



DEPARTMENT OF MECHANICAL ENGINEERING

**Course Outcomes**

SE: III SEM (REV- 2019 'C' Scheme)

**Subject- Engineering Mathematics-III, Course Code- MEC 301**

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| CO1 | Apply the concept of Laplace transform to solve the real integrals in engineering problems.  |
| CO2 | Apply the concept of inverse Laplace transform of various functions in engineering problems.   |
| CO3 | Expand the periodic function by using Fourier series for real life problems and complex engineering problems                           |
| CO4 | Find orthogonal trajectories and analytic function by using basic concepts of complex variable theory.                                 |
| CO5 | Apply Matrix algebra to solve the engineering problems.  |
| CO6 | Solve Partial differential equations by applying numerical solution and analytical methods for one dimensional heat and wave equations |

**Subject- Strength of Materials, Course Code- MEC302**

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| CO1 | Demonstrate fundamental knowledge about various types of loading and stresses induced              |
| CO2 | Draw the SFD and BMD for different types of loads and support conditions                           |
| CO3 | Analyse the bending and shear stresses induced in beam   |
| CO4 | Analyse the deflection in beams and stresses in shaft.   |
| CO5 | Analyse the stresses and deflection in beams and Estimate the strain energy in mechanical elements |
| CO6 | Analyse buckling phenomenon in columns.  |

**Subject- Production Processes, Course Code- MEC303**

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|-----|---|
| CO1 | Demonstrate an understanding of casting process                               |
| CO2 | Illustrate principles of forming processes.                                   |
| CO3 | Demonstrate applications of various types of welding processes.               |
| CO4 | Differentiate chip forming processes such as turning, milling, drilling, etc. |
| CO5 | Illustrate the concept of producing polymer components and ceramic components |
| CO6 | Illustrate principles and working of non-traditional manufacturing            |
| CO7 | Understand the manufacturing technologies enabling Industry 4.0               |



**Subject- Materials and Metallurgy, Course Code- MEC304**

|     |   |
|-----|---|
| CO1 | Identify the various classes of materials and comprehend their properties               |
| CO2 | Apply phase diagram concepts to engineering applications                                |
| CO3 | Apply particular heat treatment for required property development                       |
| CO4 | Identify the probable mode of failure in materials and suggest measures to prevent them |
| CO5 | Choose or develop new materials for better performance                                  |
| CO6 | Decide an appropriate method to evaluate different components in service                |

**Subject- Thermodynamics, Course Code- MEC305**

|     |  |
|-----|--|
| CO1 | Demonstrate application of the laws of thermodynamics to a wide range of systems           |
| CO2 | Compute heat and work interactions in thermodynamic systems                                |
| CO3 | Demonstrate the interrelations between thermodynamic functions to solve practical problems |
| CO4 | Compute thermodynamic interactions using the steam table and Mollier chart                 |
| CO5 | Compute efficiencies of heat engines, power cycles.  |
| CO6 | Apply the fundamentals of compressible fluid flow to the relevant systems                  |

**Subject- Materials Testing, Course Code- MEL301**

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|-----|---|
| CO1 | Prepare metallic samples for studying its microstructure following the appropriate procedure  |
| CO2 | Identify effects of heat treatment on microstructure of medium carbon steel and hardenability of steel using Jominy end Quench test |
| CO3 | Perform Fatigue Test and draw S-N curve   |
| CO4 | Perform Tension test to Analyze the stress - strain behaviour of materials  |
| CO5 | Measure torsional strength, hardness and impact resistance of the material  |
| CO6 | Perform flexural test with central and three point loading conditions   |

**Subject- Machine Shop Practice, Course Code- MEL302**

|     |  |
|-----|--|
| CO1 | Know the specifications, controls and safety measures related to machines and machining operations |
| CO2 | Use the machines for making various engineering jobs   |
| CO3 | Perform various machining operations   |
| CO4 | Perform Tool Grinding  |
| CO5 | Perform welding operations   |



**Subject- CAD –Modeling, Course Code- MESBL301**

|     |   |
|-----|---|
| CO1 | Illustrate basic understanding of types of CAD model creation                         |
| CO2 | Visualize and prepare 2D modeling of a given object using modeling software           |
| CO3 | Build solid model of a given object using 3D modeling software                        |
| CO4 | Visualize and develop the surface model of a given object using modeling software     |
| CO5 | Generate assembly models of given objects using assembly tools of a modeling software |
| CO6 | Perform product data exchange among CAD systems.                                      |

**Subject- Mini Project – 1 A, Course Code- MEPBL301**

|     |   |
|-----|---|
| CO1 | Identify problems based on societal /research needs   |
| CO2 | Apply Knowledge and skill to solve societal problems in a group                                   |
| CO3 | Develop interpersonal skills to work as member of a group or leader.                              |
| CO4 | Draw the proper inferences from available results through theoretical/ experimental/simulations   |
| CO5 | Analyze the impact of solutions in societal and environmental context for sustainable Development |
| CO6 | Use standard norms of engineering practices   |
| CO7 | Excel in written and oral communication.  |
| CO8 | Demonstrate capabilities of self-learning in a group, which leads to life long learning.          |
| CO9 | Demonstrate project management principles during project work.                                    |

**SE: IV SEM (REV- 2019 ‘C’ Scheme )**

**Subject- Engineering Mathematics-IV, Course Code- MEC 401**

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|-----|--|
| CO1 | Apply the concept of Vector calculus to evaluate line integrals, surface integrals using Green’s theorem, Stoke’s theorem & Gauss Divergence theorem |
| CO2 | Use the concepts of Complex Integration for evaluating integrals, computing residues & evaluate various contour integrals.                           |
| CO3 | Apply the concept of Correlation, Regression and curve fitting to the engineering problems in data science   |
| CO4 | Illustrate understanding of the concepts of probability and expectation for getting the spread of the data and distribution of probabilities         |
| CO5 | Apply the concept of probability distribution to engineering problems & testing hypothesis of small samples using sampling theory                    |
| CO6 | Apply the concepts of parametric and nonparametric tests for analyzing practical problems  |

**Subject- Fluid Mechanics, Course Code- MEC402**

|     |   |
|-----|---|
| CO1 | <b>Define</b> properties of fluids, <b>classify</b> fluids and <b>evaluate</b> hydrostatic forces on various surfaces                                       |
| CO2 | <b>Illustrate</b> understanding of dimensional analysis of Thermal and Fluid systems  |
| CO3 | <b>Differentiate</b> velocity potential function and stream function and solve for velocity and acceleration of a fluid at a given location in a fluid flow |
| CO4 | <b>Formulate</b> and <b>solve</b> equations of the control volume for fluid flow systems and Apply Bernoulli's equation to various flow measuring devices   |
| CO5 | <b>Calculate</b> pressure drop in laminar and turbulent flow, evaluate major and minor losses in pipes.   |
| CO6 | <b>Calculate</b> resistance to flow of incompressible fluids through closed conduits and over surfaces.   |

**Subject- Kinematics of Machinery, Course Code- MEC403**

|     |  |
|-----|--|
| CO1 | Identify various components of mechanisms                                    |
| CO2 | Develop mechanisms to provide specific motion                                |
| CO3 | Draw velocity and acceleration diagrams of various mechanisms                |
| CO4 | Choose a cam profile for the specific follower motion                        |
| CO5 | Predict condition for maximum power transmission in the case of a belt drive |
| CO6 | Illustrate requirements for an interference-free gear pair                   |

**Subject- CAD/CAM, Course Code- MEC404**

|     |   |
|-----|---|
| CO1 | Identify suitable computer graphics techniques for 3D modeling.   |
| CO2 | Transform, manipulate objects & store and manage data   |
| CO3 | Develop 3D model using various types of available biomedical data.                                      |
| CO4 | Create the CAM Toolpath for specific given operations   |
| CO5 | Build and create data for 3D printing of any given object using rapid prototyping and tooling processes |
| CO6 | Illustrate understanding of various cost effective alternatives for manufacturing products              |

**Subject- Industrial Electronics, Course Code- MEC405**

|     |  |
|-----|--|
| CO1 | Illustrate construction, working principles and applications of power electronic Switches. |
| CO2 | Identify rectifiers and inverters for dc and ac motor speed control.                       |
| CO3 | Develop circuits using OPAMP and Timer IC 555.   |
| CO4 | Identify digital circuits for industrial applications.                                     |
| CO5 | Demonstrate the knowledge of basic functioning of microcontrollers.                        |
| CO6 | Analyze speed-torque characteristics of electrical machines for speed control.             |



**Subject- Industrial Electronics, Course Code- MEL401**

|     |   |
|-----|---|
| CO1 | Demonstrate characteristics of various electrical and electronics components.           |
| CO2 | Develop simple applications built around these components.                              |
| CO3 | Identify use of different logic gates and their industrial applications.                |
| CO4 | Built and demonstrate parameter measurements using microcontroller.                     |
| CO5 | Test and Analyze speed-torque characteristics of electrical machines for speed Control. |

**Subject- Kinematics of Machinery, Course Code- MEL402**

|     |   |
|-----|---|
| CO1 | Draw velocity diagram using Instantaneous Centre method   |
| CO2 | Find velocity and acceleration of a point on a four-bar mechanism by using Relative method.                                   |
| CO3 | Analyze velocity and acceleration of a specific link of a slider crank mechanism using graphical approach by Relative method. |
| CO4 | Plot displacement-time, velocity-time, and acceleration-time diagrams of follower motion.                                     |
| CO5 | Draw cam profile for the specific follower motion.  |
| CO6 | Develop and build mechanisms to provide specific motion.  |

**Subject- Python Programming, Course Code- MESBL403**

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|-----|--|
| CO1 | Demonstrate understand of basic concepts of python programming.            |
| CO2 | Identify, install and utilize python packages.                             |
| CO3 | Develop and execute python programs for specific applications.             |
| CO4 | Develop and build python program to solve real-world engineering problems. |
| CO5 | Prepare a report on case studies selected.                                 |

**Subject- CNC and 3-D Printing, Course Code- MESBL401**

|     |  |
|-----|--|
| CO1 | Develop and execute part programming for any given specific operation. |
| CO2 | Build any given object using various CNC operations.                   |
| CO3 | Demonstrate CAM Tool path and prepare NC- G code.                      |
| CO4 | Develop 3D model using available biomedical data.                      |
| CO5 | Build any given real life object using 3D printing process.            |
| CO6 | Convert 2D images into 3D model.                                       |

**Subject - Mini Project – 1 B, Course code- MEPBL401**

|     |  |
|-----|--|
| CO1 | Identify problems based on societal /research needs.   |
| CO2 | Apply Knowledge and skill to solve societal problems in a group.                                   |
| CO3 | Develop interpersonal skills to work as member of a group or leader.                               |
| CO4 | Draw the proper inferences from available results through theoretical/ Experimental/simulations.   |
| CO5 | Analyse the impact of solutions in societal and environmental context for Sustainable development. |
| CO6 | Use standard norms of engineering practices  |
| CO7 | Excel in written and oral communication.   |
| CO8 | Demonstrate capabilities of self-learning to leads to life long Learning.                          |



**TE :V SEM (REV- 2019 'C' Scheme )**

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| <b>Course Code:</b> | <b>MEC501</b>  |
| <b>Course:</b>      | <b>Mechanical Measurements and Controls</b>  |
| <b>CO-1</b>         | Handle, operate and apply the precision measuring instruments / equipment's  |
| <b>CO-2</b>         | Analyze simple machined components for dimensional stability & functionality   |
| <b>CO-3</b>         | Classify various types of static characteristics and types of errors occurring in the system   |
| <b>CO-4</b>         | Classify and select proper measuring instrument for displacement, pressure, flow and temperature measurements  |
| <b>CO-5</b>         | Design mathematical model of system/process for standard input responses and analyse error and differentiate various types of control systems and time domain specifications |
| <b>CO-6</b>         | Analyze the problems associated with stability   |

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| <b>Course Code:</b> | <b>MEC502</b>   |
| <b>Course:</b>      | <b>Thermal Engineering</b>  |
| <b>CO-1</b>         | Analyze the three modes of heat transfer in engineering application                     |
| <b>CO-2</b>         | Develop mathematical models for different modes of heat transfer                        |
| <b>CO-3</b>         | Analyze performance parameters of different types of heat exchangers                    |
| <b>CO-4</b>         | Identify and analyze the Transient heat Transfer in engineering applications            |
| <b>CO-5</b>         | Explain construction and working of different components of internal combustion engines |
| <b>CO-6</b>         | Evaluate engine performance and emission characteristics                                |

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| <b>Course Code:</b> | <b>MEC503</b>   |
| <b>Course:</b>      | <b>Dynamics of Machinery</b>  |
| <b>CO-1</b>         | Demonstrate working Principles of different types of governors and Gyroscopic effects on the mechanical systems |
| <b>CO-2</b>         | Illustrate basic of static and dynamic forces   |
| <b>CO-3</b>         | Determine natural frequency of element/system   |
| <b>CO-4</b>         | Determine vibration response of mechanical elements / systems   |
| <b>CO-5</b>         | Design vibration isolation system for a specific application  |
| <b>CO-6</b>         | Demonstrate basic concepts of balancing of forces and couples   |



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| <b>Course Code:</b> | <b>MEC504</b>  |
| <b>Course:</b>      | <b>Finite Element Analysis</b>   |
| <b>CO-1</b>         | Solve differential equations using weighted residual methods.  |
| <b>CO-2</b>         | Develop the finite element equations to model engineering problems governed by second order differential equations.    |
| <b>CO-3</b>         | Apply the basic finite element formulation techniques to solve engineering problems by using one dimensional elements. |
| <b>CO-4</b>         | Apply the basic finite element formulation techniques to solve engineering problems by using two dimensional elements. |
| <b>CO-5</b>         | Apply the basic finite element formulation techniques to find natural frequency of single degree of vibration system.  |
| <b>CO-6</b>         | Use commercial FEA software, to solve problems related to mechanical engineering.                                      |

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| <b>Course Code:</b> | <b>MEDLO5011</b>   |
| <b>Course:</b>      | <b>Optimization Technique (Elective)</b>   |
| <b>CO-1</b>         | Identify the types of optimization problems and apply the calculus method to single variable problems.   |
| <b>CO-2</b>         | Formulate the problem as Linear Programming problem and analyse the sensitivity of a decision variable.  |
| <b>CO-3</b>         | Apply various linear and non-linear techniques for problem solving in various domain.                    |
| <b>CO-4</b>         | Apply multi-objective decision making methods for problem in manufacturing environment and other domain. |
| <b>CO-5</b>         | Apply multi criterion decision making methods for problem in manufacturing environment and other domain. |
| <b>CO-6</b>         | Apply Design of Experiments method for Optimization.   |

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| <b>Course Code:</b> | <b>MEDLO5012</b>  |
| <b>Course:</b>      | <b>Design of Experiment (Elective)</b>  |
| <b>CO-1</b>         | Understand concept and get an overview of design of experiments.  |
| <b>CO-2</b>         | Understand and interpret full factorial design.   |
| <b>CO-3</b>         | Understand and interpret two and three level fractional factorial design.   |
| <b>CO-4</b>         | Understand and interpret robust design.   |
| <b>CO-5</b>         | Understand and interpret response surface methodology.  |
| <b>CO-6</b>         | Understand and interpret experimental design according to shainin, multi-variate charts, components search, paired comparisons. |



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| <b>Course Code:</b> | <b>MEL501</b>  |
| <b>Course:</b>      | <b>Thermal Engineering</b>   |
| <b>CO-1</b>         | Estimate thermal conductivity of engineering materials.                              |
| <b>CO-2</b>         | Evaluate performance parameters of extended surfaces.                                |
| <b>CO-3</b>         | Analyze heat transfer parameters in various engineering applications                 |
| <b>CO-4</b>         | Measure emissivity of grey body.   |
| <b>CO-5</b>         | Evaluate the performance of material under unsteady state heat transfer.             |
| <b>CO-6</b>         | Analyze engine performance and emission parameters at different operating condition. |

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| <b>Course Code:</b> | <b>MEL502</b>                                     |
| <b>Course:</b>      | <b>Dynamics of Machinery</b>                      |
| <b>CO-1</b>         | Plot and analyze governor characteristics.        |
| <b>CO-2</b>         | Analyze gyroscopic effect on laboratory model.    |
| <b>CO-3</b>         | Estimate natural frequency of mechanical systems. |
| <b>CO-4</b>         | Analyze vibration response of mechanical systems. |
| <b>CO-5</b>         | Determine damping coefficient of a system.        |
| <b>CO-6</b>         | Balance rotating mass.                            |

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| <b>Course Code:</b> | <b>MEL503</b>   |
| <b>Course:</b>      | <b>Finite Element Analysis</b>                            |
| <b>CO-1</b>         | Select appropriate element for given problem.             |
| <b>CO-2</b>         | Select suitable meshing and perform convergence test.     |
| <b>CO-3</b>         | Select appropriate solver for given problem.              |
| <b>CO-4</b>         | Interpret the result.                                     |
| <b>CO-5</b>         | Apply basic aspects of FEA to solve engineering problems. |
| <b>CO-6</b>         | Validate FEA solution.                                    |

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| <b>Course Code:</b> | <b>MESBL501</b>   |
| <b>Course:</b>      | <b>Professional communication and ethics –II</b>  |
| <b>CO-1</b>         | Plan and prepare effective business/ technical documents which will in turn provide solid foundation for their future managerial roles. |
| <b>CO-2</b>         | Strategize their personal and professional skills to build a professional image and meet the demands of the industry.                   |
| <b>CO-3</b>         | Emerge successful in group discussions, meetings and result-oriented agreeable solutions in group communication situations.             |
| <b>CO-4</b>         | Deliver persuasive and professional presentations.  |
| <b>CO-5</b>         | Develop creative thinking and interpersonal skills required for effective professional communication.                                   |
| <b>CO-6</b>         | Apply codes of ethical conduct, personal integrity and norms of organizational behavior.  |





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| <b>Course Code:</b> | <b>MEPBL501</b>  |
| <b>Course:</b>      | <b>Mini Project – 2 A</b>  |
| <b>CO-1</b>         | Breath and depth of literature survey  |
| <b>CO-2</b>         | Clarity of objectives and scope  |
| <b>CO-3</b>         | Quality of presentation and report preparation.  |
| <b>CO-4</b>         | Clarity of problem definition and feasibility.   |
| <b>CO-5</b>         | Analyze the impact of solutions in societal and environmental context for sustainable development. |
| <b>CO-6</b>         | Use standard norms of engineering practices.   |

**TE : VI SEM (REV- 2019 ‘C’ Scheme )**

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| <b>Course Code:</b> | <b>MEC601</b>   |
| <b>Course:</b>      | <b>Machine Design</b>   |
| <b>CO-1</b>         | Use design data book/standard codes to standardize the designed dimensions. |
| <b>CO-2</b>         | Design Knuckle Joint, cotter joint and Screw Jack.                          |
| <b>CO-3</b>         | Design shaft under various conditions and couplings.                        |
| <b>CO-4</b>         | Select bearings for a given applications from the manufacturers catalogue   |
| <b>CO-5</b>         | Select and/or design belts and flywheel for given applications              |
| <b>CO-6</b>         | Design springs, clutches and brakes.  |

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| <b>Course Code:</b> | <b>MEC602</b>  |
| <b>Course:</b>      | <b>Turbo Machinery</b>   |
| <b>CO-1</b>         | Define various parameters associated with steam generators and turbo machines.   |
| <b>CO-2</b>         | Identify various components and mountings of steam generators with their significance.   |
| <b>CO-3</b>         | Identify various turbo machines and explain their significance.  |
| <b>CO-4</b>         | Apply principles of thermodynamics and fluid mechanics to estimate various parameters like mass flow rate power, torque, efficiency, temperature, etc. |
| <b>CO-5</b>         | Evaluate performance of SG and Turbo machines and apply various techniques to enhance performance.   |
| <b>CO-6</b>         | Evaluate various phenomena related to performance like cavitations, choking, surging.  |



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| Course Code: | <b>MEC603</b>   |
| Course:      | <b>Heating, Ventilation, Air Conditioning and Refrigeration</b>   |
| CO-1         | Illustrate the fundamental principles and applications of refrigeration and air conditioning systems.     |
| CO-2         | Identify various HVAC&R components.   |
| CO-3         | Evaluate performance of various refrigeration system  |
| CO-4         | Estimate cooling and heating loads for an air conditioning system.  |
| CO-5         | Select air handling unit and design air distribution system.  |
| CO-6         | Apply the knowledge of HVAC for the sustainable development of refrigeration and air conditioning system. |

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| Course Code: | <b>MEC604</b>   |
| Course:      | <b>Automation and Artificial Intelligence</b>                               |
| CO-1         | Demonstrate understanding of fundamentals of industrial automation and AI.  |
| CO-2         | Design & develop pneumatic / hydraulic circuits.                            |
| CO-3         | Design and develop electro pneumatic circuits and PLC ladder logics.        |
| CO-4         | Demonstrate understanding of robotic control systems and their applications |
| CO-5         | Demonstrate understanding of various AI and machine learning technologies   |

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| Course Code: | <b>MEDLO6021</b>  |
| Course:      | <b>Press Tool Design</b>  |
| CO-1         | Demonstrate various press working operations for mass production of sheet metal parts.  |
| CO-2         | Identify press tool requirements to build concepts pertaining to design of press tools. |
| CO-3         | Prepare working drawings and setup for economic production of sheet metal components.   |
| CO-4         | Select suitable materials for different elements of press tools.                        |
| CO-5         | Illustrate the principles and blank development in bent & drawn components.             |
| CO-6         | Understand safety aspects and automation in press working.                              |

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| Course Code: | <b>MEDLO6023</b>  |
| Course:      | <b>Metal Forming Technology</b>   |
| CO-1         | Understand the concept of different metal forming process   |
| CO-2         | Approach metal forming processes both analytically and numerically.                                       |
| CO-3         | Design metal forming processes.   |
| CO-4         | Develop approaches and solutions to analyze metal forming processes and the associated problems and flaws |



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| Course Code: | <b>MEL601</b>   |
| Course:      | <b>Machine Design</b>   |
| CO-1         | Design shaft under various conditions.                                      |
| CO-2         | Design Knuckle Joint / cotter joint.  |
| CO-3         | Design Screw Jack.  |
| CO-4         | Design Flexible flange couplings/ Leaf spring.                              |
| CO-5         | Convert design dimensions into working/manufacturing drawing.               |
| CO-6         | Use design data book/standard codes to standardise the designed dimensions. |

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| Course Code: | <b>MEL602</b>   |
| Course:      | <b>Turbo Machinery</b>  |
| CO-1         | Differentiate boiler, boiler mountings and accessories.               |
| CO-2         | Conduct a trial on reciprocating compressor / centrifugal compressor. |
| CO-3         | Conduct a trial on impulse turbine and analyze its performance.       |
| CO-4         | Conduct a trial on reaction turbine and analyze its performance.      |
| CO-5         | Conduct a trial on Centrifugal pump and analyze its performance.      |
| CO-6         | Conduct a trial on Reciprocating pump and analyze its performance.    |
| CO-7         | Conduct a trial on gear pump.   |

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| Course Code: | <b>MEL603</b>  |
| Course:      | <b>Heating, Ventilation, Air Conditioning and Refrigeration</b>                                  |
| CO-1         | Aware of the roles and ethics of s eh & y engineers in related industries.                       |
| CO-2         | Present the impact of professional engineering solutions in societal and environmental contexts. |
| CO-3         | Evaluate performance of HVAC & R system.   |
| CO-4         | Develop awareness of the engineering and technological aspects in the s eh & y industries.       |
| CO-5         | Communicate effectively through the preparation of report and practical presentation.            |
| CO-6         | Analyze design aspects of HVAC & R system in various applications.                               |

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| Course Code: | <b>MESBL601</b>  |
| Course:      | <b>Measurements and Automation</b>   |
| CO-1         | Apply inspection gauge to check or measure surface parameters.               |
| CO-2         | Measure surface parameters using precision measurement tools and equipment.  |
| CO-3         | Measure different mechanical parameters by using sensors.                    |
| CO-4         | Analyse the response of a control systems.                                   |
| CO-5         | Demonstrate use of automated controls using pneumatic and hydraulic systems. |
| CO-6         | Implement program on PLC system and demonstrate its application.             |

**BE: VII SEM (REV- 2019)**

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| <b>Course Code:</b> | <b>MEC701</b>  |
| <b>Course:</b>      | <b>Design of Mechanical System</b>   |
| <b>CO-1</b>         | Apply the concept of system design   |
| <b>CO-2</b>         | Select appropriate gears for power transmission on the basis of given load and speed |
| <b>CO-3</b>         | Design material handling systems such as hoisting mechanism of EOT crane             |
| <b>CO-4</b>         | Design belt conveyor systems   |
| <b>CO-5</b>         | Design engine components such as cylinder, piston, connecting rod and crankshaft     |
| <b>CO-6</b>         | Design pumps for the given applications  |

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| <b>Course Code:</b> | <b>MEC702</b>   |
| <b>Course:</b>      | <b>Logistics and Supply Chain Management</b>  |
| <b>CO-1</b>         | Demonstrate a sound understanding of Logistics and Supply Chain Management concepts and their role in today's business environment. |
| <b>CO-2</b>         | Identify the drivers of supply chain performance and risks in supply chain management.  |
| <b>CO-3</b>         | Apply various techniques of inventory management and rank the items using inventory management technique                            |
| <b>CO-4</b>         | Apply various strategies and techniques to minimize overall logistics cost  |
| <b>CO-5</b>         | Understand the role of digitization in supply chain management leading to sustainability  |
| <b>CO-6</b>         | Apply various mathematical models/tools to design the supply chain network  |

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| <b>Course Code:</b> | <b>MEDLO7032</b>   |
| <b>Course:</b>      | <b>Renewable Energy Sources</b>  |
| <b>CO-1</b>         | Describe the need for renewable energy and its potential for the development of a sustainable Environment        |
| <b>CO-2</b>         | Analyze different solar collectors using geometrical parameters and photovoltaics for generation of solar energy |
| <b>CO-3</b>         | Identify and analyze various wind turbine energy harnessment techniques  |
| <b>CO-4</b>         | Design biogas plant for harnessing energy from organic waste   |
| <b>CO-5</b>         | Describe significance of hydrogen energy to fulfill present and future energy needs.                             |
| <b>CO-6</b>         | Describe the operating principle of geothermal energy and ocean energy and their role in sustainable             |



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| <b>Course Code:</b> | <b>MEDLO7041</b>  |
| <b>Course:</b>      | <b>Machinery Diagnostics</b>  |
| <b>CO-1</b>         | Relate basic concepts of Machinery Diagnostic.                        |
| <b>CO-2</b>         | Describe the working of Vibration Measuring Instruments               |
| <b>CO-3</b>         | Apply different Signal Processing Techniques in Vibration Measurement |
| <b>CO-4</b>         | Identify common faults in Machinery using Vibration Spectrum          |
| <b>CO-5</b>         | Interpret the Vibration Signals for Monitoring and Prognosis          |
| <b>CO-6</b>         | Apply applications of condition monitoring                            |

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| <b>Course Code:</b> | <b>ILO7011</b>   |
| <b>Course:</b>      | <b>Product Life Cycle Management</b>   |
| <b>CO-1</b>         | Gain knowledge about phases of PLM, PLM strategies and methodology for PLM feasibility study and PDM implementation        |
| <b>CO-2</b>         | Illustrate various approaches and techniques for designing and developing products   |
| <b>CO-3</b>         | Apply product engineering guidelines / thumb rules in designing products for moulding, machining, sheet metal working etc. |
| <b>CO-4</b>         | Acquire knowledge in applying virtual product development tools for components, machining and manufacturing plant          |
| <b>CO-5</b>         | Apply environmental aspects in product design.   |
| <b>CO-6</b>         | Apply Life Cycle Assessment and Life Cycle Cost Analysis concept.  |

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| <b>Course Code:</b> | <b>ILO7011</b>   |
| <b>Course:</b>      | <b>Product Lifecycle Management</b>  |
| <b>CO-1</b>         | Gain knowledge about phases of PLM, PLM strategies and methodology for PLM feasibility study and PDM implementation        |
| <b>CO-2</b>         | Illustrate various approaches and techniques for designing and developing products.  |
| <b>CO-3</b>         | Apply product engineering guidelines / thumb rules in designing products for moulding, machining, sheet metal working etc. |
| <b>CO-4</b>         | Acquire knowledge in applying virtual product development tools for components, machining and manufacturing plant          |
| <b>CO-5</b>         | Apply environmental aspects in product design.   |
| <b>CO-6</b>         | Illustrate various approaches and techniques in Life Cycle cost Assessment and Analysis.                                   |



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| <b>Course Code:</b> | <b>ILO7015</b>   |
| <b>Course:</b>      | <b>Operation Research</b>  |
| <b>CO-1</b>         | Apply OR techniques to formulate and solve real-world problem.                   |
| <b>CO-2</b>         | Develop an integrated framework for strategic thinking and problem solving       |
| <b>CO-3</b>         | Identify mathematical tools that are needed to solve optimisation problems       |
| <b>CO-4</b>         | Identify appropriate decision making approaches and apply tools to be used.      |
| <b>CO-5</b>         | Analyse situations in manufacturing environment and optimizing the solution      |
| <b>CO-6</b>         | Identify features of operations and production management and provide solution . |

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| <b>Course Code:</b> | <b>MEL701</b>  |
| <b>Course:</b>      | <b>Design of mechanical system</b>   |
| <b>CO-1</b>         | Apply the concept of system design.  |
| <b>CO-2</b>         | Design of hoisting mechanism of EOT crane  |
| <b>CO-3</b>         | Design belt conveyor systems   |
| <b>CO-4</b>         | Design pumps for the given applications  |
| <b>CO-5</b>         | Design engine components such as cylinder, piston, connecting rod and crankshaft |

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| <b>Course Code:</b> | <b>MEL702</b>   |
| <b>Course:</b>      | <b>Maintenance Engineering Lab</b>                            |
| <b>CO-1</b>         | Identify different tools used for maintenance.                |
| <b>CO-2</b>         | Demonstrate dismantling and assembly of mechanical system.    |
| <b>CO-3</b>         | Apply different maintenance strategies.                       |
| <b>CO-4</b>         | Demonstrate the process of servicing a machine.               |
| <b>CO-5</b>         | Identify common faults in Machinery using Vibration Spectrum. |
| <b>CO-6</b>         | Interpret the Vibration Signals for Monitoring and Prognosis. |

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| <b>Course Code:</b> | <b>MEL703</b>   |
| <b>Course:</b>      | <b>Industrial Skills</b>  |
| <b>CO-1</b>         | Skilfully prepare and edit documents and slides on MS Word and MS PowerPoint etc. |
| <b>CO-2</b>         | Execute functions on MS Excel.  |
| <b>CO-3</b>         | Learn how to navigate tasks and execute functions in G-suite.                     |
| <b>CO-4</b>         | Understand and practice metacognitive skills of creativity and problem solving    |
| <b>CO-5</b>         | Hone team building and leadership skills.   |



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| CO-6 | Use of typesetting/PPT packages like Latex, Prezi |
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| <b>Course Code:</b> | <b>MEP701</b>   |
| <b>Course:</b>      | <b>Project-I</b>  |
| <b>CO-1</b>         | Students will be able to develop the understanding of the problem domain through extensive review of literature   |
| <b>CO-2</b>         | Students will be able to identify and analyze the problem in detail to define its scope with problem specific data  |
| <b>CO-3</b>         | Students will be able to identify various techniques to be implemented for the selected problem and related technical skills through feasibility analysis |
| <b>CO-4</b>         | Students will be able to design solutions for real-time problems that will positively impact society and environment                                      |
| <b>CO-5</b>         | Students will be able to develop clarity of presentation based on communication, teamwork and leadership skills.  |
| <b>CO-6</b>         | Students will be able to inculcate professional and ethical behavior..  |

**BE : VIII SEM (REV- 2019 )**

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| <b>Course Code:</b> | <b>MEC801</b>   |
| <b>Course:</b>      | <b>Operations Planning and Control</b>  |
| <b>CO-1</b>         | Illustrate operations functions and manage operations in a better way   |
| <b>CO-2</b>         | Apply various strategies to develop aggregate production plan based on the demand forecasting .   |
| <b>CO-3</b>         | Apply various algorithms in scheduling and sequencing of manufacturing and service operations   |
| <b>CO-4</b>         | Develop Material Requirements Plans (MRP) to estimate the planned order releases  |
| <b>CO-5</b>         | Apply various techniques for facility layout planning and line balancing to optimize the resources  |
| <b>CO-6</b>         | Demonstrate the importance of implementation of JIT, Lean, Agile and Synchronous manufacturing in manufacturing and service organizations |

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| <b>Course Code:</b> | <b>MEDLO8051</b>  |
| <b>Course:</b>      | <b>Composite Materials</b>  |
| <b>CO-1</b>         | Select the type of material for the fibres and matrix in a composite material for the given application |
| <b>CO-2</b>         | Relate stresses and strains through the elastic constants for a given lamina                            |
| <b>CO-3</b>         | Evaluate elastic properties of a lamina based on the properties of its                                  |



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|      | constituents.  |
| CO-4 | Predict failure of a lamina under the given loading condition.   |
| CO-5 | Select the number of laminae and their stacking sequence in a composite material for the given loading condition |
| CO-6 | Identify the type of damage occurring in a composite structure and select an appropriate method to repair it.    |

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| <b>Course Code:</b> | <b>MEDLO8052</b>  |
| <b>Course:</b>      | <b>Smart Materials</b>  |
| CO-1                | Classify and select different types of smart materials  |
| CO-2                | Comprehend Important Concepts and principles of Smart Materials   |
| CO-3                | synthesis, sensing and actuation of Piezoelectric Materials, Magneto strictive Materials, Shape Memory Alloys, Electroactive Polymers                             |
| CO-4                | synthesis, sensing and actuation of Ferrofluids and Magneto rheological Fluids, Soft Matter, Carbon Nanotubes and Carbon nanostructures, Thermoelectric Materials |
| CO-5                | Classify and select Smart Materials for Energy Applications: Materials used for energy storage  |
| CO-6                | Classify and select Composite Materials, Nano Composite Materials   |

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| <b>Course Code:</b> | <b>MEDLO8061</b>  |
| <b>Course:</b>      | <b>Product Design and Development</b>   |
| CO-1                | Describe the process of product design & development  |
| CO-2                | Employ engineering, scientific, and mathematical principles to develop and execute a design project from a concept to a finished product. |
| CO-3                | Create 3D solid models of mechanical components using CAD software.   |
| CO-4                | Demonstrate individual skills using selected manufacturing techniques such as rapid Prototyping   |
| CO-5                | Fabricate an electromechanical assembly of a product from engineering drawings  |
| CO-6                | Work collaboratively in a team to complete a design project.  |
| CO-7                | Effectively communicate the results of projects and other assignments both in a written and oral format.                                  |

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| <b>Course Code:</b> | <b>MEDLO8062</b>  |
| <b>Course:</b>      | <b>Design for X</b>   |
| CO-1                | Apply design concepts and guidelines for manufacturing and assembly |
| CO-2                | Demonstrate the concept of value analysis and its relevance         |
| CO-3                | Understand the economics of product development                     |





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| CO-4 | Apply design concepts for reliability and maintainability |
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| <b>Course Code:</b> | <b>ILO8021</b>   |
| <b>Course:</b>      | <b>Project Management</b>  |
| <b>CO-1</b>         | Gain project management foundation and various organization structure knowledge.                         |
| <b>CO-2</b>         | Apply selection criteria and select an appropriate project from different options                        |
| <b>CO-3</b>         | Write work break down structure for a project and develop a schedule based on it.                        |
| <b>CO-4</b>         | Identify opportunities and threats to the project and decide an approach to deal with them Strategically |
| <b>CO-5</b>         | Use Earned value technique and determine & predict status of the project                                 |
| <b>CO-6</b>         | Capture lessons learned during project phases and document them for future reference                     |

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| <b>Course Code:</b> | <b>MEL801</b>  |
| <b>Course:</b>      | <b>Product Design and Development</b>  |
| <b>CO-1</b>         | Identify the need for developing products  |
| <b>CO-2</b>         | Select suitable PD&D processes   |
| <b>CO-3</b>         | Apply the creativity & industrial design methods to design & develop the chosen product                  |
| <b>CO-4</b>         | Work collaboratively in a team to complete a PD&D project  |
| <b>CO-5</b>         | Effectively communicate the results of projects and other assignments both in a written and oral format. |

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| <b>Course Code:</b> | <b>MEL802</b>   |
| <b>Course:</b>      | <b>Laboratory based on IoT</b>                                      |
| <b>CO-1</b>         | Develop simple applications using microcontrollers 8051 and Arduino |
| <b>CO-2</b>         | Interface simple peripheral devices to a Microcontroller            |
| <b>CO-3</b>         | Use microcontroller based embedded platforms in IoT                 |
| <b>CO-4</b>         | Use wireless peripherals for exchange of data                       |
| <b>CO-5</b>         | Setup cloud platform and log sensor data                            |

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| <b>Course Code:</b> | <b>ILO8022</b>  |
| <b>Course:</b>      | <b>Finance Management</b>   |
| <b>CO-1</b>         | Students should be able to explain the importance and components of the |



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|      | Indian Financial System   |
| CO-2 | Students should be able to estimate the risk & returns and present / future value of various investments                                    |
| CO-3 | Students should be able to describe corporate finance and significance of financial statements & ratio analysis                             |
| CO-4 | Students should be able to calculate capital budgeting using various investment appraisal criterias & also the working capital requirements |
| CO-5 | Students should be able to explain the various sources of finance and capital structure theories & approaches                               |
| CO-6 | Students should be able to describe the dividend policy theories & approaches   |

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| <b>Course Code:</b> | <b>ILO8028</b>  |
| <b>Course:</b>      | <b>Digital Business Management</b>  |
| CO-1                | Summarize drivers of digital business.  |
| CO-2                | Illustrate various approaches and techniques for E-business and management.               |
| CO-3                | Explain different digital business support services and technologies in E infrastructure. |
| CO-4                | Explain various ethics and societal impacts of ecommerce.                                 |
| CO-5                | Identify the need of security and summarize various security techniques.                  |
| CO-6                | Develop E-business plan.  |

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| <b>Course Code:</b> | <b>ILO8029</b>  |
| <b>Course:</b>      | <b>Environmental Management</b>   |
| CO-1                | Identify environmental Issues relevant to India and Global concerns.                    |
| CO-2                | Understand and apply the concept of Environment Management and Sustainable development. |
| CO-3                | Relate to the scope of Environment Management and identify career opportunities         |
| CO-4                | Understand the concept of ecology, Ecosystem, its interdependence and food chain.       |
| CO-5                | Demonstrate awareness of environment related legislations.                              |
| CO-6                | Develop awareness of EMS and ISO-14000.   |

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| <b>Course Code:</b> | <b>MEP801</b>  |
| <b>Course:</b>      | <b>Major Project-II</b>  |
| CO-1                | Students will be able to implement solutions for the selected problem by applying technical and professional skills. |



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| <b>CO-2</b> | Students will be able to analyze impact of solutions in societal and environmental context for sustainable development. |
| <b>CO-3</b> | Students will be able to collaborate best practices along with effective use of modern tools.                           |
| <b>CO-4</b> | Students will be able to develop proficiency in oral and written communication with effective leadership and teamwork.  |
| <b>CO-5</b> | Students will be able to nurture professional and ethical behavior.   |
| <b>CO-6</b> | Students will be able to gain expertise that helps in building lifelong learning Experience.                            |

**SIES GRADUATE SCHOOL OF TECHNOLOGY**

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