Department of Mechanical Engineering

Course Outcomes and CO-PO-PSO Articulation Matrix

2016 - 2020 Batch

2015 Scheme

Semester-I/II

Subject: ELEMENTS OF MECHANICAL ENGINEERING	Subject Code:15EME14/24

Course Outcomes	
CO1	Recognize different sources of energy and their conversation process and different types of boilers.
CO2	Demonstrate the various turbines and IC engines.
CO3	Discuss Metal removal process using Lathe, drilling, Milling Robotics and Automation.
CO4	Fair understanding of application and usage of various engineering materials.
CO5	Explain the refrigeration and air-conditioning systems

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													
CO2	2	2													
CO3	3	3													
CO4	3	2													
CO5	2	3													
Average	2.6	2.4													

Subject: COMPUTER AIDED ENGINEERING DRAWING	Subject Code:15CED14/24

Course Outcomes	
CO1	Grasp the usage of tool bars used in CAD software, Co-ordinate system, Reference planes, BIS conventions of Engineering Drawing, Orthographic projections of points & lines.
CO2	Understand the Orthographic projections of Points in all the four quadrants and lines in first angle
CO3	Understand the Orthographic projections of plane surfaces in different positions by change of position method using first angle projections.
CO4	Understand the Orthographic projections of prisms, pyramids, regular tetrahedron ,Hexahedron, cylinders and cones in different positions using first angle projections.
CO5	Identify the Development of lateral surfaces of prisms, pyramids, cylinders and cones. and Isometric projection of Polygons.

CO-PO-PSO Mapping

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

Subject: Engineering Mathematics-III											Subject Code:15MAT31				
Course Outcomes															
CO1	Know the use of periodic signals and Fourier series to analyze circuits and systems communication.														
CO2	Explain the general linear system theory for continous - time signals and digital signal processing using the Fourier transform and z-transform.														
CO3	Employ appropriate numerical methods to solve algebraic and transcedental equations.														
CO4	Apply Green's theorem, Divergence theorem and Stokes theorem in various applications in the field of electro-magnetic and gravitational fields and fluid flow problems.														
CO5	Determine the extermals of functional and solve the simple problems for calculus of variations. Utilize the concepts of functional and their variations in the applications of communication systems, decision theory, synthesis and optimization of digital circuits.														

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													
CO2	3	2													
CO3	3	2													
CO4	3	2													
CO5	3	2													
Average	3	2													

Subject: MATERIALS SCIENCE												Subject Code:15ME32			
Course Outcomes															
CO1	Describe the mechanical properties of metals, their alloys and various modes of failure.														
CO2	Understand the microstructures of ferrous and non-ferrous materials to mechanical properties														
CO3	Explain the processes of heat treatment of various alloys.														
CO4	Understand the properties and potentialities of various materials available and material selection procedures.														
CO5	Understand the properties and potentialities of various materials available and material selection procedures.														

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		
CO2	3	3											2		
CO3	3												2		
CO4	3												2		
CO5	3												2		
Average	3	3											2		

Subject: BASIC THERMODYNAMICS		Subject Code:15ME33
Course Outcomes		
CO1	Understand the thermodynamic systems, properties, Zeroth law of thermodynamics, temperature scales and energy interactions.	
CO2	Analyze heat, work, internal energy, enthalpy for flow & non flow process using First and Second Law of Thermodynamics	
CO3	Identify the behavior of pure substances and its applications to practical problems.	
CO4	Analyze and apply the basic thermodynamic concept to calculate the change in internal energy, change in enthalpy and change in entropy using TD relations for ideal gases	
CO5	Analyze and apply the knowledge of Thermodynamics properties of real gases at all ranges of pressure, temperatures using	

modified equation of state including Vander Waals equation, Redlich Wong equation and Beattie-Bridgeman equation Recall thermodynamic.

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		
CO2	3	3											2		
CO3	3	2											2		
CO4	3	2											2		
CO5	3	3											2		
Average	3	2.5											2		

Subject: MECHANICS OF MATERIALS	Subject Code:15ME34

Course Outcomes

CO1	Apply an engineering knowledge to demonstrate the behavior of materials
CO2	Analyze thin and thick cylinders and draw a stress distribution curve, also to create Mohrs circle diagram for plane stress conditions.
CO3	Determine the various forces and moments in beams
CO4	Evaluate the dimensions of mechanical elements for various applications.
CO5	Compare different strain energy methods and theories of failures in design of machineries

CO-PO-PSO Mapping

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3														
CO2	1	2											2		
CO3	1	3											2		
CO4	3	2											2		
CO5	3	2											2		
Average	2.2	2.25											2		

Subject: METAL CASTING AND WELDING	Subject Code:15ME35A

Course Outcomes

CO1	Apply the knowledge of various metal casting processes that are useful in designing system
CO2	Understand the concept of various metal casting methods.
CO3	Identify the Solidification process in Casting of Non-Ferrous Metals.
CO4	Discuss the various principle of operations in welding techniques
CO5	Describe the Metallurgical aspects in Welding and inspection methods for the quality assurance of components made of casting and joining process.

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		
CO2	3	2											3		
CO3	3	2											3		
CO4	3	2											3		
CO5	3	2											3		
Average	3	2											3		

Subject: COMPUTER AIDED MACHINE DRAWING												Subject Code:15ME36A			

Course Outcomes

CO1	To read and understand the orthographic and sectional views of various machine components
CO2	To develop 3D models using modeling software's
CO3	To produce 2D drawings by manual drafting and by using drafting packages
CO4	To construct assembly drawings, part drawings and Bill of materials as per BIS Conventions
CO5	To apply limits fits and tolerance to all assemblies and part drawings

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		
CO2	2				2								2	2	
CO3	2				2								2	2	
CO4	2	2			2								2	2	
CO5	2											2	2		
Average	2	2			2							2	2	2	2

Subject: MATERIALS TESTING LAB												Subject Code:15MEL37A			

Course Outcomes

CO1	Acquire experimentation skills in the field of material testing.
CO2	Develop theoretical understanding of the mechanical properties of materials by performing experiments.
CO3	Apply the knowledge of testing methods in related areas.
CO4	Apply the knowledge of testing methods in related areas.
CO5	Know how to improve structure/behavior of materials for various industrial applications.

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													
CO2	2	1	2									1	1		
CO3	1	2			2								1		
CO4	3												1		
CO5	2	1										1	1		
Average	2.4	1	2		2							1	1		

Subject: FOUNDRY AND FORGING LAB												Subject Code:15MEL38A	

Course Outcomes

CO1	Identify the properties of moulding sand (Tension, compression, shear & permeability)
CO2	Build sand moulds using hand tools ,patterns and cores
CO3	Estimate the raw material required for change of cross section and dimensions.
CO4	Demonstrate the forging operations

CO-PO-PSO Mapping

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

Semester-IV

Subject: ENGINEERING MATHEMATICS-IV	Subject Code:15MAT41

Course Outcomes	
CO1	Solve first and second ordinary differential equations arising in flow problems using single step and multistep numerical methods.
CO2	Solveproblems of quantum mechanics employing Bessel's function relating to cyclindrical polar coordinatesystems and Legrendre's polynomials relating to spherical polar coordinate systems
CO3	Understand the analyticity,potentialfields,residues and poles of complex potentials in field theory and electromagnetic theory Describe conformal and bilinear transformation arising in aerofoil theory fluid flow visualization and image processing
CO4	Solve problems on probability distributions relating to digital signal processing, Determie joint probability distributions and stochastic matrix connected with multivariate correlation problems for feasible random events
CO5	Draw the validity of the hypothesis proposed for the given sampling distribution in accepting or rejecting the hypothesis,Definetransition probability matrix of a Markov chain and solve problems related to discrete parameter random process.

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													
CO2	3	3													
CO3	3	3													
CO4	3	3													
CO5	3	3													
Average	3	3													

Subject: KINEMATICS OF MACHINERY	Subject Code:15ME42

Course Outcomes	
CO1	Identify the kinematic link, kinematic pairs, chains, mechanisms, mobility, and inversions.
CO2	Determine the velocities and accelerations of linkages and joints of mechanisms graphical method.
CO3	Apply the Freudenstein's equation to determine the velocities and accelerations by analytical method for slider crank mechanism and other applications.
CO4	Evaluate the velocity ratio and torque in various types of gear trains.
CO5	Analyse different cams and sketch the cam profiles for various motions of the follower, motion characteristics

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		
CO2	3	2											2		
CO3	3	2											2		
CO4	3	2											2		
CO5	3	2											3		
Average	3	2											2.6		

Subject: APPLIED THERMODYNAMICS	Subject Code:15ME43

Course Outcomes	

CO1	Recall thermodynamic concepts and classify various types of gas power cycles and vapour power cycles.															
CO2	Understand the working principle of Rocket and Jet Propulsion.															
CO3	Analyze combustion of fuels and combustion processes in I C engines including alternate fuels and pollution effect on environment															
CO4	Understand the principles and applications of refrigeration systems and performance parameters of refrigeration and air-conditioning systems															
CO5	Discuss the operation of reciprocating compressor and functioning of steam nozzles.															

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		
CO2	3	3											2		
CO3	3	2					1						2		
CO4	3	2				1	1						2		
CO5	3	3											2		
Average	3	2.5				1	1						2		

Subject: FLUID MECHANICS	Subject Code:15ME44

Course Outcomes

CO1	Know about various basic fluid properties and about the behavior of fluid when it is at rest.
CO2	Understand the concepts related to how a fluid behaves when it is in motion with and without considering the forces acting on them
CO3	Define the various types of flow, and can describe the energy losses that occurs in pipes during fluid flow.
CO4	Explain the development of boundary layer and about the basic concepts of lift and drag of an aero-foil.
CO5	Identify the need of dimensional analysis and will also know about the basic concepts of compressible flow and Computational Fluid Dynamics.

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: MACHINE TOOLS AND OPERATIONS	Subject Code:15ME45B

Course Outcomes

CO1	Demonstrate the construction and specification of machine tools
CO2	Demonstrate the various machining processes pertaining to relative motions between tool and workpiece
CO3	Choose the right cutting tool materials and cutting fluids, also to evaluate cutting tool parameter for different machining operations
CO4	Apply mechanics of machining process to evaluate machining time and to estimate/calculate the various forces and power requirement in metal cutting operation
CO5	Analyse tool wear mechanism and equations to enhance tool life and minimize machining cost

CO-PO-PSO Mapping

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

CO4	3	2	1												
CO5	3	2	1												
Average	3	2	1												

Subject: MECHANICAL MEASUREMENTS AND METROLOGY	**Subject Code:**15ME46B

Course Outcomes	
CO1	Apply the methods and processes of measurements and standards.
CO2	Illustrate the use of instruments for measurement and their calibration.
CO3	Carry out linear and angular measurements using gauges.
CO4	Determine the pressure, force, and torque measurements using sensors and dynamometers.
CO5	Determine strain, temperature, and surface roughness.

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		
CO2	2	2											2		
CO3	2	2											2		
CO4	2	2											2		
CO5	2	2											2		
Average	2	2											2		

Subject: MECHANICAL MEASUREMENTS AND METROLOGY LAB	**Subject Code:**15MEL47B

Course Outcomes	
CO1	Understand Calibration of pressure gauge, thermocouple, LVDT, load cell, micrometer
CO2	Apply concepts of Measurement of angle using Sine Centre/ Sine Bar/ Bevel Protractor, alignment using Autocollimator/ Roller set
CO3	Demonstrate measurements using Optical Projector/Tool maker microscope, Optical flats and mechanical comparator
CO4	Analyze Screw thread parameters using 2-Wire or 3-Wire method, gear tooth profile using gear tooth Vernier/Gear tooth micrometer
CO5	Analyse tool forces using Lathe/Drill tool dynamometer

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		
CO2	3	2											2		
CO3	3	2											2		
CO4	3	2											2		
CO5	3	1											2		
Average	3	1.8											2		

Subject: MACHINE SHOP LAB	**Subject Code:**15MEL48B

Course Outcomes	
CO1	Understanding integral parts of lathe, shaping and milling machines and various accessories and attachments used thereof
CO2	Select cutting parameters like cutting speed, feed, depth of cut and tooling for various machining operations like lathe, shaping, milling.
CO3	Perform cylindrical turning operations such as plain turning, taper turning, step turning, thread cutting, facing, knurling, internal thread cutting, eccentric turning and estimate cutting time

CO4	To work on shaping machine, to do the different shaping operations like plain shaping, keyway cutting, indexing and gear cutting and to demonstrate in power hacksaw machine for specimen preparation in machine shop

CO-PO-PSO Mapping

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

Semester-V

Subject: MANAGEMENT AND ENGINEERING ECONOMICS	Subject Code:15ME51

Course Outcomes

CO1	Explain the development of management and the role it plays at different levels in an organization
CO2	Comprehend the process and role of effective planning,organizing and staffing for the development of an organization
CO3	Understand the necessity of good leadership,communication and co-ordination for establishing effective control in an organization
CO4	Understand engineering economics demand supply and its importance in economic decision making and problem solving
CO5	Calculate present worth,annual worth and IRR for different alternatives in economic decision making

CO-PO-PSO Mapping

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1										1					
CO2										1	1				
CO3	3														
CO4	3												1		
CO5	3												1		
Average	2.4									0.9	0.9		0.8		

Subject: DYNAMICS OF MACHINERY	Subject Code:15ME52

Course Outcomes

CO1	Apply the concepts of static and dynamic balancing of reciprocating and rotating masses on automobiles
CO2	Determine static and dynamic forces for four bars and slider crank mechanism, stability of governors, Natural frequency of different parameters of vibratory system, force and motion
CO3	Analyze the stability of governors , gyroscopic effects on ships, plane disc, aero planes , automobiles
CO4	Distinguish different types of vibratory systems
CO5	Formulate mathematical equations for damped and undamped vibratory system

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	
CO2		1	3											2	
CO3		2	2											2	
CO4	2	1	2											2	
CO5		2	3										2	2	
Average	2	1.5	1.5										2	2	

Subject: TURBO MACHINES													Subject Code:15ME53		

Course Outcomes	
CO1	Recognize the appropriate turbo machine and dimensionless variables for a given dynamical situation and predict the prototype based on similitude.
CO2	Comprehend the significance of static and stagnation properties for turbines and compressors.
CO3	Summarize the Euler's equation to analyze energy transfer in turbomachines.
CO4	Apply the velocity triangles for steam turbines and hydraulic turbines to estimate various performance parameters.
CO5	Perform the preliminary design of centrifugal pumps and centrifugal compressors.

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: DESIGN OF MACHINE ELEMENTS - I													Subject Code:15ME54		

Course Outcomes	
CO1	Apply the concepts of stresses for 1-d, 2-D and 3-D elements
CO2	Formulate; analyze stresses and strains in machine elements, permanent and temporary joints subjected to various loads.
CO3	Analyze and design for static, fatigue and impact strength, permanent and temporary joints
CO4	Evaluate the stresses in the elements such as Gears, cotter and knuckle joint keys and couplings
CO5	

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		
CO2	3	3											2		
CO3	3	2	3			1							2		
CO4	3	3											2		
CO5	2	2	2			1							2		
Average													2		

Subject: NON TRADITIONAL MACHINING													Subject Code:15ME554		

Course Outcomes	

CO1	understand the difference between traditional and non-traditional machining process , its need and their applications
CO2	Identify the variables involved in water jet machining and abrasive jet machining, and also its working principle .
CO3	Recognize the different elements that affect the working of chemical and electro-chemical machining.
CO4	Identify the parameters that influence the working of electrical discharge machining
CO5	Analyse the mechanism and working principle of plasma arc and laser beam machining

CO-PO-PSO Mapping

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

Subject: AUTOMATION AND ROBOTICS	Subject Code:15ME563

Course Outcomes

CO1	To identify potential areas for automation and justify need for automation
CO2	To select suitable major control components required to automate a process or an activity
CO3	To design various types of robots based on application & determine the various kinematics and inverse kinematics for different robots
CO4	To analyse the operators of translations, rotations and transformations for the robots
CO5	To propose solution to problems peculiar to Robot Programming Languages

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		
CO2			2												
CO3		2	2												
CO4		2													
CO5		2											2		
Average	3	2	2										2.5		

Subject: FLUID MECHANICS & MACHINERY LAB	Subject Code:15MEL57

Course Outcomes

CO1	Perform experiments to determine the coefficient of discharge of flow measuring devices.
CO2	Conduct experiments on hydraulic turbines and pumps to draw characteristics.
CO3	Test basic performance parameters of hydraulic turbines and pumps and execute the knowledge in real life situations.
CO4	Determine the energy flow pattern through the hydraulic turbines and pumps
CO5	Exhibit his competency towards preventive maintenance of hydraulic machines

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: ENERGY LAB		**Subject Code:**15MEL58

Course Outcomes

CO1	Perform experiments to determine the properties of Fuels and Oils.
CO2	Draw the characteristic diagram of Valve Timing and Port opening in Internal Combustion engine
CO3	Conduct experiments on Internal Combustion engines to determine performance parameters of Petrol and Diesel engines.
CO4	Evaluate the performance of a Multi cylinder Internal combustion engine.
CO5	

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		
CO2	3	2											2		
CO3	3	2							2				2		
CO4	3	2							2				2		
CO5															
Average	3	2							2				2		

Semester-VI

Subject: FINITE ELEMENT ANALYSIS		**Subject Code:**15ME61

Course Outcomes

CO1	Demonstrate the basic concepts of Finite Element methods with its potential applications.
CO2	Interpret the use of the basic finite elements for structural applications using truss, beam, frame, and plane elements.
CO3	Derive element matrix equation by different methods by applying basic laws in mechanics.
CO4	Make use of professional-level finite element software to solve engineering problems in Solid mechanics, fluid mechanics and heat transfer.
CO5	Implement finite element methods for simple problems such as beam analysis and 1-D heat conduction either by hand calculation or by programming.

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		
CO2	2												2		
CO3	1	3											2		
CO4	3	2											2		
CO5		2	3		2								2		
Average	2.25	2.333	3		2								2		

Subject: COMPUTER INTEGRATED MANUFACTURING		**Subject Code:**15ME62

Course Outcomes

CO1	Interpret various automation methods and to develop mathematical models in production system.

CO2	Analyse the design processes using computer graphics software and CAPP.
CO3	Develop an algorithm for line balancing to improve the productivity by adopting flexible manufacturing system.
CO4	Apply different computer applications in manufacturing and prepare part programs for simple jobs on CNC machine tools and robot technology.
CO5	Identify the modern trends in manufacturing process like additive manufacturing, Industry 4.0 and applications of IOT leading to smart manufacturing

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		
CO2	2	2											2		
CO3		2											2		
CO4	2												2		
CO5		2											2		
Average	2	2											2		

Subject: HEAT TRANSFER	Subject Code:15ME63

Course Outcomes

CO1	Comprehend the modes of heat transfer and apply basic laws of heat transfer to formulate and solve steady state heat transfer problems
CO2	study and evaluate critical thickness of insulation, steady and variable thermal conductivity of fins, and heat transfer in finite, semi infinita and finite solids
CO3	explain the principles of radiation heat transfer and predict the temperature distribution using numerical approach for heat conduction problems
CO4	Interpret and compute forced, free convection heat transfer.
CO5	design heat exchangers using LMTD and NTU methods and explain the concept of condensation and boiling of liquids.

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: DESIGN OF MACHINE ELEMENTS -II	Subject Code:15ME64

Course Outcomes

CO1	Understand & Analyze the stresses in curved beams, cylinders, and cylinder heads
CO2	Decide flexible drives (belts, ropes, and chains) required for power transmission and springs.
CO3	Analyze and design different types of gears for static and dynamic loads and apply in real life application
CO4	Design clutches and brakes for static and dynamic loads
CO5	Carry out the design of journal bearing by choosing the lubricant and choice of ball and roller bearings

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				1							2		

COs	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	PSO3
CO2	2	3	2			1							1	2	
CO3	3		3			2							1	2	
CO4	3	3	3			2							1	2	
CO5	3	3	2			2	1						1	2	
Average	2.20	2.75	2.50			1.60	1.00						1.00	**2**	

Subject: AUTOMOBILE ENGINEERING		Subject Code:15ME655

Course Outcomes

CO1	Apply the knowledge of engineering fundamental related to automobile engines to solve the complex engineering problems
CO2	Analyze the design of engine, transmission and controlling system to draw the conclusion on the basis of engineering sciences to address the performance parameters of the engines
CO3	Apply the knowledge of transmission, controlling, auxiliary systems and other support systems employed in automobile to find solution to complex engineering problems
CO4	To incorporate the contextual knowledge of standards and norms to address the safety and legal issues related to automobiles in ones professional engineering practice
CO5	demonstrate the knowledge of standards and norms towards automobile pollution and respective control system to address environment and sustainability issues

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		
CO2	1	2											1		
CO3	3												1		
CO4						2									
CO5						1	2								
Average	2.33	2				1.5	2						1		

Subject: INDUSTRIAL SAFETY		Subject Code:15ME662

Course Outcomes

CO1	Identify the safety equipments around work environment and industries
CO2	Distinguish different portable extinguishers used for different class of fires
CO3	Choose the personal protective equipment while working in the laboratories
CO4	Apply safety measures to adopt for preventing electrical hazards
CO5	Identify various chemicals and describe prevention of chemical hazards

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						1	2		
CO2	2					3			1			1	2		
CO3	2					3						1	2		
CO4	2					2						1	2		
CO5	2					2						1	2		
Average	2					1			1			1	2		

Subject: HEAT TRANSFER LAB												Subject Code:15MEL67			

	Course Outcomes
CO1	Perform experiments to determine the thermal conductivity of a metal rod and emissivity of a test plate
CO2	Estimate the effective thermal resistance in composite slabs and efficiency in pin-fin
CO3	Conduct experiments to determine convective heat transfer coefficient for free and forced convection and correlate with theoretical values
CO4	Determine Boiling of Liquid and Condensation of Vapour and Estimate the performance of a refrigerator
CO5	Calculate temperature distribution of study and transient heat conduction through a plane wall, cylinder and fin

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		
CO5	3	3	3			3							3		
Average	3	3	3			3							3		

Subject: MODELING AND ANALYSIS LAB(FEA)												Subject Code:15MEL68			

	Course Outcomes
CO1	Analyze the structural members like bars, trusses, and beams for different loads.
CO2	Determine the stresses in plates under plane stress conditions.
CO3	Solve for temperature distribution in 1D and 2D members under conduction and convection heat transfer.
CO4	Analyze bars and beams for dynamic response

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	
CO3	3	3	3		3							3	3	3	
CO4	3	3	3		3							3	3	3	
Average	3	3	3		3							3	3	3	

Semester-VII

Subject: ENERGY ENGINEERING	Subject Code:15ME71

Course Outcomes

CO1	Understand thermal energy conversion system for real time applications
CO2	Apply the knowledge of principle of energy conversion by diesel and hydel energy
CO3	analyze the solar radiation parameters,working of solar PV and thermal systems.
CO4	Interpret principle of energy conversion from wind and tidal.
CO5	Review the applications of biomass energy, fuel cell, thermoelectric conversion and MHD generators.

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		
CO2	2												2		
CO3	2												2		
CO4	2						1						2		
CO5	2						1						2		
Average															

Subject: FLUID POWER SYSTEMS	Subject Code:15ME72

Course Outcomes

CO1	Understand the basic concepts (principles) of working and maintenance of fluid power system with its potential applications
CO2	Interpret the construction and working of input and output elements of fluid power systems viz. hydraulic and pneumatic pumps, motors and cylinders
CO3	Demonstrate the functioning of control valves for obtaining desired output from fluid power systems.
CO4	Formulate (construct) the hydraulic and pneumatic circuits for various outputs
CO5	Integrate fluid power system with electrical and logic elements, controls to maintain the sequence of operations

CO-PO-PSO Mapping

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3													
CO2	2	3												
CO3	3													
CO4	2				1									2
CO5	2				1							1		2
Average	2.4	3			1							1		2

Subject: CONTROL ENGINEERING	Subject Code:15ME73

Course Outcomes

CO1	Identify or Recognize control system and types,control actions
CO2	Construct the system governing eqations for physical,mechanical,electrical models
CO3	Analyze the gain of the system using block diagram and SFG
CO4	Evaluate the stability of transfer functions in complex domain and frequency domain
CO5	Employ state equations to study the controllabilty and observabilty

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													
CO2	2														
CO3	3				1										
CO4	2				1									2	
CO5	2				1							1		2	
Average	2.4	3			1							1		2	

Subject: SMART MATERIALS & MEMS											Subject Code:15ME745				

Course Outcomes

CO1	Discuss smart structures, piezoelectric properties, and shape memory alloys
CO2	Interpret the properties and characteristics of electro, magneto rheological fluids and fiber optics on real time applications
CO3	Analyze vibration absorbers and characteristics of Biomimetics
CO4	Understand intrinsic characteristics and properties of MEMS, piezoelectric sensing, and actuation systems
CO5	Summarize polymers in MEMS and its case studies

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	
CO2	3	2												2	
CO3	3													2	
CO4	2	2												2	
CO5	3	2												2	
Average	2.8	2												2	

Subject: AUTOMOTIVE ELECTRONICS											Subject Code:15ME751				

Course Outcomes

CO1	Explain the electronics systems used for control of automobiles
CO2	Select sensors, actuators and control systems used in automobiles
CO3	Diagnose the faults in the subsystems and systems used automobile

CO-PO-PSO Mapping

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

Subject: MECHATRONICS											Subject Code:15ME753				

Course Outcomes

CO1	Illustrate various components of mechatronics systems
CO2	Develop electronic, hydraulic, pneumatic and electrical actuation circuits using sensors, transducers, microprocessors and PLC programming
CO3	Analyze the various hydraulic and pneumatics actuation circuits and rectify the errors
CO4	Construct hydraulic and pneumatic circuits for a given scenario
CO5	Propose a solution for the situation related to automation system

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	
CO2	3														
CO3	2														
CO4					1									2	
CO5					1										
Average	2				1									2	

Subject: DESIGN LAB												Subject Code:15MEL76			

Course Outcomes	
CO1	Analyze principal stresses, strains in members subjected to various loading using Strain Gauge Rosettes
CO2	Evaluate the parameters for single DOF of vibrational systems and identify critical speed of shaft for different modes
CO3	Estimate the parameters of journal bearing, governor and apply the knowledge of dynamics to balance the rotating masses
CO4	Apply the concept of photo elasticity for stress analysis and to calibrate photo elastic models
CO5	

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		
CO2	3	2										2	1		
CO3	3	2	2										1		
CO4	3	2											2		
Average	3	2	2									2	1.8		

Subject: CIM LAB												Subject Code:15MEL77			

Course Outcomes	
CO1	Generate CNC Lathe part programs for different turning operations.
CO2	Generate CNC Mill Part programs for point to point motions & line motions
CO3	Make use of Canned Cycles for Drilling, Peck drilling, Boring, Tapping, Turning, Facing,Taper turning Thread cutting etc
CO4	Simulate Tool Path for different machining operations using CNC TRAIN software.

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		
CO2			3										2		
CO3						2	2								
CO4									2	2					
Average	3	2	3			2	2		2	2			2.5		

Semester-VIII

Subject: OPERATIONS RESEARCH												Subject Code:15ME81			

Course Outcomes	
CO1	Apply the significance of Operations Research in decision making and identify and develop mathematical model from verbal description of real system problems
CO2	Obtain the solution of formulated real life problem with its inherent resources and constraints
CO3	Recognize and formulate a transportation and assignment model and obtain optimal solution with all the variants of models.
CO4	Construct network diagram and determine critical path, floats for deterministic and PERT networks including crashing of networks and waiting line problems for M/M/1 and M/M/K queuing theory
CO5	Solve problems on game theory for pure and mixed strategy under competitive environment and also Determine minimum processing times for sequencing of n jobs-2 machines, n jobs-3machines,n jobs-m machinesand 2 jobs-n machines using Johnsons algorithm

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		

	1	2	3										1	2	3
CO2	3	2	2											2	
CO3	3	2	2											2	
CO4	3	2	2											2	
CO5	3	2	2											2	
Average	3	2	2											2	

Subject: ADDITIVE MANUFACTURING												Subject Code:15ME82			

Course Outcomes	
CO1	Apply the knowledge of Additive Manufacturing and Rapid Prototyping technologies
CO2	Choose various nanomaterial's production techniques.
CO3	Develop NC machine program
CO4	Automate the process by analyzing the required type of Pneumatic and hydraulics Systems in various application areas
CO5	Decide the types of Industrial controls required

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		
CO2		2													
CO3			2												
CO4				2											
CO5				2									2		
Average	3	2	2	2									2		

Subject: PRODUCT LIFE CYCLE MANAGEMENT												Subject Code:15ME835			

Course Outcomes	
CO1	Point out the Components, Phases, Characteristics, and Opportunities, benefits, Views, feasibility, vision and Drivers of PLM.
CO2	Choose Conceptualization, Design, Development, Validation, Production, implementation of PLM and PDM.
CO3	Calculate the Engineering prototype development, design for environment, virtual testing, validation and Creation of animation using CAD software
CO4	Analyze the parameterization of design, optimization of products, Digital manufacturing, virtual learning curve, production planning.
CO5	Evaluate the PLM strategy, PLM initiatives to support corporate objectives Infrastructure assessment, assessment of current systems and applications.

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							1		
CO2	3		3									1	1		
CO3	3	2		1									1		
CO4	3			1								2		1	
CO5	3	2										1	1		
Average	3	2	3	1		2						1	0.6	1	1

Subject: INTERNSHIP												Subject Code:15ME84			

Course Outcomes	
CO1	Apply modern techniques, resources, engineering and IT tools while addressing complex engineering problems.

	CO2	Make use of contextual knowledge to access societal, health, safety and cultural issues normally encountered in industries.
	CO3	Choose the engineering solutions for the sustainable development in societal and environmental context and exercise professional ethics, norms, standards and responsibilities in engineering practice.
	CO4	Identify to work as a team member as well a leader while demonstrating the knowledge of project management, finance handling and other management practices in multidisciplinary environment.
	CO5	Build the knowledge of documentation, report writing, effective presentation, receiving and delivering clear instructions in the professional environment and recognize the need & have preparation ability to engage in independent &life- long learning facing the challenges of technological changes.

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	
CO2						2							2		
CO3							2								
CO4											2				
CO5										2		2			
Average	2				2	2	2			2	2	2	2	2	2

Subject: PROJECT PHASE II		Subject Code:15MEP85

Course Outcomes

	CO1	Review the research literature,identify and analyze the complex engineering problems, formulate the sustainable conclusions or solutions using the basic principles of applied mathematics,science and engineering
	CO2	Design proper methodology to derive the solutions for the existing or anticipated complex engineering problems in concern with the issues of public health ,safety societal, cultural and environmental areas.
	CO3	Practice and establish the professional engineering methodology for sustainable development in the society to address the complex engineering problems associated with societal and environmental factors.
	CO4	Form internal & external group to work together as a team in the project under consideration under multi disciplinary settings.
	CO5	Communicate effectively addressing the complex engineering activities with documentation reports and proper presentation tools.

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		
CO2															
CO3			3			2	2						3		
CO4									2						
CO5										3					
Average	3	2	3			2	2		2	3			2.5		

Subject: SEMINAR		Subject Code:15MES86

Course Outcomes

	CO1	Identify, formulate and analyze the complex engineering problems through extornius literature study on basic principles of engineering sciences.
	CO2	Evaluate, interpret, synthesize and conclude on the information so obtained through literature study,physical observations and experimental data.

CO3	Connect the Engineering knowledge to the society by accessing the various issues on social health, environment sustainability, safety, legal, cultural etc by compiling the knowledge so acquired using modern tools during the process of preparation to the course through self learning.
CO4	Present and communicate effectively with acquired oral and written documentation skills addressing the complex engineering activities
CO5	Pursue the need to Engage himself in the further learning throughout based on technological and societal changes

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	3		
CO2		3		3	3	3	3			3		3	3		
CO3		3		3	3	3	3			3		3	3		
CO4		3		3	3	3	3			3		3	3		
CO5		3		3	3	3	3			3		3	3		
Average		3		3	3	3	3			3		3	3		

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