processes such as casting, forging, metal joining, etc.
- MEC304.2 Demonstrate understanding of forming process.
- MEC304.3 Demonstrate the understanding of joining process.
- MEC304.4 Understand basics of powder metallurgy.

- MEC304.5 Understand basics of moulding with polymer.
- MEC304.6 Identify the role of Non Destructive Techniques in production processes

Subject: Computer Aided Machine Drawing

- MEC305.1 Visualize and prepare detail drawing of a given object.
- MEC305.2 Read and interpret the drawing
- MEC305.3 Draw details and assembly of different mechanical systems.
- MEC305.4 Convert detailed drawing into assembly drawing using modelling software
- MEC305.5 Convert assembly drawing into detailed drawing using modelling software
- MEC305.6 Prepare detailed drawing of any given physical object/machine element with actual measurements

Subject: Data Base & Information Retrieval System

- MEL306.1 Identify data models and schemes in dbms
- MEL306.2 Demonstrate the features of database management systems and relational database
- MEL306.3 Use sql- the standard language of relational databases
- MEL306.4 Demonstrate understanding of functional dependencies and design of the database and implementation of transactions
- MEL306.5 Design graphical user interface for specific application and create visual entities
- MEL306.6 Ability to develop good communication skills and teamwork

Subject: Machine Shop Practice-I

- MEL307.1 Operate various machines like lathe, shaper etc
- MEL307.2 Perform plain turning, taper turning, and screw cutting etc. on lathe machine.
- MEL307.3 Perform machining operations on shaper.
- MEL307.4 Demonstrate metal joining process like compressive welding.

Second Year: Sem-IV

Subject: Applied Mathematics-IV

- MEC401.1 Find Eigen values and eigenvectors of a matrix to diagonalize the Square matrix.
- MEC401.2 Evaluate surface/ volume integral using Stokes and Gauss Divergence theorem.
- MEC401.3 Use Binomial, Poisson and Normal distribution to solve statistical probability
- MEC401.4 To analyze the problem by using Large and Small Sampling theory
- MEC401.5 Find the regression lines using method of least squares and correlation coefficients.
- MEC401.6 Optimize the solution of NLPP

Subject: Fluid Mechanics

- MEC402.1 Define properties of fluids and classification of fluids.
- MEC402.2 Evaluate hydrostatic forces on various surfaces and predict stability of floating bodies.
- MEC402.3 Formulate and solve equations of the control volume for fluid flow systems.
- MEC402.4 Apply Bernoulli's equation to various flow measuring devices.
- MEC402.5 Calculate resistance to flow of incompressible fluids through closed conduits and over surfaces.
- MEC402.6 Apply fundamentals of compressible fluid flows to relevant systems.

Subject: Theory of Machine - I

- MEC403.1 Describe various types of mechanisms
- MEC403.2 Develop mechanisms to provide specific motions
- MEC403.3 Draw Velocity and acceleration diagram for mechanism upto 6 link
- MEC403.4 Draw cam profile for specific motion of followers
- MEC403.5 Identify various types of gears and gear trains
- MEC403.6 Select appropriate power transmission for specific applications

Subject: Production Process-II

- MEC404.1 Describe working principles of machine tools and gear manufacturing processes.
- MEC404.2 Program to control and operate NC and CNC machines.
- MEC404.3 Calculate the cutting forces, efficiency and power in metal cutting.
- MEC404.4 Interpret the principle of measurement of tool forces and economics of machining.
- MEC404.5 Select the appropriate coolant, tool material and grinding wheel.
- MEC404.6 Design the various cutting tool.

Subject: Material Technology

- MEC405.1 Identify various crystal imperfections, deformation mechanisms, and strengthening mechanisms.
- MEC405.2 Demonstrate various failure mechanisms of materials.
- MEC405.3 Interpret iron-iron carbide phase diagram, and different phases in microstructures of materials at different conditions.

- MEC405.4 Recommend specific heat treatment process for different applications.
- MEC405.5 Identify effect of alloying elements on properties of steels.
- MEC405.6 Illustrate basics of composite materials, nano- materials and smart materials.

Subject: Industrial Electronics

- MEC406.1 Describe construction, working principles and applications of power electronic switches
- MEC406.2 Identify rectifiers and inverters for dc and ac motor speed control
- MEC406.3 Develop circuits using OPAMP and timer IC555
- MEC406.4 Identify digital circuits for industrial applications
- MEC406.5 Describe the basic functioning of microcontroller
- MEC406.6 Analyse speed-torque characteristics of electrical machines for speed control

Subject: Machine Shop Practice-II

- MEL407.1 Operate various machines like lathe, shaper, grinding machine, milling machine etc.
- MEL407.2 Perform precision turning, boring etc.

Third Year: Sem-V

Subject: IC Engines

- MEC501.1 Analyze ideal air standard cycles and fuel-air cycles and actual engine cycles.
- MEC501.2 Identify and explain working of engines components/systems
- MEC501.3 Describe and Analyze SI and CI engine considering combustion process, knocking, and calculating parameters of fuel system such as nozzle/orifice/venturi diameter or A/F ratio.
- MEC501.4 Calculate, Plot and analyze engine performance characteristic
- MEC501.5 Describe exhaust gas analysis and comment on adverse implications on environment, pollution control devices and standards.
- MEC501.6 Describe fuels and alternative potential engines and modern trends in I.C Engines

Subject: Mechanical Measurements and Control

- MEC502.1 Outline the architecture of the measurement system.
- MEC502.2 Illustrate working principle of measuring instruments
- MEC502.3 Derive the mathematical model of the control system.
- MEC502.4 Analyse the Transient and steady state of first and second order system.
- MEC502.5 Analysis the time domain specification for various control system.
- MEC502.6 Analyse the stability of various control system.

Subject: Production Process-III

- MEC503.1 Get knowledge on advanced machines like high speed machines, automats and transfer lines.
- MEC503.2 Demonstrate understanding of sheet metal forming and various stress systems involved in metal forming operations.
- MEC503.3 Design jigs and fixtures for a given applications.
- MEC503.4 Get knowledge about non-conventional machining operations and its application areas.
- MEC503.5 Get knowledge on plastic injection mold design.
- MEC503.6 Illustrate advanced concepts such as Agile manufacturing.

Subject: Theory of Machines-II

- MEC504.1 Apply the working principles of clutches and its constructional details.
- MEC504.2 Analyze working of brakes and dynamometers.
- MEC504.3 Analyze working mechanism of different types of governors.
- MEC504.4 Analyze and select gear trains, power transmission system.
- MEC504.5 Understand and analyze the gyroscopic effect on various applications.
- MEC504.6 Apply the principles of static and dynamic analysis of machinery.

Subject: Heat Transfer

- MEC505.1 Identify the three modes of heat transfer (conduction, convection and radiation).
- MEC505.2 Develop mathematical model for each mode of heat transfer
- MEC505.3 Develop mathematical model for fin and transient heat transfer
- MEC505.4 Estimate convective heat transfer coefficient in forced and free convection
- MEC505.5 Analyse different heat exchangers and quantify their performance
- MEC505.6 Apply concept of radiation to solve real life problem

Subject: Business Communication and Ethics

- MEL501.1 Write technical report in specific format
- MEL501.2 Write technical proposal in specific format
- MEL501.3 Use interpersonal skills effectively and enhance communication .
- MEL501.4 Prepare the Notice , Agenda and Minutes of a formal meeting.
- MEL501.5 Understand the importance of ethics and apply it for their career advancement.
- MEL501.6 Understand employment skills and prepare a resume along with the skills required to face an interview

Third Year: Sem-VI

Subject: Metrology and Quality Engineering

- MEC601.1 Describe the fundamentals of measurement and to use various inspection gauges and checking systems.
- MEC601.2 Demonstrate use of various comparators and surface texture measurement devices.
- MEC601.3 Demonstrate the use of measurement techniques for critical dimensions like screw thread or gear teeth parameters and special measuring equipments.
- MEC601.4 Explain the need of quality control in manufacturing
- MEC601.5 Apply and analyse the sqc tools (such as control charts, p charts etc.) for manufacturing and service activates.
- MEC601.6 Apply sampling inspection techniques to solve quality control problems.

Subject: Machine Design-I

- MEC602.1 Demonstrate understanding of various design considerations
- MEC602.2 Apply basic principles of machine design
- MEC602.3 Design machine elements for static as well as dynamic loading
- MEC602.4 Design of components subjected to fluctuating loads
- MEC602.5 Design machine elements on the basis of strength/ rigidity concepts
- MEC602.6 Analyse and design mechanical spring

Subject: Mechanical Vibrations

- MEC603.1 Develop mathematical model to represent dynamic system
- MEC603.2 Estimate natural frequency and damping nature of SDOF mechanical element/system
- MEC603.3 Estimate natural frequency of multi DOF mechanical element/system
- MEC603.4 Analyze response of forced SDOF vibratory mechanical element/system
- MEC603.5 Understand and analyze the uses of vibration measuring instruments
- MEC603.6 Analyze static and dynamic balancing of mechanical system

Subject: Thermal and Fluid Power Engineering

- MEC604.1 Demonstrate and explain working principle of different boilers, boiler mounting & accessories and its significance
- MEC604.2 Working Principle of nozzle and steam turbine and optimize the design calculation based on nozzle and steam turbine turbine
- MEC604.3 Working Principle of hydraulic turbine and types of hydraulic turbines
- MEC604.4 Optimize the design calculation based hydraulic turbine
- MEC604.5 Working Principle of gas turbine and optimize the design calculation of gas turbine
- MEC604.6 Explain and analyze Jet Propulsion Systems (Like Ramjet, Turbojets and Rockets)

Subject: Mechatronics

- MEC605.1 Identify the suitable sensor and actuator for a mechatronics system
- MEC605.2 Select suitable logic controls

- MEC605.3 Analyse continuous control logics for standard input conditions
- MEC605.4 Develop ladder logic programming
- MEC605.5 Design hydraulic/pneumatic circuits
- MEC605.6 Design a mechatronic system such as simple mechanical applications

Subject: Finite Element Analysis

- MEC606.1 Select appropriate element for given problem to solve 1D problem
- MEC606.2 Select suitable meshing and perform convergence test to validate problem using analytical method
- MEC606.3 Select appropriate solver for given problem to validate results using analytical method
- MEC606.4 Interpret the result and conclude the accuracy of the solution
- MEC606.5 Apply basic aspects of FEA to solve engineering problems
- MEC606.6 Analyze CFD technique to solve numerical on flow through pipe.

Final Year: Sem-VII

Subject: Machine Design-II

- MEC701.1 Design appropriate gears for power transmission on the basis of given load and speed
- MEC701.2 Design bearings for given application from the manufacturing catalogue
- MEC701.3 Design hydro dynamic bearings for given application from the manufacturing catalogue
- MEC701.4 Design appropriate gears for power transmission on the basis of given load and speed
- MEC701.5 Design belts for the given applications
- MEC701.6 Design clutches based on uniform pressure theory and uniform wear theory consideration

Subject: CAD/CAM/CAE

- MEC702.1 Identify proper computer graphics techniques for geometric modelling.
- MEC702.2 Apply Transformation, manipulation techniques to different objects
- MEC702.3 Prepare part programming applicable to CNC machines
- MEC702.4 Use rapid prototyping and tooling concepts in any real life applications
- MEC702.5 Identify the tools for Analysis of a complex engineering component
- MEC702.6 Recognise the need of CIM systems, Socio -techno- economic aspects of CIM

Subject: Mechanical Utility Systems

- MEC703.1 Describe different types of compressor and evaluate performance of reciprocating compressor
- MEC703.2 Evaluate performance of centrifugal and Axial compressor
- MEC703.3 Describe different types of pumps and evaluate performance of centrifugal pumps and analyze characteristic curves of pumps
- MEC703.4 Evaluate performance of reciprocating pump
- MEC703.5 Interpret possibilities of energy conservation in techniques in pumping
- MEC703.6 Interpret possibilities of energy conservation in techniques in compressed air systems

Subject: Production Planning and Control

- MEC704.1 Illustrate production planning functions and manage manufacturing functions in a better way.
- MEC704.2 Develop competency in various activities of PPC
- MEC704.3 Manage and control inventory with cost effectiveness.
- MEC704.4 Get conversant with various documents procedural aspects and preparation of orders for various manufacturing methods
- MEC704.5 To understand the linear programming concepts
- MEC704.6 Develop competency in scheduling and sequencing in manufacturing operations and effect affordable manufacturing lead time

Subject: Power Plant Engineering

- MEE7012.1 Comprehend various equipment/systems utilized in power plants
- MEE7012.2 Demonstrate site selection methodology, construction and operation of Hydro Electric Power Plants
- MEE7012.3 Describe site selection and working of steam power plants
- MEE7012.4 Describe operation of Combined Cycle Power Plants
- MEE7012.5 Classify reactors and comprehend waste disposal issues in nuclear power plants
- MEE7012.6 Solve problems on power plant economics

Subject: Operations Research

- MEE70119.1 Apply the techniques used in operations research to formulate a real-world problem and solve it using various problem solving approaches.
- MEE70119.2 Develop an integrated framework for strategic thinking and problem solving.
- MEE70119.3 Understand the mathematical tools that are needed to solve optimisation problems.
- MEE70119.4 Identify the characteristics of different types of environments and the appropriate decision making approaches and tools to be used in each type.
- MEE70119.5 Gain the ability to recognize situations in a manufacturing environment that suggests the use of certain quantitative methods to assist in optimizing the solution.
- MEE70119.6 Understand the core features of the operations and production management function and how it contributes to the competitiveness of firms.

Subject: Project-I

- MEP701.1 Literature survey/industrial visit and identify the problem
- MEP701.2 Apply basic engineering fundamental in the domain of practical applications
- MEP701.3 Cultivate the habit of working in a team
- MEP701.4 Attempt a problem solution in a right approach
- MEP701.5 Correlate the theoretical and experimental/simulations results and draw the proper inferences
- MEP701.6 Prepare report as per the standard guidelines.

Final Year: Sem-VIII

Subject: Design of Mechanical Systems

- MEC801.1 Apply the concept of system design.
- MEC801.2 Design material handling systems such as hoisting mechanism of EOT crane,
- MEC801.3 Design belt conveyor systems
- MEC801.4 Design engine components such as cylinder, piston, connecting rod and crankshaft
- MEC801.5 Design pumps for the given applications
- MEC801.6 Prepare layout of machine tool gear box and select number of teeth on each gear

Subject: Industrial Engineering and Management

- MEC802.1 Illustrate the need for optimization of resources and its significance in manufacturing industries, in order to enhance overall productivity.
- MEC802.2 Demonstrate the concept of value analysis and value engineering with its relevance.
- MEC802.3 Demonstrate the different concepts of method study and understanding of work content in different situations.
- MEC802.4 Describe different aspects of work system design pertinent to industries.
- MEC802.5 Recommend the possible ways of facility design for better utilization of available resources.
- MEC802.6 Identify various cost accounting and financial management practices widely applied in industries.

Subject: Refrigeration and Air Conditioning

- MEC803.1 Discuss first and second law of thermodynamics with fundamentals of refrigeration and explain environment friendly air refrigeration systems.
- MEC803.2 Identify and locate various important components of the vapor refrigeration system with calculation of its capacity and compare different refrigerants
- MEC803.3 Identify and locate various important components of the vapor absorption system with calculation of its capacity and non conventional refrigeration system.
- MEC803.4 Illustrate various refrigeration and air conditioning processes using psychometric chart.
- MEC803.5 Carryout cooling load calculations for designing air conditioning system and describe human comfort.
- MEC803.6 Design duct for different air-conditioning systems and describe application of refrigeration with selection of controls for refrigeration system.

Subject: Renewable Energy Sources

- MEE8022.1 Demonstrate need of different renewable energy sources and their importance.
- MEE8022.2 Calculate and analyse utilization of solar energy.
- MEE8022.3 Calculate and analyse utilization wind energy.
- MEE8022.4 Illustrate design of biogas plant.

- MEE8022.5 Illustrate concept of geothermal energy and energy from the ocean.
MEE8022.6 Illustrate energy management.

Subject: World Class Manufacturing

- MEE80210.1 Demonstrate the relevance and basics of World Class Manufacturing.
MEE80210.2 Identify the factors of competitiveness and performance measures based on which, global manufacturing success is bench marked
MEE80210.3 Draw current Status of Indian Manufacturing scenario and design and develop a roadmap to achieve world class manufacturing status
MEE80210.4 Identify the human resource dimensions in WCM
MEE80210.5 To study the various characteristics of WCM companies
MEE80210.6 Demonstrate the relevance and basics of Total Quality Management.

Subject: Project-II

- MEP802.1 Literature review, design and drawing for the selected problem.
MEP802.2 Cultivate the habit of working in a team .
MEP802.3 fabrication of the model.
MEP802.4 Experimentation and testing of the model.
MEP802.5 Analysis and inferences on the test result.
MEP802.6 Prepare report as per the standard guidelines.