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(Affiliated to Visvesvaraya Technological University & Recognized by AICTE)
AIRPORT ROAD, KENJAR, MANGALORE – 574 142
Phone: 0824 – 2254104 Website: www.sdc.ac.in, E-mail : sdit_kenjar@rediffmail.com

# Department of Mechanical Engineering

## Course Outcomes and CO-PO-PSO articulation Matrix Batch: 2019-23

Semester-III

| **Subject:** Engineering Mathematics – III | **Subject Code:** 18MAT31 |
|---|---|

**Course Outcomes**

| | |
|---|---|
| **CO1** | Use Laplace transform and inverse Laplace transform in solving differential/ integral equation arising in network analysis, control systems and other fields of engineering. |
| **CO2** | Demonstrate Fourier series to study the behavior of periodic functions and their applications in system communications, digital signal processing and field theory. |
| **CO3** | Make use of Fourier transform and Z-transform to illustrate discrete/continuous function arising in wave and heat propagation, signals and systems. |
| **CO4** | Solve first and second order ordinary differential equations arising in engineering problems using single step and multistep numerical methods. |
| **CO5** | Determine the externals of functionals using calculus of variations and solve problems arising in dynamics of rigid bodies and vibrational analysis. |

**CO-PO-PSO Mapping**

| **COs** | **POs** | | | | | | | | | | | | **PSOs** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** | **3** |
| **CO1** | 3 | 3 | - | 3 | 3 | - | - | - | - | - | - | 2 | | | |
| **CO2** | 3 | 3 | - | 3 | 3 | - | - | - | - | - | - | 2 | | | |
| **CO3** | 3 | 3 | - | 3 | 3 | - | - | - | - | - | - | 2 | | | |
| **CO4** | 3 | 3 | - | 3 | 3 | - | - | - | - | - | - | 2 | | | |
| **CO5** | 3 | 3 | - | 3 | 3 | - | - | - | - | - | - | 2 | | | |
| **Average** | 3 | 3 | - | 3 | 3 | - | - | - | - | - | - | 2 | | | |

| **Subject:** Materials Science | **Subject Code:** 18ME32 |
|---|---|

**Course Outcomes**

| | |
|---|---|
| **CO1** | **The foundation for understanding the structure and various modes of failure in materials common in mechanical engineering.** |
| **CO2** | **Topics are designed to explore the mechanical properties of metals and their alloys, polymers, ceramics ,smart materials and composites.** |
| **CO3** | **The means of modifying such properties, as well as the processing and failure of materials.** |
| **CO4** | **Concepts of use of materials for various applications are highlighted.** |

CO-PO-PSO Mapping

| **COs** | **POs** | | | | | | | | | | | | **PSOs** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | 1 | 2 | 3 |
| **CO1** | 3 | 3 | - | 3 | 3 | - | 2 | - | 3 | - | 2 | 2 | | | |
| **CO2** | 3 | 3 | - | 3 | 3 | - | 2 | - | 3 | - | 2 | 2 | | | |
| **CO3** | 3 | 3 | - | 3 | 3 | - | 2 | - | 3 | - | 2 | 2 | | | |
| **CO4** | 3 | 3 | - | 3 | 3 | - | 2 | - | 3 | - | 2 | 2 | | | |
| Average | 3 | 3 | - | 3 | 3 | - | 2 | - | 3 | - | 2 | 2 | | | |

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| **Subject:** Basic Thermodynamics | **Subject Code:** 18ME33 |
|---|---|
| **Course Outcomes** | |
| **CO1** | **Learn about thermodynamic systems and boundaries.** |
| **CO2** | **Study the basic laws of thermodynamics including, conservation of mass, conservation of energy or first law , second law and Zeroth law.** |
| **CO3** | **Understand various forms of energy including heat transfer and work.** |
| **CO4** | **Identify various types of properties (e.g., extensive and intensive properties)** |
| **CO5** | **Use tables, equations, and charts, in evaluation of thermodynamic properties** |
| **CO6** | **Apply conservation of mass, first law, and second law in thermodynamic analysis of systems (e.g., turbines, pumps, compressors, heat exchangers, etc.)** |
| **CO7** | **Enhance their problem-solving skills in thermal engineering** |

CO-PO-PSO Mapping

| **COs** | **POs** | | | | | | | | | | | | **PSOs** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | 1 | 2 | 3 |
| **CO1** | 3 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | 2 | | | |
| **CO2** | 3 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | 2 | | | |
| **CO3** | 3 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | 2 | | | |
| **CO4** | 3 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | 2 | | | |
| **CO5** | 3 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | 2 | | | |
| **CO6** | 3 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | 2 | | | |
| **CO7** | 3 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | 2 | | | |
| Average | 3 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | 2 | | | |

| **Subject: MECHANICS OF MATERIALS** | **Subject Code:** 18ME34 |
|---|---|
| **Course Outcomes** | |
| **CO1** | **Classify the stresses into various categories and define elastic properties of materials and compute stress and strain intensities caused by applied loads in simple and compound sections and temperature changes.** |
| **CO2** | **Derive the equations for principal stress and maximum in-plane shear stress and calculate their magnitude and direction. Draw Mohr circle for plane stress system and interpret this circle.** |
| **CO3** | Comprehend the complexities involved during development of flight vehicles. |
| **CO4** | **Determine the shear force, bending moment and draw shear force and bending moment diagrams, describe behaviour of beams under lateral loads.** |
| **CO5** | **Explain the structural behaviour of members subjected to torque, calculate twist and stress induced in shafts subjected to bending and torsion.** |
| **CO6** | **Understand the concept of stability and derive crippling loads for columns.** |
| **CO7** | **Understand the concept of strain energy and compute strain energy for applied loads.** |

CO-PO-PSO Mapping

| **COs** | **POs** | | | | | | | | | | | | **PSOs** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | 1 | 2 | 3 |
| **CO1** | 3 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | 2 | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO2** | 3 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | 2 | | | |
| **CO3** | 3 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | 2 | | | |
| **CO4** | 3 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | 2 | | | |
| **CO5** | 3 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | 2 | | | |
| **CO6** | 3 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | 2 | | | |
| **CO7** | 3 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | 2 | | | |
| Average | 3 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | 2 | | | |

| **Subject: METAL CASTING AND WELDING** | **Subject Code:** 18ME35A |
|---|---|

**Course Outcomes**

| | |
|---|---|
| **CO1** | **To provide detailed information about the moulding processes.** |
| **CO2** | **To provide knowledge of various casting process in manufacturing.** |
| **CO3** | **To impart knowledge of various joining process used in manufacturing.** |
| **CO4** | **To provide adequate knowledge of quality test methods conducted on welded and casted components.** |

CO-PO-PSO Mapping

| **COs** | **POs** | | | | | | | | | | | | **PSOs** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | 1 | 2 | 3 |
| **CO1** | 3 | 3 | 2 | 3 | 3 | - | - | - | - | - | | 1 | | | |
| **CO2** | 3 | 3 | 2 | 3 | 3 | - | - | - | - | - | | 1 | | | |
| **CO3** | 3 | 3 | 2 | 3 | 3 | - | - | - | - | - | | 1 | | | |
| **CO4** | 3 | 3 | 2 | 3 | 3 | - | - | - | - | - | | 1 | | | |
| Average | 3 | 3 | 2 | 3 | 3 | - | - | - | - | - | | 1 | | | |

| **Subject: COMPUTER AIDED MACHINE DRAWING** | **Subject Code:** 18ME36A |
|---|---|

**Course Outcomes**

| | |
|---|---|
| **CO1** | **To acquire the knowledge of CAD software and its features.** |
| **CO2** | **To inculcate understanding of the theory of projection and make drawings using orthographic projections and sectional views** |
| **CO3** | **To familiarize the students with Indian Standards on drawing practices.** |
| **CO4** | **To impart knowledge of thread forms, fasteners, keys, joints and couplings.** |
| **CO5** | **To make the students understand and interpret drawings of machine components so as to prepare assembly drawings either manually and using CAD packages.** |
| **CO6** | **To acquire the knowledge of limits, tolerances and fits pertaining to machine drawings.** |

CO-PO-PSO Mapping

| **COs** | **POs** | | | | | | | | | | | | **PSOs** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | 1 | 2 | 3 |
| **CO1** | 3 | 3 | 3 | 3 | 2 | - | - | - | - | - | 2 | | | | |
| **CO2** | 3 | 3 | 3 | 3 | 2 | - | - | - | - | - | 2 | | | | |
| **CO3** | 3 | 3 | 3 | 3 | 2 | - | - | - | - | - | 2 | | | | |
| **CO4** | 3 | 3 | 3 | 3 | 2 | - | - | - | - | - | 2 | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO5** | 3 | 3 | 3 | 3 | 2 | - | - | - | - | - | 2 | | | | |
| **CO6** | 3 | 3 | 3 | 3 | 2 | - | - | - | - | - | 2 | | | | |
| Average | 3 | 3 | 3 | 3 | 2 | - | - | - | - | - | 2 | | | | |

| **Subject: MATERIALS TESTING LAB** | **Subject Code:** 18MEL37A |
|---|---|

**Course Outcomes**

| | |
|---|---|
| **CO1** | **To learn the concept of the preparation of samples to perform characterization such as microstructure, volume fraction of phases and grain size.** |
| **CO2** | **To understand mechanical behaviour of various engineering materials by conducting standard tests.** |
| **CO3** | **To learn material failure modes and the different loads causing failure.** |
| **CO4** | **To learn the concepts of improving the mechanical properties of materials by different methods like heat treatment, surface treatment etc.** |

CO-PO-PSO Mapping

| **COs** | **POs** | | | | | | | | | | | | **PSOs** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | 1 | 2 | 3 |
| **CO1** | 3 | 3 | 3 | 3 | 3 | - | - | - | - | - | | | | | |
| **CO2** | 3 | 3 | 3 | 3 | 3 | - | - | - | - | - | | | | | |
| **CO3** | 3 | 3 | 3 | 3 | 3 | - | - | - | - | - | | | | | |
| **CO4** | 3 | 3 | 3 | 3 | 3 | - | - | - | - | - | | | | | |
| Average | 3 | 3 | 3 | 3 | 3 | - | - | - | - | - | | | | | |

| **Subject: KINEMATICS OF MACHINES** | **Subject Code:** 18ME42 |
|---|---|

**Course Outcomes**

| | |
|---|---|
| **CO1** | **Familiarize with mechanisms and motion analysis of mechanisms.** |
| **CO2** | **Understand methods of mechanism motion analysis and their characteristics.** |
| **CO3** | **Analyse motion of planar mechanisms, gears, gear trains and cams.** |

CO-PO-PSO Mapping

| **COs** | **POs** | | | | | | | | | | | | **PSOs** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | 1 | 2 | 3 |
| **CO1** | - | - | - | - | - | 3 | 3 | 3 | - | - | - | 1 | | | |
| **CO2** | - | - | - | - | - | 3 | 3 | 3 | - | - | - | 1 | | | |
| **CO3** | - | - | - | - | - | 3 | 3 | 3 | - | - | - | 1 | | | |
| Average | - | - | - | - | - | 3 | 3 | 3 | - | - | - | 1 | | | |

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Phone: 0824 – 2254104 Website: www.sdc.ac.in, E-mail : sdit_kenjar@rediffmail.com

Semester-IV

| **Subject:** COMPLEX ANALYSIS, PROBABILITY AND STATISTICAL METHODS | **Subject Code:** 18MAT41 |
|---|---|

**Course Outcomes**

| | |
|---|---|
| **CO1** | Use the concepts of analytic function and complex potentials to solve the problems arising in electromagnetic field theory. |
| **CO2** | Utilize conformal transformation and complex integral arising in aero foil theory, fluid flow visualization and image processing. |
| **CO3** | Apply discrete and continuous probability distributions in analyzing the probability models arising in engineering field. |
| **CO4** | Make use of the correlation and regression analysis to fit a suitable mathematical model for the statistical data. |
| **CO5** | Construct joint probability distributions and demonstrate the validity of testing the hypothesis. |

CO-PO-PSO Mapping

| **COs** | **POs** | | | | | | | | | | | | | **PSOs** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | 1 | 2 | 3 | |
| **CO1** | 3 | 3 | - | 3 | 3 | - | - | - | - | - | - | | | | | |
| **CO2** | 3 | 3 | - | 3 | 3 | - | - | - | - | - | - | | | | | |
| **CO3** | 3 | 3 | - | 3 | 3 | - | - | - | - | - | - | | | | | |
| **CO4** | 3 | 3 | - | 3 | 3 | - | - | - | - | - | - | | | | | |
| **CO5** | 3 | 3 | - | 3 | 3 | - | - | - | - | - | - | | | | | |
| Average | 3 | 3 | - | 3 | 3 | - | - | - | - | - | - | | | | | |

| **Subject:** Applied Thermodynamics | **Subject Code:** 18ME42 |
|---|---|

**Course Outcomes**

| | |
|---|---|
| **CO1** | **To have a working knowledge of basic performance of Gas power cycles.** |
| **CO2** | **To determine performance parameters of refrigeration and air-conditioning systems.** |
| **CO3** | **Evaluate the performance parameters of reciprocating air compressor as a function of receiver pressure.** |
| **CO4** | **To Calculate the forces exerted by a fluid at rest on submerged surfaces and understand the force of buoyancy** |
| **CO5** | **To understand and evaluate the performance of steam power cycles their various Engineering applications** |
| **CO6** | **To know how fuel burns and their thermodynamic properties.** |
| **CO7** | **To Understand mechanism of power transfer through belt, rope, chain and gear drives in I C Engines** |

CO-PO-PSO Mapping

| **COs** | **POs** | | | | | | | | | | | | **PSOs** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | 1 | 2 | 3 |
| **CO1** | 3 | 3 | 3 | 3 | 3 | - | - | - | | - | 3 | | | | |
| **CO2** | 3 | 3 | 3 | 3 | 3 | - | - | - | | - | 3 | | | | |
| **CO3** | 3 | 3 | 3 | 3 | 3 | - | - | - | | - | 3 | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO4** | 3 | 3 | 3 | 3 | 3 | - | - | - | | - | 3 | | | | |
| **CO5** | 3 | 3 | 3 | 3 | 3 | - | - | - | | - | 3 | | | | |
| **CO6** | 3 | 3 | 3 | 3 | 3 | - | - | - | | - | 3 | | | | |
| **CO7** | 3 | 3 | 3 | 3 | 3 | - | - | - | | - | 3 | | | | |
| Average | 3 | 3 | 3 | 3 | 3 | - | - | - | | - | 3 | | | | |

| **Subject:** Fluid Mechanics | **Subject Code:** 18ME44 |
|---|---|
| **Course Outcomes** | |
| **CO1** | **To have a working knowledge of the basic properties of fluids and understand the continuum approximation.** |
| **CO2** | **To Calculate the forces exerted by a fluid at rest on submerged surfaces and understand the force of buoyancy** |
| **CO3** | **To understand the flow characteristic and dynamics of flow field for various Engineering applications** |
| **CO4** | **To know how velocity changes and energy transfers in fluid flows are related to forces and torques and to understand why designing for minimum loss of energy in fluid flows is so important.** |
| **CO5** | **To discuss the main properties of laminar and turbulent pipe flow and appreciate their differences and the concept of boundary layer theory.** |
| **CO6** | **Understand the concept of dynamic similarity and how to apply it to experimental modeling** |
| **CO7** | **To appreciate the consequences of compressibility in gas flow and understand the effects of friction and heat transfer on compressible flows** |

CO-PO-PSO Mapping

| **COs** | **POs** | | | | | | | | | | | | **PSOs** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | 1 | 2 | 3 |
| **CO1** | 3 | 3 | 3 | 3 | 3 | - | 2 | - | 3 | - | | | | | |
| **CO2** | 3 | 3 | 3 | 3 | 3 | - | 2 | - | 3 | - | | | | | |
| **CO3** | 3 | 3 | 3 | 3 | 3 | - | 2 | - | 3 | - | | | | | |
| **CO4** | 3 | 3 | 3 | 3 | 3 | - | 2 | - | 3 | - | | | | | |
| **CO5** | 3 | 3 | 3 | 3 | 3 | - | 2 | - | 3 | - | | | | | |
| **CO6** | 3 | 3 | 3 | 3 | 3 | - | 2 | - | 3 | - | | | | | |
| **CO7** | 3 | 3 | 3 | 3 | 3 | - | 2 | - | 3 | - | | | | | |
| Average | 3 | 3 | 3 | 3 | 3 | - | 2 | - | 3 | - | | | | | |

| **Subject:** Mechanical Measurements and Metrology Lab | **Subject Code:** 18MEL47B |
|---|---|
| **Course Outcomes** | |
| **CO1** | **To illustrate the theoretical concepts taught in Mechanical Measurements & Metrology** |
| | **through experiments.** |
| **CO2** | **To illustrate the use of various measuring tools measuring techniques.** |
| **CO3** | **To understand calibration techniques of various measuring devices.** |

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| CO-PO-PSO Mapping | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **COs** | **POs** | | | | | | | | | | | | **PSOs** | | |
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** | **3** |
| **CO1** | 2 | 3 | 2 | 2 | 3 | - | - | - | | - | | 1 | | | |
| **CO2** | 2 | 3 | 2 | 2 | 3 | - | - | - | | - | | 1 | | | |
| **CO3** | 2 | 3 | 2 | 2 | 3 | - | - | - | | - | | 1 | | | |
| Average | 2 | 3 | 2 | 2 | 3 | - | - | - | | - | | 1 | | | |

| **Subject:** MEASUREMENTS AND METROLOGY LAB | **Subject Code:** 18MEL48B |
|---|---|
| **Course Outcomes** | |
| **CO1** | **To illustrate the theoretical concepts taught in Mechanical Measurements & Metrology through experiments.** |
| **CO2** | **To illustrate the use of various measuring tools measuring techniques.** |
| **CO3** | **To understand calibration techniques of various measuring devices.** |

| CO-PO-PSO Mapping | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **COs** | **POs** | | | | | | | | | | | | **PSOs** | | |
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **1** | **2** | **3** |
| **CO1** | 2 | 2 | 2 | 2 | 3 | - | - | - | | - | 3 | | | | |
| **CO2** | 2 | 2 | 2 | 2 | 3 | - | - | - | | - | 3 | | | | |
| **CO3** | 2 | 2 | 2 | 2 | 3 | - | - | - | | - | 3 | | | | |
| Average | 2 | 2 | 2 | 2 | 3 | - | - | - | | - | 3 | | | | |

| **Subject:** Machine Tools and Operations | **Subject Code:** 18ME45B |
|---|---|
| **Course Outcomes** | |
| **CO1** | **To introduce students to different machine tools in order to produce components having different shapes and sizes.** |
| **CO2** | **To enrich the knowledge pertaining to relative motion and mechanics required for various machine tools.** |
| **CO3** | **To develop the knowledge on mechanics of machining process and effect of various parameters on economics of machining.** |

| CO-PO-PSO Mapping | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **COs** | **POs** | | | | | | | | | | | | **PSOs** | | |
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | 1 | 2 | 3 |
| **CO1** | 3 | 3 | 3 | 3 | 3 | - | - | - | 2 | - | 2 | 2 | | | |
| **CO2** | 3 | 3 | 3 | 3 | 3 | - | - | - | 2 | - | 2 | 2 | | | |
| **CO3** | 3 | 3 | 3 | 3 | 3 | - | - | - | 2 | - | 2 | 2 | | | |
| Average | 3 | 3 | 3 | 3 | 3 | - | - | - | 2 | - | 2 | 2 | | | |

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| **Subject:** Mechanical Measurements and Metrology | | | | | | | | | | | | **Subject Code:** 18ME46B | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Outcomes** | | | | | | | | | | | | | | |
| **CO1** | **Understand metrology, its advancements & measuring instruments,** | | | | | | | | | | | | | |
| **CO2** | **Acquire knowledge on different standards of length, calibration of End Bars, linear and angular measurements, Screw thread and gear measurement & comparators.** | | | | | | | | | | | | | |
| **CO3** | **Equip with knowledge of limits, fits, tolerances and gauging.** | | | | | | | | | | | | | |
| **CO4** | **Acquire knowledge of measurement systems and methods with emphasis on different transducers, intermediate modifying and terminating devices** | | | | | | | | | | | | | |
| **CO5** | **Understand the measurement of Force, Torque, Pressure, Temperature and Strain.** | | | | | | | | | | | | | |
| CO-PO-PSO Mapping | | | | | | | | | | | | | | |
| **COs** | **POs** | | | | | | | | | | | | **PSOs** | | |
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | 1 | 2 | 3 |
| **CO1** | 3 | 3 | 3 | 3 | 3 | - | - | - | 2 | - | 2 | 2 | | | |
| **CO2** | 3 | 3 | 3 | 3 | 3 | - | - | - | 2 | - | 2 | 2 | | | |
| **CO3** | 3 | 3 | 3 | 3 | 3 | - | - | - | 2 | - | 2 | 2 | | | |
| **CO4** | 3 | 3 | 3 | 3 | 3 | - | - | - | 2 | - | 2 | 2 | | | |
| **CO5** | 3 | 3 | 3 | 3 | 3 | - | - | - | 2 | - | 2 | 2 | | | |
| Average | 3 | 3 | 3 | 3 | 3 | - | - | - | 2 | - | 2 | 2 | | | |

## Semester-V

| **Subject:** MANAGEMENT AND ENTREPRENEURSHIP | **Subject Code:** 18ME51 |
|---|---|
| **Course Outcomes** | |
| **CO1** | Examine the meaning, importance, nature of management, its difference between management and administration and role of managers in management. Describe effective communication process, its importance, types and purpose for running an organization. |
| **CO2** | Examine the meaning characteristics principles and process of organizing. |
| **CO3** | Explain the importance of engineering economics, Law of demand and supply in engineering decision making. |
| **CO4** | Describe various interest rate factors and implement the same for economic decision making. |
| **CO5** | Examine different economic analysis methods-NPW, EAW, IRR, FW for decision making. |
| **CO6** | Discuss different component of costs and methods of cost estimation. |
| **CO7** | Explain depreciation, different methods of computing depreciation. |

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| CO8 | Discuss taxation concepts-income tax and corporate taxes. |
|---|---|

CO-PO-PSO Mapping

| COs | POs | | | | | | | | | | | | PSOs | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 |
| CO1 | 3 | 3 | - | - | 3 | 2 | - | - | - | - | 3 | 2 | | | |
| CO2 | 3 | 3 | - | - | 3 | 2 | - | - | - | - | 3 | 2 | | | |
| CO3 | 3 | 3 | - | - | 3 | 2 | - | - | - | - | 3 | 2 | | | |
| CO4 | 3 | 3 | - | - | 3 | 2 | - | - | - | - | 3 | 2 | | | |
| CO5 | 3 | 3 | - | - | 3 | 2 | - | - | - | - | 3 | 2 | | | |
| CO6 | 3 | 3 | - | - | 3 | 2 | - | - | - | - | 3 | 2 | | | |
| CO7 | 3 | 3 | - | - | 3 | 2 | - | - | - | - | 3 | 2 | | | |
| CO8 | 3 | 3 | - | - | 3 | 2 | - | - | - | - | 3 | 2 | | | |
| Average | 3 | 3 | - | - | 3 | 2 | - | - | - | - | 3 | 2 | | | |

| **Subject:** Energy and Environment | **Subject Code:** 18ME562 |
|---|---|

**Course Outcomes**

| CO1 | Understand energy scenario, energy sources and their utilization |
|---|---|
| CO2 | Learn about methods of energy storage, energy management and economic analysis |
| CO3 | Have proper awareness about environment and eco system. |
| CO4 | Understand the environment pollution along with social issues and acts. |

CO-PO-PSO Mapping

| COs | POs | | | | | | | | | | | | PSOs | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 |
| CO1 | 3 | 2 | 3 | 2 | 2 | 2 | - | - | - | - | 3 | 3 | | | |
| CO2 | 3 | 2 | 3 | 2 | 2 | 2 | - | - | - | - | 3 | 3 | | | |
| CO3 | 3 | 2 | 3 | 2 | 2 | 2 | - | - | - | - | 3 | 3 | | | |
| CO4 | 3 | 2 | 3 | 2 | 2 | 2 | - | - | - | - | 3 | 3 | | | |
| Average | 3 | 2 | 3 | 2 | 2 | 2 | - | - | - | - | 3 | 3 | | | |

| **Subject:** Dynamics of Machinery | **Subject Code:** 18ME52 |
|---|---|

**Course Outcomes**

| CO1 | To gain the knowledge static and dynamic equilibrium conditions of mechanisms subjected forces and couple, with and without friction. |
|---|---|
| CO2 | Analyze the mechanisms for static and dynamic equilibrium. |
| CO3 | To understand the balancing principles of rotating and reciprocating masses, governors and gyroscopes. |
| CO4 | Analyze the balancing of rotating and reciprocating masses, governors and gyroscopes. |
| CO5 | To understand vibrations characteristics of single degree of freedom systems. |

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| | |
|---|---|
| **CO6** | **Characterize the single degree freedom systems subjected to free and forced vibrations with and without damping.** |

CO-PO-PSO Mapping

| COs | POs | | | | | | | | | | | | PSOs | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | 1 | 2 | 3 |
| **CO1** | 3 | 3 | - | 3 | - | - | - | - | - | - | 3 | 2 | | | |
| **CO2** | 3 | 3 | - | 3 | - | - | - | - | - | - | 3 | 2 | | | |
| **CO3** | 3 | 3 | - | 3 | - | - | - | - | - | - | 3 | 2 | | | |
| **CO4** | 3 | 3 | - | 3 | - | - | - | - | - | - | 3 | 2 | | | |
| **CO5** | 3 | 3 | - | 3 | - | - | - | - | - | - | 3 | 2 | | | |
| **CO6** | 3 | 3 | - | 3 | - | - | - | - | - | - | 3 | 2 | | | |
| Average | 3 | 3 | - | 3 | - | - | - | - | - | - | 3 | 2 | | | |

| **Subject:** Turbo Machines | **Subject Code:** 18ME53 |
|---|---|

**Course Outcomes**

| | |
|---|---|
| **CO1** | **The course aims at giving an overview of different types of turbomachinery used for energy transformation, such as pumps, fans, compressors, as well as hydraulic and steam turbines.** |
| **CO2** | **Explain the working principles of turbomachines and apply it to various types of machines** |
| **CO3** | **It will focus on application of turbo machinery in power generation, power absorption and transportation sectors.** |

CO-PO-PSO Mapping

| COs | POs | | | | | | | | | | | | PSOs | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | 1 | 2 | 3 |
| **CO1** | 3 | 2 | 2 | 3 | 3 | - | - | - | - | - | 2 | 2 | | | |
| **CO2** | 3 | 2 | 2 | 3 | 3 | - | - | - | - | - | 2 | 2 | | | |
| **CO3** | 3 | 2 | 2 | 3 | 3 | - | - | - | - | - | 2 | 2 | | | |
| Average | 3 | 2 | 2 | 3 | 3 | - | - | - | - | - | 2 | 2 | | | |

| **Subject:** Non-Traditional Machining | **Subject Code:** 18ME554 |
|---|---|

**Course Outcomes**

| | |
|---|---|
| **CO1** | Understand the compare traditional and non-traditional machining process and recognize the need for Non-traditional machining process. |
| **CO2** | Understand the constructional features, performance parameters, process characteristics, applications, advantages and limitations of USM, AJM and WJM. |
| **CO3** | Identify the need of Chemical and electro-chemical machining process along with the constructional features, process parameters, process characteristics, applications, advantages and limitations. |
| **CO4** | Understand the constructional feature of the equipment, process parameters, process characteristics, applications, advantages and limitations EDM & PAM. |
| **CO5** | Understand the LBM equipment, LBM parameters, and characteristics. EBM equipment and mechanism of metal removal, applications, advantages and |

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| | limitations LBM & EBM. |
|---|---|

CO-PO-PSO Mapping

| COs | POs | | | | | | | | | | | | PSOs | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 |
| CO1 | 3 | 2 | 2 | 3 | 3 | - | - | 3 | - | - | 2 | - | | | |
| CO2 | 3 | 2 | 2 | 3 | 3 | - | - | 3 | - | - | 2 | - | | | |
| CO3 | 3 | 2 | 2 | 3 | 3 | - | - | 3 | - | - | 2 | - | | | |
| CO4 | 3 | 2 | 2 | 3 | 3 | - | - | 3 | - | - | 2 | - | | | |
| CO5 | 3 | 2 | 2 | 3 | 3 | - | - | 3 | - | - | 2 | - | | | |
| Average | 3 | 2 | 2 | 3 | 3 | - | - | 3 | - | - | 2 | - | | | |

| **Subject:** Design of Machine Elements - I | **Subject Code:** 18ME54 |
|---|---|

**Course Outcomes**

| | |
|---|---|
| **CO1** | **Able to understand mechanical design procedure, materials, codes and use of standards** |
| **CO2** | Able to design machine components for static, impact and fatigue strength. |
| **CO3** | Able to design fasteners, shafts, joints, couplings, keys, threaded fasteners riveted joints, welded joints and power screws. |

CO-PO-PSO Mapping

| COs | POs | | | | | | | | | | | | PSOs | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 |
| CO1 | 3 | 3 | 2 | 3 | 3 | - | 1 | - | - | - | 3 | - | | | |
| CO2 | 3 | 3 | 2 | 3 | 3 | - | 1 | - | - | - | 3 | - | | | |
| CO3 | 3 | 3 | 2 | 3 | 3 | - | 1 | - | - | - | 3 | - | | | |
| Average | 3 | 3 | 2 | 3 | 3 | - | 1 | - | - | - | 3 | - | | | |

| **Subject:** Fluid Mechanics & Machinery Lab | **Subject Code:** 18MEL57 |
|---|---|

**Course Outcomes**

| | |
|---|---|
| **CO1** | This course will provide a basic understanding of flow measurements using various types of flow measuring devices, calibration and losses associated with these devices. |
| **CO2** | Energy conversion principles, analysis and understanding of hydraulic turbines and pumps will be discussed. Application of these concepts for these machines will be demonstrated. Performance analysis will be carried out using characteristic curves. |

CO-PO-PSO Mapping

| COs | POs | | | | | | | | | | | | PSOs | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 |
| CO1 | 3 | 3 | - | 3 | 3 | - | - | 3 | - | - | - | - | | | |
| CO2 | 3 | 3 | - | 3 | 3 | - | - | 3 | - | - | - | - | | | |
| Average | 3 | 3 | - | 3 | 3 | - | - | 3 | - | - | - | - | | | |

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| **Subject:** Energy Lab | **Subject Code:** 18MEL58 |
|---|---|
| **Course Outcomes** | |
| **CO1** | This course will provide a basic understanding of fuel properties and its measurements using various types of measuring devices |
| **CO2** | Energy conversion principles, analysis and understanding of I C Engines will be discussed. Application of these concepts for these machines will be demonstrated. Performance analysis will be carried out using characteristic curves. |
| **CO3** | Exhaust emissions of I C Engines will be measured and compared with the standards. |

CO-PO-PSO Mapping

| **COs** | **POs** | | | | | | | | | | | | **PSOs** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | 1 | 2 | 3 |
| **CO1** | 3 | 3 | - | 2 | 3 | - | - | - | 2 | - | - | 1 | | | |
| **CO2** | 3 | 3 | - | 2 | 3 | - | - | - | 2 | - | - | 1 | | | |
| **CO3** | 3 | 3 | - | 2 | 3 | - | - | - | 2 | - | - | 1 | | | |
| Average | 3 | 3 | - | 2 | 3 | - | - | - | 2 | - | - | 1 | | | |

Semester-VI

| **Subject:** Finite Element Analysis | **Subject Code:** 18ME61 |
|---|---|
| **Course Outcomes** | |
| **CO1** | To learn basic principles of finite element analysis procedure. |
| **CO2** | To learn the theory and characteristics of finite elements that represent engineering structures. |
| **CO3** | To learn and apply finite element solutions to structural, thermal, dynamic problem to develop the knowledge and skills needed to effectively evaluate finite element analyses. |

CO-PO-PSO Mapping

| **COs** | **POs** | | | | | | | | | | | | **PSOs** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | 1 | 2 | 3 |
| **CO1** | 3 | 3 | - | 2 | 3 | - | - | - | 2 | - | - | 1 | | | |
| **CO2** | 3 | 3 | - | 2 | 3 | - | - | - | 2 | - | - | 1 | | | |
| **CO3** | 3 | 3 | - | 2 | 3 | - | - | - | 2 | - | - | 1 | | | |
| Average | 3 | 3 | - | 2 | 3 | - | - | - | 2 | - | - | 1 | | | |

| **Subject:** Industrial Safety | **Subject Code:** 18ME662 |
|---|---|
| **Course Outcomes** | |
| **CO1** | Students will be able to recognize and evaluate occupational safety and health hazards in the workplace, and to determine appropriate hazard controls following the hierarchy of controls. |

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| | |
|---|---|
| **CO2** | Students will furthermore be able to analyze the effects of workplace exposures, injuries and illnesses, fatalities and the methods to prevent |
| **CO3** | incidents using the hierarchy of controls, effective safety and health management systems and task-oriented training. |

CO-PO-PSO Mapping

| **COs** | **POs** | | | | | | | | | | | | **PSOs** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | 1 | 2 | 3 |
| **CO1** | 3 | 2 | 2 | 3 | 3 | - | - | - | - | - | 2 | 2 | | | |
| **CO2** | 3 | 2 | 2 | 3 | 3 | - | - | - | - | - | 2 | 2 | | | |
| **CO3** | 3 | 2 | 2 | 3 | 3 | - | - | - | - | - | 2 | 2 | | | |
| Average | 3 | 2 | 2 | 3 | 3 | - | - | - | - | - | 2 | 2 | | | |

| **Subject:** Computer integrated Manufacturing | **Subject Code:** 18ME62 |
|---|---|

**Course Outcomes**

| | |
|---|---|
| **CO1** | To impart knowledge of CIM and Automation and different concepts of automation by developing mathematical models. |
| **CO2** | To make students to understand the Computer Applications in Design and Manufacturing [CAD / CAM) leading to Computer integrated |
| **CO3** | systems. Enable them to perform various transformations of entities on display devices. |
| **CO4** | To expose students to automated flow lines, assembly lines, Line Balancing Techniques, and Flexible Manufacturing Systems. |
| **CO5** | To expose students to computer aided process planning, material requirement planning, capacity planning etc. |
| **CO6** | To expose the students to CNC Machine Tools, NC part programming, and industrial robots. |
| **CO7** | To introduce the students to concepts of Additive Manufacturing, Internet of Things, and Industry 4.0leading to Smart Factory. |

CO-PO-PSO Mapping

| **COs** | **POs** | | | | | | | | | | | | **PSOs** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | 1 | 2 | 3 |
| **CO1** | 3 | 3 | 2 | 2 | 1 | - | - | - | - | - | - | 1 | | | |
| **CO2** | 3 | 3 | 2 | 2 | 1 | - | - | - | - | - | - | 1 | | | |
| **CO3** | 3 | 3 | 2 | 2 | 1 | - | - | - | - | - | - | 1 | | | |
| **CO4** | 3 | 3 | 2 | 2 | 1 | - | - | - | - | - | - | 1 | | | |
| **CO5** | 3 | 3 | 2 | 2 | 1 | - | - | - | - | - | - | 1 | | | |
| **CO6** | 3 | 3 | 2 | 2 | 1 | - | - | - | - | - | - | 1 | | | |
| **CO7** | 3 | 3 | 2 | 2 | 1 | - | - | - | - | - | - | 1 | | | |
| Average | 3 | 3 | 2 | 2 | 1 | - | - | - | - | - | - | 1 | | | |

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| **Subject:** Heat Transfer | **Subject Code:** 18ME63 |
|---|---|
| **Course Outcomes** | |
| **CO1** | Study the modes of heat transfer. |
| **CO2** | Learn how to formulate and solve 1-D steady and unsteady heat conduction problems. |
| **CO3** | Apply empirical correlations for fully developed laminar, turbulent internal flows and external boundary layer convective flow problems. |
| **CO4** | Study the basic principles of heat exchanger analysis and thermal design. |
| **CO5** | Understand the principles of boiling and condensation including radiation heat transfer related engineering problems. |

CO-PO-PSO Mapping

| **COs** | **POs** | | | | | | | | | | | | **PSOs** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | 1 | 2 | 3 |
| **CO1** | 2 | 2 | - | 3 | 3 | - | - | - | 1 | - | - | 1 | | | |
| **CO2** | 2 | 2 | - | 3 | 3 | - | - | - | 1 | - | - | 1 | | | |
| **CO3** | 2 | 2 | - | 3 | 3 | - | - | - | 1 | - | - | 1 | | | |
| **CO4** | 2 | 2 | - | 3 | 3 | - | - | - | 1 | - | - | 1 | | | |
| **CO5** | 2 | 2 | - | 3 | 3 | - | - | - | 1 | - | - | 1 | | | |
| Average | 2 | 2 | - | 3 | 3 | - | - | - | 1 | - | - | 1 | | | |

| **Subject:** Design of Machine Elements -II | **Subject Code:** 18ME64 |
|---|---|
| **Course Outcomes** | |
| **CO1** | To understand various elements involved in a mechanical system. |
| **CO2** | To analyze various forces acting on the elements of a mechanical system and design them using appropriate techniques, codes, and standards. |
| **CO3** | To select transmission elements like gears, belts, pulleys, bearings from the manufacturers" catalogue. |
| **CO4** | To design completely a mechanical system integrating machine elements. |
| **CO5** | To produce assembly and working drawings of various mechanical systems involving machine elements like belts, pulleys, gears, springs, bearings, clutches and brakes. |

CO-PO-PSO Mapping

| **COs** | **POs** | | | | | | | | | | | | **PSOs** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | 1 | 2 | 3 |
| **CO1** | 3 | 2 | 2 | 3 | 3 | - | - | - | - | - | - | 1 | | | |
| **CO2** | 3 | 2 | 2 | 3 | 3 | - | - | - | - | - | - | 1 | | | |
| **CO3** | 3 | 2 | 2 | 3 | 3 | - | - | - | - | - | - | 1 | | | |
| **CO4** | 3 | 2 | 2 | 3 | 3 | - | - | - | - | - | - | 1 | | | |
| **CO5** | 3 | 2 | 2 | 3 | 3 | - | - | - | - | - | - | 1 | | | |
| Average | 3 | 2 | 2 | 3 | 3 | - | - | - | - | - | - | 1 | | | |

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| **Subject:** Automobile Engineering | | | | | | | | | | | | **Subject Code:** 18ME655 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Outcomes** | | | | | | | | | | | | | | |
| **CO1** | Explain the fundamentals of operating system | | | | | | | | | | | | | |
| **CO2** | Comprehend process management, memory management and storage management. | | | | | | | | | | | | | |
| **CO3** | Familiar with various types of operating systems | | | | | | | | | | | | | |
| CO-PO-PSO Mapping | | | | | | | | | | | | | | |
| **COs** | **POs** | | | | | | | | | | | | **PSOs** | |
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | 1 | 2 | 3 |
| **CO1** | - | - | 2 | - | 2 | - | - | - | - | - | 1 | 1 | | | |
| **CO2** | - | - | 2 | - | 2 | - | - | - | - | - | 1 | 1 | | | |
| **CO3** | - | - | 2 | - | 2 | - | - | - | - | - | 1 | 1 | | | |
| Average | - | - | 2 | - | 2 | - | - | - | - | - | 1 | 1 | | | |

| **Subject:** Heat Transfer Lab | | | | | | | | | | | | **Subject Code:** 18MEL67 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Outcomes** | | | | | | | | | | | | | | |
| **CO1** | The primary objective of this course is to provide the fundamental knowledge necessary to understand the behavior of thermal systems. | | | | | | | | | | | | | |
| **CO2** | This course provides a detailed experimental analysis, including the application and heat transfer through solids, fluids, and vacuum. Convection, conduction, and radiation heat transfer in one and two dimensional steady and unsteady systems are examined. | | | | | | | | | | | | | |
| CO-PO-PSO Mapping | | | | | | | | | | | | | | |
| **COs** | **POs** | | | | | | | | | | | | **PSOs** | |
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | 1 | 2 | 3 |
| **CO1** | 3 | 3 | | | | 3 | | | 3 | 3 | 3 | 3 | | | |
| **CO2** | 3 | 3 | | | | 3 | | | 3 | 3 | 3 | 3 | | | |
| Average | 3 | 3 | | | | 3 | | | 3 | 3 | 3 | 3 | | | |

| **Subject:** Modeling and Analysis Lab (FEA) | | | | | | | | | | | | **Subject Code:** 18MEL68 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Outcomes** | | | | | | | | | | | | | | |
| **CO1** | To acquire basic understanding of Modeling and Analysis software | | | | | | | | | | | | | |
| **CO2** | To understand the different kinds of analysis and apply the basic principles to find out the stress and other related parameters of bars, beams loaded with loading conditions. | | | | | | | | | | | | | |
| **CO3** | To lean to apply the basic principles to carry out dynamic analysis to know the natural frequency of different kind of beams. | | | | | | | | | | | | | |
| CO-PO-PSO Mapping | | | | | | | | | | | | | | |
| **COs** | **POs** | | | | | | | | | | | | **PSOs** | |
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | 1 | 2 | 3 |

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| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 3 | - | - | - | - | - | 3 | - | - | - | | | |
| **CO2** | 3 | 3 | 3 | - | - | - | - | - | 3 | - | - | - | | | |
| **CO3** | 3 | 3 | 3 | - | - | - | - | - | 3 | - | - | - | | | |
| Average | 3 | 3 | 3 | - | - | - | - | - | 3 | - | - | - | | | |

## Semester-VII

| **Subject:** Energy Engineering | | | | | | | | **Subject Code:** 18ME71 | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Outcomes** | | | | | | | | | | | | | | |
| **CO1** | Understand energy scenario, energy sources and their utilization, Learn about energy conversion methods and their analysis | | | | | | | | | | | | | |
| **CO2** | Study the principles of renewable energy conversion systems. | | | | | | | | | | | | | |
| **CO3** | Understand the concept of green energy and zero energy. | | | | | | | | | | | | | |
| CO-PO-PSO Mapping | | | | | | | | | | | | | | |
| **COs** | **POs** | | | | | | | | | | | | **PSOs** | | |
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | 1 | 2 | 3 |
| **CO1** | 2 | 2 | 3 | - | 2 | - | - | - | - | - | - | - | | | |
| **CO2** | 2 | 2 | 3 | - | 2 | - | - | - | - | - | - | - | | | |
| **CO3** | 2 | 2 | 3 | - | 2 | - | - | - | - | - | - | - | | | |
| Average | 2 | 2 | 3 | - | 2 | - | - | - | - | - | - | - | | | |

| **Subject:** Fluid Power Systems | | | | | | | | **Subject Code:** 18ME72 | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Outcomes** | | | | | | | | | | | | | | |
| **CO1** | To provide an insight into the capabilities of hydraulic and pneumatic fluid power. | | | | | | | | | | | | | |
| **CO2** | To understand concepts and relationships surrounding force, pressure, energy and power in fluid power systems. | | | | | | | | | | | | | |
| **CO3** | To examine concepts centering on sources of hydraulic power, rotary and linear actuators, distribution systems, hydraulic flow in pipes, and control components in fluid power systems. | | | | | | | | | | | | | |
| **CO4** | Exposure to build and interpret hydraulic and pneumatic circuits related to industrial applications. | | | | | | | | | | | | | |
| **CO5** | To familiarize with logic controls and trouble shooting | | | | | | | | | | | | | |
| CO-PO-PSO Mapping | | | | | | | | | | | | | | |
| **COs** | **POs** | | | | | | | | | | | | **PSOs** | | |
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | 1 | 2 | 3 |
| **CO1** | 3 | 3 | - | 3 | 3 | - | - | - | 1 | - | - | 1 | | | |
| **CO2** | 3 | 3 | - | 3 | 3 | - | - | - | 1 | - | - | 1 | | | |
| **CO3** | 3 | 3 | - | 3 | 3 | - | - | - | 1 | - | - | 1 | | | |
| **CO4** | 3 | 3 | - | 3 | 3 | - | - | - | 1 | - | - | 1 | | | |
| **CO5** | 3 | 3 | - | 3 | 3 | - | - | - | 1 | - | - | 1 | | | |
| Average | 3 | 3 | - | 3 | 3 | - | - | - | 1 | - | - | 1 | | | |

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| **Subject:** Tribology | **Subject Code:** 18ME742 |
|---|---|
| **Course Outcomes** | |
| **CO1** | To educate the students on the importance of friction, the related theories/laws of sliding and rolling friction and the effect of viscosity of lubricants. |
| **CO2** | To expose the students to the consequences of wear, wear mechanisms, wear theories and analysis of wear problems. |
| **CO3** | To make the students understand the principles of lubrication, lubrication regimes, theories of hydrodynamic and the advanced lubrication techniques |
| **CO4** | To expose the students to the factors influencing the selection of bearing materials for different sliding applications. |
| **CO5** | To introduce the concepts of surface engineering and its importance in tribology. |

CO-PO-PSO Mapping

| **COs** | **POs** | | | | | | | | | | | | **PSOs** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | 1 | 2 | 3 |
| **CO1** | 2 | 2 | 3 | - | - | - | - | - | - | - | 2 | - | | | |
| **CO2** | 2 | 2 | 3 | - | - | - | - | - | - | - | 2 | - | | | |
| **CO3** | 2 | 2 | 3 | - | - | - | - | - | - | - | 2 | - | | | |
| **CO4** | 2 | 2 | 3 | - | - | - | - | - | - | - | 2 | - | | | |
| **CO5** | 2 | 2 | 3 | - | - | - | - | - | - | - | 2 | - | | | |
| Average | 2 | 2 | 3 | - | - | - | - | - | - | - | 2 | - | | | |

| **Subject: Mechatronics** | **Subject Code:** 18ME753 |
|---|---|
| **Course Outcomes** | |
| **CO1** | Understand the evolution and development of Mechatronics as a discipline. |
| **CO2** | Substantiate the need for interdisciplinary study in technology education. |
| **CO3** | Understand the applications of microprocessors in various systems and to know the functions of each element |
| **CO4** | Demonstrate the integration philosophy in view of Mechatronics technology |

CO-PO-PSO Mapping

| **COs** | **POs** | | | | | | | | | | | | **PSOs** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | 1 | 2 | 3 |
| **CO1** | 2 | 2 | - | 2 | 3 | - | - | - | - | - | - | 1 | | | |
| **CO2** | 2 | 2 | - | 2 | 3 | - | - | - | - | - | - | 1 | | | |
| **CO3** | 2 | 2 | - | 2 | 3 | - | - | - | - | - | - | 1 | | | |
| **CO4** | 2 | 2 | - | 2 | 3 | - | - | - | - | - | - | 1 | | | |
| Average | 2 | 2 | - | 2 | 3 | - | - | - | - | - | - | 1 | | | |

| **Subject:** Control Engineering | **Subject Code:** 18ME73 |
|---|---|
| **Course Outcomes** | |
| **CO1** | Modeling of mechanical, hydraulic, pneumatic and electrical systems. |
| **CO2** | Representation of system elements by blocks and its reduction |
| **CO3** | Transient and steady state response analysis of a system. |
| **CO4** | Frequency response analysis using polar plot. |

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|---|---|
| **CO5** | Frequency response analysis using bode plot. |
| **CO6** | Analysis of system using root locus plots. |
| **CO7** | Different system compensators and variable characteristics of linear systems. |

CO-PO-PSO Mapping

| **COs** | **POs** | | | | | | | | | | | | **PSOs** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | 1 | 2 | 3 |
| **CO1** | - | 2 | - | 2 | 3 | - | - | - | 2 | - | - | 2 | | | |
| **CO2** | - | 2 | - | 2 | 3 | - | - | - | 2 | - | - | 2 | | | |
| **CO3** | - | 2 | - | 2 | 3 | - | - | - | 2 | - | - | 2 | | | |
| **CO4** | - | 2 | - | 2 | 3 | - | - | - | 2 | - | - | 2 | | | |
| **CO5** | - | 2 | - | 2 | 3 | - | - | - | 2 | - | - | 2 | | | |
| **CO6** | - | 2 | - | 2 | 3 | - | - | - | 2 | - | - | 2 | | | |
| **CO7** | - | 2 | - | 2 | 3 | - | - | - | 2 | - | - | 2 | | | |
| Average | - | 2 | - | 2 | 3 | - | - | - | 2 | - | - | 2 | | | |

| **Subject:** CIM Lab | **Subject Code:** 18MEL77 |
|---|---|

**Course Outcomes**

| | |
|---|---|
| **CO1** | Draw the geometric models of symmetric, cambered aero foil, nozzle, wing and other structures. |
| **CO2** | Apply different types of meshing. |
| **CO3** | Perform the flow and stress analysis. |

CO-PO-PSO Mapping

| **COs** | **POs** | | | | | | | | | | | | **PSOs** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | 1 | 2 | 3 |
| **CO1** | 2 | 2 | 3 | 1 | - | - | - | - | - | - | - | - | | | |
| **CO2** | 2 | 2 | 3 | 1 | - | - | - | - | - | - | - | - | | | |
| **CO3** | 2 | 2 | 3 | 1 | - | - | - | - | - | - | - | - | | | |
| Average | 2 | 2 | 3 | 1 | - | - | - | - | - | - | - | - | | | |

| **Subject DESIGN LAB** | **Subject Code:** 18MEL76 |
|---|---|

**Course Outcomes**

| | |
|---|---|
| **CO1** | To understand the natural frequency, logarithmic decrement, damping ratio and damping. |
| **CO2** | To understand the balancing of rotating masses. |
| **CO3** | To understand the concept of the critical speed of a rotating shaft. |
| **CO4** | To understand the concept of stress concentration using Photo elasticity. |
| **CO5** | To understand the equilibrium speed, sensitiveness, power and effort of Governor. |

CO-PO-PSO Mapping

| **COs** | **POs** | | | | | | | | | | | | **PSOs** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | 1 | 2 | 3 |
| **CO1** | 2 | 2 | 3 | 1 | - | - | - | - | - | - | - | - | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO2** | 2 | 2 | 3 | 1 | - | - | - | - | - | - | - | - | | | |
| **CO3** | 2 | 2 | 3 | 1 | - | - | - | - | - | - | - | - | | | |
| **CO4** | 2 | 2 | 3 | 1 | - | - | - | - | - | - | - | - | | | |
| **CO5** | 2 | 2 | 3 | 1 | - | - | - | - | - | - | - | - | | | |
| Average | 2 | 2 | 3 | 1 | - | - | - | - | - | - | - | - | | | |

| **Subject:** Project Work Phase - 1 | **Subject Code:** 18MEP78 |
|---|---|
| **Course Outcomes** | |
| **CO1** | Identify and interpret the realistic mechanical engineering problems and related systems. |
| **CO2** | Apply the basic principles and concepts of mechanical engineering in real world systems based on professional ethics and responsibilities. |
| **CO3** | Criticize and experiment to achieve optimum solutions for mechanical engineering problems. |
| **CO4** | Analyze, evaluate and review the obtained solution for problems in mechanical engineering systems. |
| **CO5** | Demonstrate professionalism with ethics; present effective communication skills and relate engineering issues to broader societal context. |

CO-PO-PSO Mapping

| **COs** | **POs** | | | | | | | | | | | | **PSOs** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | 1 | 2 | 3 |
| **CO1** | 3 | | | | 1 | 2 | 2 | - | 3 | 3 | 1 | 2 | | | |
| **CO2** | 3 | 1 | | | 2 | 1 | - | 1 | 3 | 3 | 1 | 3 | | | |
| **CO3** | 3 | 2 | 2 | 2 | 2 | 2 | 1 | | 3 | 3 | 1 | 2 | | | |
| **CO4** | 3 | 2 | 2 | 2 | 2 | 2 | 1 | | 3 | 3 | 1 | 2 | | | |
| **CO5** | | | | | | 1 | | 3 | 3 | 3 | | 1 | | | |
| Average | 2.5 | 2.33 | 2.33 | 2 | 1.75 | 2 | 2 | 2.5 | 3 | 3 | 1.6 | 2.6 | | | |

| Subject: Operations Research | **Subject Code:** 18ME81 |
|---|---|
| **Course Outcomes** | |
| **CO1** | To enable the students to understand the scientific methods of providing various departments of an organization with a quantitative basis of decision making. |
| **CO2** | To enable the studentsto understand the importance of various tools and techniques in finding optimal solutions to problems involving limited resources in the form of Men, Materials and machinery. |

CO-PO-PSO Mapping

| **COs** | **POs** | | | | | | | | | | | | **PSOs** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | 1 | 2 | 3 |
| **CO1** | 2 | 2 | 3 | 1 | - | - | - | - | - | - | - | 2 | | | |
| **CO2** | 2 | 2 | 3 | 1 | - | - | - | - | - | - | - | 2 | | | |
| Average | 2 | 2 | 3 | 1 | - | - | - | - | - | - | - | 2 | | | |

| Subject: Additive Manufacturing | **Subject Code:** 18ME82 |
|---|---|

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| Course Outcomes | |
|---|---|
| **CO1** | Understand the additive manufacturing process, polymerization and powder metallurgy process |
| **CO2** | Understand characterization techniques in additive manufacturing. |
| **CO3** | Acquire knowledge on CNC and Automation. |

CO-PO-PSO Mapping

| **COs** | **POs** | | | | | | | | | | | | **PSOs** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | 1 | 2 | 3 |
| **CO1** | 2 | 2 | 3 | 1 | - | - | - | - | - | - | - | 2 | | | |
| **CO2** | 2 | 2 | 3 | 1 | - | - | - | - | - | - | - | 2 | | | |
| **CO3** | 2 | 2 | 3 | 1 | - | - | - | - | - | - | - | 2 | | | |
| Average | 2 | 2 | 3 | 1 | - | - | - | - | - | - | - | 2 | | | |

| Subject: Internship / Professional Practice | **Subject Code:** 18ME84 |
|---|---|

| Course Outcomes | |
|---|---|
| **CO1** | Conduct experiments to evaluate the design characteristics of various machine elements subjected to various loading. |
| **CO2** | Analyse the theoretical and experimental concept in machine elements subjected to various loading. |
| **CO3** | Understand and discuss the design characteristics of various systems subjected to mechanical loading. |

CO-PO-PSO Mapping

| **COs** | **POs** | | | | | | | | | | | | **PSOs** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | 1 | 2 | 3 |
| **CO1** | 2 | 2 | 3 | 1 | - | - | - | - | - | - | - | 2 | | | |
| **CO2** | 2 | 2 | 3 | 1 | - | - | - | - | - | - | - | 2 | | | |
| **CO3** | 2 | 2 | 3 | 1 | - | - | - | - | - | - | - | 2 | | | |
| Average | 2 | 2 | 3 | 1 | - | - | - | - | - | - | - | 2 | | | |

| Subject: Product life cycle management | **Subject Code:** 18ME835 |
|---|---|

| Course Outcomes | |
|---|---|
| **CO1** | Familiarize with various strategies of PLM |
| **CO2** | Understand the concept of product design and simulation. |
| **CO3** | Develop New product development ,product structure and supporting systems |
| **CO4** | Interpret the technology forecasting and product innovation and development in business processes. |
| **CO5** | Understand product building and Product Configuration. |

CO-PO-PSO Mapping

| **COs** | **POs** | | | | | | | | | | | | **PSOs** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | 1 | 2 | 3 |
| **CO1** | 2 | 2 | 3 | 1 | - | - | - | - | - | - | - | 2 | | | |
| **CO2** | 2 | 2 | 3 | 1 | - | - | - | - | - | - | - | 2 | | | |
| **CO3** | 2 | 2 | 3 | 1 | - | - | - | - | - | - | - | 2 | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO4** | 2 | 2 | 3 | 1 | - | - | - | - | - | - | - | 2 | | | |
| **CO5** | 2 | 2 | 3 | 1 | - | - | - | - | - | - | - | 2 | | | |
| Average | 2 | 2 | 3 | 1 | - | - | - | - | - | - | - | 2 | | | |

| **Subject:** Project Phase – II | | | | | | | | | | | **Subject Code:** 18ME85 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Outcomes** | | | | | | | | | | | | | | | |
| **CO1** | Identify and interpret the realistic mechanical engineering problems and related systems. | | | | | | | | | | | | | | |
| **CO2** | Apply the basic principles and concepts of mechanical engineering in real world systems based on professional ethics and responsibilities. | | | | | | | | | | | | | | |
| **CO3** | Criticize and experiment to achieve optimum solutions for mechanical engineering problems. | | | | | | | | | | | | | | |
| **CO4** | Analyze, evaluate and review the obtained solution for problems in mechanical engineering systems. | | | | | | | | | | | | | | |
| **CO5** | Demonstrate professionalism with ethics; present effective communication skills and relate engineering issues to broader societal context. | | | | | | | | | | | | | | |
| CO-PO-PSO Mapping | | | | | | | | | | | | | | | |
| **COs** | **POs** | | | | | | | | | | | | **PSOs** | | |
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | 1 | 2 | 3 |
| **CO1** | 3 | | | | 1 | 2 | 2 | - | 3 | 3 | 1 | 2 | | | |
| **CO2** | 3 | 1 | | | 2 | 1 | - | 1 | 3 | 3 | 1 | 3 | | | |
| **CO3** | 3 | 2 | 2 | 2 | 2 | 2 | 1 | | 3 | 3 | 1 | 2 | | | |
| **CO4** | 3 | 2 | 2 | 2 | 2 | 2 | 1 | | 3 | 3 | 1 | 2 | | | |
| **CO5** | | | | | | 1 | | 3 | 3 | 3 | | 1 | | | |
| Average | 2.5 | 2.33 | 2.33 | 2 | 1.75 | 2 | 2 | 2.5 | 3 | 3 | 1.6 | 2.6 | | | |

| Subject: Seminar | | | | | | | | | | | **Subject Code:** 18MES86 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Outcomes** | | | | | | | | | | | | | | | |
| **CO1** | Identify recent technical topics from interested domains | | | | | | | | | | | | | | |
| **CO2** | Acquire basic skills for performing literature survey. | | | | | | | | | | | | | | |
| **CO3** | Improve their Presentation and Communication skills. | | | | | | | | | | | | | | |
| **CO4** | Develop skills for preparing technical report | | | | | | | | | | | | | | |
| CO-PO-PSO Mapping | | | | | | | | | | | | | | | |
| **COs** | **POs** | | | | | | | | | | | | **PSOs** | | |
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | 1 | 2 | 3 |
| **CO1** | 2 | 2 | 3 | 1 | - | - | - | - | - | - | - | 2 | | | |
| **CO2** | 2 | 2 | 3 | 1 | - | - | - | - | - | - | - | 2 | | | |
| **CO3** | 2 | 2 | 3 | 1 | - | - | - | - | - | - | - | 2 | | | |
| **CO4** | 2 | 2 | 3 | 1 | | | | | | | | 1 | | | |
| Average | 2 | 2 | 3 | 1 | - | - | - | - | - | - | - | 1.8 | | | |

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