SAPTHAGIRI COLLEGE OF ENGINEERING

Department of Mechanical Engineering

COURSE OUTCOMES AND COURSE ARTICULATION MATRIX

2015 SCHEME

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
	PROGRAM OUTCOMES												PROGRAM SPECIFIC OUTCOMES		
	Apply Knowledge	Problem Analysis	Design Solution	Investigation	Modern Tools	Society,Health, Safety, Legal	Environment & Sustainability	Ethics	Individual & Team Work	Report, Document,Presentation, Communication	Proj Mgmt Finance	Life Long Learn	Design,Thermal, Manufacturing	Analytical, Experimental, Creativity	Modern Tools, Management, Product
					3	2	1	-							

Elements of Mechanical Enginering	
CO1	Explain different sources of energy and calculcate steam properties.
CO2	Describe conversion of energy by prime movers calculate performance parameters.
CO3	Describe the different machine tool operations and basics of Robotics and Automation.
CO4	Classify basic engineering materials and identify its application.
CO5	Illustrate the working principle of refrigeration and air conditioning.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	2	-	-	-	-	2	-	2	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-
CO5	-	2	-	-	-	-	2	-	-	-	-	-	-	-	-
Average	3.00	2.00	-	-	-	-	2.00	-	-	-	-	2.00	-	2.00	-

COMPUTER AIDED ENGINEERING DRAWING

CO1	Demonstrate the usage of CAD software
CO2	Draw orthographic projections of points, lines, planes and solids.
CO3	Generate the development of lateral surfaces of solids and isometric projections of solids

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	3	-	-	-	-	3	-	3	-	-	3
CO2	3	2	-	-	3	-	-	-	-	3	-	3	-	-	3
CO3	3	2	-	-	3	-	-	-	-	3	-	3	-	-	3
Average	2.67	2.00	-	-	3.00	-	-	-	-	3.00	-	3.00	-	-	3.00

Workshop

CO1	Demonstrate the use of fitting tools to make models.
CO2	Demonstrate the use of sheet metals tools to make models.
CO3	Demonstrate the use of Welding tools to make models.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	2	2	-	2	2	-	2
CO2	-	-	-	-	-	-	-	-	2	2	-	2	2	-	2
CO3	-	-	-	-	-	-	2	-	2	2	-	3	2	-	2
Average	-	-	-	-	-	-	2.00	-	2.00	2.00	-	2.33	2.00	-	2.00

SECOND YEAR

Material Science-15ME32

CO1	Describe the basic structure and mechanical properties and failure of materials.
CO2	Illustrate the phase transformation of Solidification.
CO3	Describe the heat treatment process of metals.
CO4	Classify materials and describe properties smart materials
CO5	Summarize the processes and application of composite Materials.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	-	-	-	-	-	-	-	-	-	3	1	-
CO2	2	2	-	-	-	-	-	-	-	-	-	-	3	2	-
CO3	2	-	-	-	-	-	-	-	-	-	-	-	3	-	-
CO4	2	-	-	-	-	-	-	-	-	-	-	2	3	-	2
CO5	2	-	-	-	-	-	-	-	-	-	-	2	3	-	2
Average	2.00	2.00	-	-	-	-	-	-	-	-	-	2.00	3.00	1.50	2.00

Basic Thermodynamics 15ME33

CO1	Determine heat and work interactions in different thermodynamic systems.
CO2	Apply first and second law of thermodynamics for work and heat interactions
CO3	Analyze reversible and irreversible processes based on change in entropy.
CO4	Compute available energy in thermodynamic processes using thermodynamic relations.
CO5	Calculate thermodynamic properties of pure substance.
CO6	Analyze the behavior of the ideal and real gases using gas laws.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	2	3	3	-
CO2	3	2	-	-	-	-	-	-	-	-	-	2	3	3	-
CO3	3	3	-	-	-	-	-	-	-	-	-	2	3	3	-
CO4	3	2	-	-	-	-	-	-	-	-	-	2	3	3	-
CO5	3	2	-	-	-	-	-	-	-	-	-	2	3	3	-
CO6	3	3	-	-	-	-	-	-	-	-	-	2	3	3	-
Average	3.00	2.33	-	-	-	-	-	-	-	-	-	2.00	3.00	3.00	-

Mechanics of Materials15ME34

CO1	Determine the stress, strain and elastic constants in bars.
CO2	Analyze stress and strain under combined loading using analytical and Mohr circle method.
CO3	Draw shear force and bending moment diagrams and determine bending stresses for beams.
CO4	Compute structural parameters of shafts and columns.
CO5	Determine the strain energy of structural member and apply theories of failure.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	3	3	3	-
CO2	3	3	-	-	-	-	-	-	-	-	-	3	3	3	-
CO3	3	2	-	-	-	-	-	-	-	-	-	2	3	3	-
CO4	3	2	-	-	-	-	-	-	-	-	-	2	3	3	-
CO5	3	2	-	-	-	-	-	-	-	-	-	2	3	3	-
Average	3.00	2.20	-	-	-	-	-	-	-	-	-	2.40	3.00	3.00	-

Metal Casting & Welding 15ME35A/45A

CO1	Explain the basics & preparation of sand mould.
CO2	Illustrate different melting furnaces & methods of casting.
CO3	Explain the solidification process & casting of aluminium.
CO4	Classify different types of welding processes.
CO5	Describe metallurgical aspects in welding process & inspection methods.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	-	-	-	-	-	-	-	2	3	-	-
CO2	2	-	-	-	-	-	-	-	-	-	-	2	2	-	-
CO3	2	-	-	-	-	-	1	-	-	-	-	2	3	-	2
CO4	2	-	-	-	-	-	1	-	-	-	-	3	3	-	2
CO5	2	-	-	-	-	-	1	-	-	-	-	2	3	-	-
Average	2.00	-	-	-	-	-	1.00	-	-	-	-	2.20	2.80	-	2.00

Machine Tools and Operations 15ME35B/45B

CO1	Demonstrate various conventional machines and operations.
CO2	Describe various cutting tool materials, geometry and surface finish.
CO3	Explain and determine parameters of machining process.
CO4	Estimate tool life and cost of machining process.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	-	-	-	-	-	-	-	2	3	-	2
CO2	2	-	-	-	-	-	-	-	-	-	-	2	3	-	2
CO3	2	2	-	-	-	-	-	-	-	-	-	2	3	-	-
CO4	3	2	-	-	-	-	-	-	-	-	2	2	3	-	-
Average	2.25	2.00	-	-	-	-	-	-	-	-	2.00	2.00	3.00	-	2.00

Computer Aided Machine Drawing 15ME36A/46A

CO1	Demonstrate the usage of CAD software for 3D modeling.
CO2	Draw section of solids and conversion of pictorial to orthographic views.
CO3	Sketch different forms of threads and fasteners.
CO4	Draw types of riveted joints, knuckle joint, cotter joints and couplings.
CO5	Assemble and draw assembly of machine parts.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	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
Average	3.00	3.00	-	-	3.00	-	-	-	-	3.00	-	3.00	2.00	-	3.00

Mechanical Measurements and Metrology 15ME36B/46B

CO1	Describe metrology, methods, standards, of measurement and measuring instruments.
CO2	Explain system of limits, fits tolerances, gauges and comparators.
CO3	Illustrate metrological measurements of screw threads, gear tooth parameters and advanced Metrology instruments.
CO4	Differentiate methods of indirect measurements.
CO5	Describe measurement of force, pressure, temperature and strain.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	-	-	-	-	-	-	-	2	3	-	-
CO2	2	2	-	-	-	-	-	-	-	-	-	2	3	-	-
CO3	2	-	-	-	-	-	-	-	-	-	-	2	3	-	-
CO4	2	-	-	-	-	-	-	-	-	-	-	-	3	-	-
CO5	2	-	-	-	-	-	-	-	-	-	-	2	3	-	-
Average	2.00	2.00	-	-	-	-	-	-	-	-	-	2.00	3.00	-	-

Material Testing LAB 15ME37A/47A

CO1	Gain experiential skills in the field of material testing.
CO2	Analyze mechanical properties of materials by performing experiments.
CO3	Analyze material failure, determine parameters and observe causes of failure.
CO4	Demonstrate non destructive testing methods.
CO5	Analyse microstructure of materials.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	3	-	3	-	-	-	-	3	3	-	3	3	3	-
CO2	-	3	-	3	-	-	3	-	3	3	-	3	3	3	-
CO3	-	3	-	3	-	-	3	-	3	3	-	3	3	3	-
CO4	-	3	-	-	-	-	-	-	-	3	-	3	3	-	-
CO5	-	3	-	3	-	-	-	-	-	3	-	3	3	3	-
Average	-	3.00	-	3.00	-	-	3.00	-	3.00	3.00	-	3.00	3.00	3.00	-

MMM LAB 15ME37B/47B

CO1	Calibrate measuring instruments.
CO2	Measure thread and gear tooth parameters using measuring instruments.
CO3	Measure linear and angular dimensions of components using measuring instruments.
CO4	Measurement of force and surface roughness.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	3	-	3	-	-	-	-	2	3	-	3	3	3	-
CO2	-	3	-	3	-	-	-	-	2	3	-	3	3	3	-
CO3	-	3	-	3	-	-	-	-	2	3	-	3	3	3	-
CO4	-	3	-	3	-	-	-	-	2	3	-	-	-	3	-
Average	-	3.00	-	3.00	-	-	-	-	2.00	3.00	-	3.00	3.00	3.00	-

Foundry and Forging Lab 15ME38A/48A

CO1	Analyze and determine properties of green sand.
CO2	Prepare green sand mould using foundry tools.
CO3	Prepare models using basic forging operations.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	2	-	-	-	-	-	-	3	3	-	-	3	3	-
CO2	-	-	-	-	-	-	-	-	3	3	-	2	3	3	-
CO3	-	2	-	-	-	3	3	-	3	3	-	2	3	3	2
Average	-	2.00	-	-	-	3.00	3.00	-	3.00	3.00	-	2.00	3.00	3.00	2.00

Machine Shop 15ME38B/48B

CO1	Perform different operations on lathe & make a cylindrical models.
CO2	Produce grooved models using shaper machine.
CO3	Perform milling operations.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	3	-	-	3	3	-	3	3	3	3
CO2	-	-	-	-	-	3	-	-	3	3	-	2	3	3	3
CO3	-	-	-	-	-	3	-	-	3	3	-	3	3	3	3
Average	-	-	-	-	-	3.00	-	-	3.00	3.00	-	2.67	3.00	3.00	3.00

Kinematics of Machines 15ME42

CO1	Describe the working of various types of mechanisms.
CO2	Analyse graphically the velocity and acceleration of simple mechanisms
CO3	Analyse analytically the velocity and acceleration of simple mechanisms.
CO4	Determine various parameters of spur gear and analyse gear trains.
CO5	Draw and analyse the cam profiles for different types of follower motions.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	-	-	-	-	-	-	-	-	3	3	-	2
CO2	3	3	-	-	-	-	-	-	-	-	-	-	3	3	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-	3	3	-
CO4	3	3	-	-	-	-	-	-	-	-	-	3	3	3	-
CO5	3	3	-	-	-	-	-	-	-	-	-	-	3	3	-
Average	2.80	2.80	-	-	-	-	-	-	-	-	-	3.00	3.00	3.00	2.00

Applied Thermodynamics 15ME43

CO1	Determine performance parameters of Gas Power Cycles.
CO2	Analyse the performance parameters of Vapour Power Cycles.
CO3	Analyse Combustion constituents of exhaust gases.
CO4	Determine the performance parameters of I C Engines.
CO5	Evaluate the performance parameters of Refrigeration system and properties of conditioned air
CO6	Determine performance parameters of Reciprocating Compressors.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	2	3	3	-
CO2	3	2	-	-	-	-	-	-	-	-	-	2	3	3	-
CO3	3	3	-	-	-	-	1	-	-	-	-	2	3	3	-
CO4	3	3	-	-	-	-	-	-	-	-	-	2	3	3	-
CO5	3	3	-	2	-	-	-	-	-	-	-	3	3	3	-
CO6	3	3	-	-	-	-	-	-	-	-	-	2	3	3	-
Average	3.00	2.67	-	2.00	-	-	1.00	-	-	-	-	2.17	3.00	3.00	-

Fluid Mechanics 15ME44

CO1	Calculate the Fluid properties, Stability of floating bodies and hydrostatic forces on surfaces.
CO2	Apply the principles of fluid kinematics and dynamics for fluid flow problems
CO3	Analyze the fluid flows.
CO4	Formulate the relations of fluid properties by using dimensional analysis
CO5	Describe the boundary layer concept.
CO6	Explain the thermodynamics of compressible flow and basics of CFD

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	2	3	3	-
CO2	3	3	-	-	-	-	-	-	-	-	-	1	3	3	-
CO3	3	3	-	-	-	-	-	-	-	-	-	1	3	3	-
CO4	3	3	2	3	-	-	-	-	-	-	-	2	3	3	-
CO5	3	3	-	-	-	-	-	-	-	-	-	2	3	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	2	3	-	-
Average	3.00	2.80	2.00	3.00	-	-	-	-	-	-	-	1.67	3.00	3.00	-

THIRD YEAR

Management & Economics 15ME51

CO1	Describe the Overview of Management.
CO2	Explain the functions of Management
CO3	Explain the basics of Economics.
CO4	Determine the interest by various Methods.
CO5	Evaluate and Select Economic Models from Various Alternatives.
CO6	Determine the Cost and Depreciation of Product.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	2	2	-	2	2	-	-	3
CO2	-	-	-	-	-	-	-	2	2	-	2	2	-	-	3
CO3	-	-	-	-	-	-	-	-	-	-	3	2	-	-	-
CO4	3	3	-	-	-	-	-	-	-	-	3	2	-	-	-
CO5	3	3	-	-	-	-	-	2	-	-	3	2	-	-	3
CO6	2	3	-	-	-	-	-	2	-	-	3	2	-	-	-
Average	2.67	3.00	-	-	-	-	-	2.00	2.00	-	2.67	2.00	-	-	3.00

Dynamics of Machinery 15ME52

CO1	Analyze simple mechanisms subjected to static and dynamic force.
CO2	Analyze the balancing of rotating and reciprocating masses.
CO3	Analyze various characteristics of the governor and gyroscope.
CO4	Explain the basics of vibration and Apply principle of super position to addition of motion
CO5	Analyze free vibration of single degree of freedom systems.
CO6	Analyze forced vibration of single degree of freedom system.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	-	-	-	-	-	-	-	-	2	3	3	-
CO2	3	3	2	-	-	-	-	-	-	-	-	2	3	3	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-	3	3	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-	3	3	-
CO5	3	3	2	-	-	-	-	-	-	-	-	2	3	3	-
CO6	3	3	2	-	-	-	-	-	-	-	-	2	3	3	-
Average	3.00	2.83	2.00	-	-	-	-	-	-	-	-	2.00	3.00	3.00	-

Turbo Machines 15ME53

CO1	Explain basic concepts of turbo machines and to determine the fluid flow parameters by using model studies.

CO2	Determine efficiency of turbo machines by using thermodynamic principles.
CO3	Analyze energy transfer in turbo machines.
CO4	Determine performance parameters of steam turbine.
CO5	Design and determine performance parameters of hydraulic turbines.
CO6	Evaluate performance parameters of centrifugal pump, centrifugal and axial compressor.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	-	-	-	-	-	-	-	-	2	3	3	-
CO2	3	2	-	-	-	-	-	-	-	-	-	2	3	3	-
CO3	3	3	-	-	-	-	-	-	-	-	-	2	3	3	-
CO4	3	3	2	-	-	-	2	-	-	-	-	2	3	3	-
CO5	3	3	3	-	-	-	-	-	-	-	-	2	3	3	-
CO6	3	3	2	-	-	-	-	-	-	-	-	2	3	3	-
Average	3.00	2.83	2.25	-	-	-	2.00	-	-	-	-	2.00	3.00	3.00	-

Design of Machine Elements-I 15ME54

CO1	Describe and apply various codes and standards in design process.
CO2	Analyze the behaviour of machine elements subjected to static, impact and fatigue loading.
CO3	Design shafts, couplings and joints for power transmission
CO4	Design riveted and welded joints
CO5	Design threaded fasteners and power screws

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	3	-	-	-	-	-	-	-	-	2	3	3	2
CO2	3	3	3	2	-	-	-	-	-	-	-	2	3	3	2
CO3	3	3	3	2	-	-	-	-	-	-	-	2	3	3	2
CO4	3	3	3	2	-	-	-	-	-	-	-	2	3	3	2
CO5	3	3	3	2	-	-	-	-	-	-	-	2	3	3	2
Average	3.00	3.00	3.00	2.00	-	-	-	-	-	-	-	2.00	3.00	3.00	2.00

Fluid Mechanics & Machinery Lab 15MEL57

CO1	Analyze the performance of power developing and Power absorbing machines.
CO2	Calibrate and determine the flow properties of flow measuring devices.
CO3	Analyze major and minor losses for flow through pipes.
CO4	Analyze the impact of jet on vanes.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	3	-	3	-	-	1	-	3	3	-	2	3	3	-
CO2	-	3	-	3	-	-	1	-	3	3	-	-	3	3	-
CO3	-	3	-	3	-	-	1	-	3	3	-	-	3	3	-
CO4	-	3	-	3	-	-	1	-	3	3	-	2	3	3	-
Average	-	3.00	-	3.00	-	-	1.00	-	3.00	3.00	-	2.00	3.00	3.00	-

Energy Conversion Lab 15MEL58

CO1	Determine the properties of fuels and oils.
CO2	Analyze performance of IC engines and draw its characteristics.
CO3	Investigate performance on Air Compressors and draw its characteristics.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	3	-	3	-	2	3	-	2	3	-	2	3	3	-
CO2	-	3	-	3	-	2	3	-	3	3	-	2	3	3	-
CO3	-	3	-	3	-	2	3	-	3	3	-	2	3	3	-
Average	-	3.00	-	3.00	-	2.00	3.00	-	2.67	3.00	-	2.00	3.00	3.00	-

Finite Element Analysis 15ME61															
CO1	Describe basics of finite element formulation methods.														
CO2	Derive interpolation functions for structural elements.														
CO3	Apply finite element formulation to determine structural behavior of bar, truss, beam and shaft.														
CO4	Formulate 1D heat transfer and fluid flow problems.														
CO5	Determine numerical solution for axisymmetric triangular element subjected to point load.														
CO6	Formulate ID bar and truss element subjected to dynamic loading.														
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	-	-	-	-	-	-	-	-	-	3	3	3	-
CO2	3	-	-	-	-	-	-	-	-	-	-	-	3	3	-
CO3	3	3	3	2	-	-	-	-	-	-	-	3	3	3	-
CO4	3	3	3	2	-	-	-	-	-	-	-	2	3	3	-
CO5	3	3	3	2	-	-	-	-	-	-	-	2	3	3	-
CO6	3	3	3	2	-	-	-	-	-	-	-	2	3	3	-
Average	3.00	3.00	3.00	2.00	-	-	-	-	-	-	-	2.40	3.00	3.00	-

Computer Integrated Manufacturing 15ME62															
CO1	Analyze the different types of automated flow lines.														
CO2	Explain the different types of manufacturing planning and control system using graphic software.														
CO3	Explain the Flexible manufacturing system														
CO4	Analyze the automated flow lines by using line balancing techniques														
CO5	Write CNC part program and programs for Robots.														
CO6	Explain the basic principles of additive manufacturing systems and the applications of IOT.														
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	-	-	-	-	-	-	-	-	-	2	3	-	-
CO2	-	-	-	-	2	-	-	-	-	-	-	2	3	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	2	3	-	-
CO4	3	3	-	-	-	-	-	-	-	-	-	2	3	2	-
CO5	3	2	-	-	-	-	-	-	-	-	-	3	3	2	-
CO6	-	-	-	-	-	-	-	-	-	-	-	3	3	-	-
Average	3.00	2.67	-	-	2.00	-	-	-	-	-	-	2.33	3.00	2.00	-

Heat Transfer 15ME63

CO1	Determine the conduction heat transfer of steady and unsteady state.
CO2	Analyze one-dimensional and two-dimensional steady and unsteady state heat conduction using numerical methods.
CO3	Analyze the radiation heat transfer by applying fundamental laws
CO4	Determine convective heat transfer using non-dimensional numbers.
CO5	Determine performance parameters using LMTD and NTU methods.
CO6	Determine heat transfer co-efficient of boiling and condensation.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	-	-	2	-	-	-	-	2	3	3	-
CO2	3	3	3	-	-	-	2	-	-	-	-	2	3	3	-
CO3	3	3	3	-	-	-	2	-	-	-	-	2	3	3	-
CO4	3	2	3	2	-	-	2	-	-	-	-	2	3	3	-
CO5	3	2	2	2	-	-	2	-	-	-	-	2	3	3	-
CO6	3	2	3	2	-	-	2	-	-	-	-	2	3	3	-
Average	3.00	2.33	2.67	2.00	-	-	2.00	-	-	-	-	2.00	3.00	3.00	-

Design of Machine Elements-II 15ME64

CO1	Compute the stresses in curved beams and cylinders.
CO2	Design belts for power transmission.
CO3	Describe wire ropes and chain drives.
CO4	Design different types of gears.
CO5	Design springs, clutches and brakes.
CO6	Design and analyze bearings for engineering applications

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	-	2	2	-	-	-	-	3	3	3	-
CO2	3	3	3	2	-	2	2	-	-	-	-	3	3	3	-
CO3	-	2	1	-	-	-	-	-	-	-	-	3	3	3	-
CO4	3	3	3	2	-	2	2	-	-	-	-	3	3	3	-
CO5	3	3	3	2	-	2	2	-	-	-	-	3	3	3	-
CO6	3	3	3	2	-	2	2	-	-	-	-	3	3	3	-
Average	3.00	2.83	2.67	2.00	-	2.00	2.00	-	-	-	-	3.00	3.00	3.00	-

Heat Transfer Lab 15MEL67

CO1	Determine the thermal conductivity of metal rod, composite wall and effectiveness of extended surfaces.
CO2	Analyze convective heat transfer coefficient for free and forced convection

CO3	Determine the surface emmissivity of a test plate and Stefan Boltzman constant validation.														
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	-	3	-	3	-	2	2	-	3	3	-	3	3	3	-
CO2	-	3	-	3	-	2	2	-	3	3	-	3	3	3	-
CO3	-	3	-	3	-	2	2	-	3	3	-	3	3	3	-
Average	-	3.00	-	3.00	-	2.00	2.00	-	3.00	3.00	-	3.00	3.00	3.00	-

Modeling & Analysis Lab 15MEL68

CO1	Use the finite element analysis software.														
CO2	Analyze 1-D and 2-D Structural Problems.														
CO3	Analyze 1-D and 2-D Heat Transfer Problems.														
CO4	Analyze the dynamic behavior for Bars and Beams Problems														
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	-	-	-	-	3	-	-	-	-	-	-	3	3	3	3
CO2	-	3	2	3	3	-	-	-	2	3	-	3	3	3	3
CO3	-	3	2	3	3	-	-	-	2	3	-	3	3	3	3
CO4	-	3	2	3	3	-	-	-	2	3	-	3	3	3	3
Average	-	3.00	2.00	3.00	3.00	-	-	-	2.00	3.00	-	3.00	3.00	3.00	3.00

FOURTH YEAR

Energy Engineering 15ME71

CO1	Explain the concepts of steam power plant.
CO2	Illustrate the concepts of Diesel, Nuclear and Analyze parameters of Hydroelectric power plant.
CO3	Describe the solar and wind energy conversion technology
CO4	Describe the tidal, ocean and geo thermal energy conversion technology
CO5	Explain the Biomass conversion methods

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	3	-	-	-	-	2	2	-	-
CO2	3	3	-	-	-	-	3	-	-	-	-	2	2	1	-
CO3	-	-	-	-	-	-	3	-	-	-	-	2	2	-	-
CO4	-	-	-	-	-	-	3	-	-	-	-	2	2	-	-
CO5	-	-	-	-	-	-	3	-	-	-	-	2	2	-	-
Average	3.00	3.00	-	-	-	-	3.00	-	-	-	-	2.00	2.00	1.00	-

Fluid Power Systems 15ME72

CO1	Describe structural components and working of hydraulic systems.
CO2	Describe different types of pumps and actuators and Determine performance parameters.
CO3	Apply the design of hydraulic circuit using control components for given applications.
CO4	Describe pneumatic power system and its components.
CO5	Apply the design of pneumatic control circuit.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	-	-	-	2	3	-	-
CO2	2	-	-	-	-	-	-	-	-	-	-	2	3	-	-
CO3	2	2	2	-	-	-	-	-	-	-	-	-	3	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	2	3	-	-
CO5	2	2	2	-	-	-	-	-	-	-	-	-	3	-	-
Average	2.00	2.00	2.00	-	-	-	-	-	-	-	-	2.00	3.00	-	-

Control Engineering 15ME73

CO1	Describe the Basic Principles of control system and controllers
CO2	Determine the system governing equations for physical models of mechanical, hydraulic,Pneumatic and electrical system.
CO3	Determine the transfer function of a control system using Block diagram reduction technique
CO4	Illustrate the response of 1st and 2nd order systems
CO5	Find the stability of the control system using Nyquist, Polar, Bode and root locus methods
CO6	Apply the State Equations to find controllability and Observability using Kalman and Gilbert's test

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	2	-	-	-	-	-	-	-	-	2	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	2	3	3	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-	3	3	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO5	3	3	-	-	-	-	-	-	-	-	-	-	3	3	-
CO6	3	3	-	-	-	-	-	-	-	-	-	-	3	3	-
Average	3.00	3.00	2.00	-	-	-	-	-	-	-	-	2.00	3.00	3.00	-

Design Lab -15MEL76

CO1	Analyse the vibration characteristics in a single degree of freedom vibrating systems
CO2	Analyse the rotating elements for balancing, critical speed of shaft.
CO3	Compute the fringe constant of photo elastic material for different loading conditions.
CO4	Analyse the characteristics of governors
CO5	Analyse the stresses for combined loading in straight and curved beam using strain gauges
CO6	Analyse pressure distribution in journal bearing

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	3	-	3	-	-	-	-	3	3	-	3	3	3	-
CO2	-	3	-	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	3	2	-
CO6	-	3	-	3	-	-	-	-	3	3	-	2	3	2	-
Average	-	3.00	-	3.00	-	-	-	-	3.00	3.00	-	2.75	3.00	2.17	-

CIM Lab-15MEL77

CO1	Use Simulation softwares in Manufacturing
CO2	Simulate Turning Operations using CNC software

CO3	Simulate Milling operations using CNC software
CO4	Demonstrate flexible manufacturing and Robots.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	3	-	-	-	-	3	-	2	3	-	3
CO2	-	3	-	-	3	-	-	-	2	3	-	2	3	2	3
CO3	-	3	-	-	3	-	-	-	2	3	-	2	3	2	3
CO4	-	-	-	-	3	-	-	-	-	-	-	2	2	-	2
Average	-	3.00	-	-	3.00	-	-	-	2.00	3.00	-	2.00	2.75	2.00	2.75

Project Phase 1

CO1	Identify, formulate and analyze engineering problems for the need of society.
CO2	Design solutions for engineering problems using modern tool/technology to investigate with interpretation of data
CO3	Analyze the impact of the engineering solutions in societal and environmental contexts for sustainable development with commit to professional ethics
CO4	Work individually and in team, Communicate effectively through reports and presentations.
CO5	Apply engineering, management and ethical principles for Project management and finance

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	3	-	3	3	-	-	-	-	3	3	3	-
CO2	3	3	3	3	3	3	3	-	-	-	-	3	3	3	3
CO3	3	3	-	3	-	3	3	-	-	-	-	3	3	3	-
CO4	-	-	-	-	-	-	-	-	3	3	-	3	-	-	-
CO5	3	-	-	-	-	-	-	3	-	-	3	3	-	-	3
Average	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00

Operations Research-15ME81															
CO1	Explain the basics of operations research and Analyze linear programming problems														
CO2	Formulate and optimize transportation and assignment problems.														
CO3	Evaluate project completion time using PERT and CPM techniques and formulate strategies of game.														
CO4	Evaluate job sequencing and queuing theory models.														
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	2	-	-	-	-	-	-	-	2	2	-	3	3
CO2	3	3	2	2	-	-	-	-	-	-	2	2	-	3	3
CO3	3	3	3	2	-	-	-	-	-	-	3	2	-	3	3
CO4	3	3	2	2	-	-	-	-	-	-	3	2	-	3	3
Average	3.00	3.00	2.25	2.00	-	-	-	-	-	-	2.50	2.00	-	3.00	3.00

Additive Manufacturing-15ME82															
CO1	Explain the different process of additive manufacturing														
CO2	Describe the working of different types of actuators														
CO3	Explain the different process of polymerization and powder metallurgy techniques.														
CO4	Describe the different characterization techniques.														
CO5	Demonstrate the various NC, CNC machine programming and Automation techniques														
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	-	-	-	-	-	-	-	-	-	-	-	3	3	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	3	3	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	3	3	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	3	3	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	3	3	2	-
Average	3.00	2.00	-	-	-	-	-	-	-	-	-	3.00	3.00	2.00	-

Internship/Professional Bodies															
CO1	Apply gained knowledge and skills in engineering practice														
CO2	Analyze and design solutions for engineering problems.														
CO3	Work individually, in team and communicate effectively through reports and presentations														
CO4	Demonstrate apt workplace attitude and ethics														
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	3	3	-	3	2	-	-	-	-	3	2	2	3
CO2	3	3	3	3	2	3	-	-	-	-	2	3	2	2	3
CO3	-	-	-	-	-	-	-	3	3	3	-	3	-	-	3
CO4	-	-	-	-	-	-	-	3	3	-	2	3	-	-	-
Average	3.00	3.00	3.00	3.00	2.00	3.00	2.00	3.00	3.00	3.00	2.00	3.00	2.00	2.00	3.00
Project Phase- II															
CO1	Identify, formulate and analyze engineering problems for the need of society.														
CO2	Design solutions for engineering problems using modern tool/technology to investigate with interpretation of data														
CO3	Analyze the impact of the engineering solutions in societal and environmental contexts for sustainable development with commit to professional ethics														
CO4	Work individually and in team, Communicate effectively through reports and presentations.														
CO5	Apply engineering, management and ethical principles for Project management and finance														
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	-	3	-	3	3	-	-	-	-	3	3	3	-
CO2	3	3	3	3	3	3	3	-	-	-	-	3	3	3	3
CO3	3	3	-	3	-	3	3	-	-	-	-	3	3	3	-
CO4	-	-	-	-	-	-	-	-	3	3	-	3	-	-	-
CO5	3	-	-	-	-	-	-	3	-	-	3	3	-	-	3
Average	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Seminar															
CO1	Identify and explore recent trends in mechanical engineering														
CO2	Prepare effective report on the selected topic														
CO3	Prepare power point presentation (PPT), communicate and answer the queries on the topic														
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	-	3	3	2	2	3	3	3	-	3	3	3	-
CO2	-	-	-	-	3	-	-	3	3	3	-	3	3	3	-
CO3	-	-	-	-	3	-	-	3	3	3	-	3	3	3	-
Average	3.00	3.00	-	3.00	3.00	2.00	2.00	3.00	3.00	3.00	-	3.00	3.00	3.00	-