Sri AdichunchanagiriShikshana Trust (R)

SJB Institute of Technology

(Affiliated to Visvesvaraya Technological University, Belagavi& Approved by AICTE, New Delhi.)

Department of Mechanical Engineering

Course Outcomes and CO-PO-PSO Articulation Matrix

2017 - 2021 Batch

2017- Scheme

Semester-I/II

Subject: ELEMENT OF MECHANICAL ENGINEERING												**Subject Code:**17EME15/25		
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:**17CED14/24		
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**			

Semester-III

Subject: Engineering Mathematics-III												**Subject Code:**17MAT31			
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:**17ME32			
Course Outcomes															
CO1	**Describe** crystal structures, mechanical properties of metals, their alloys and various modes of failure.														
CO2	**Discuss** mechanism of solidification of engineering materials.														
CO3	**Assess** the structural and physical properties of engineering materials through various heat treatment process														
CO4	**Propose** alternate materials which are sustainable, economic and enable new product generation														
CO5	**Perceive** various properties of composites, its application and to provide an alternate to conventional structural materials														
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: BASIC THERMODYNAMICS	**Subject Code:**17ME33
Course Outcomes	
CO1	Explain the fundamental of thermodynamics and evaluate energy interactions the boundary of thermodynamics syastem
CO2	apply the knowledge of temperature scale and work and heat interaction in thermodynamics process

CO3	apply the first and second law thermodynamics to closed and open system and evaluate the readability of cyclic and noncyclic process, entropy, reversibility and irreversibility
CO4	interpret the behavior of pure substances and application in practical problems.
CO5	Recognize differences between ideal and real gasses and evaluate thermodynamic properties of ideal and real gas mixture using various relations

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

Subject: MECHANICS OF MATERIALS	**Subject Code:**17ME34

Course Outcomes

CO1	Apply an engineering knowledge to demonstrate the behaviour of materials
CO2	Analyze the 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	1												2	
CO2	1	2											2	2	
CO3	1	3											2	2	
CO4	2	3											2	2	
CO5	3	2												2	
Average	2.2	2.2											2	2	

Subject: METAL CASTING AND WELDING	**Subject Code:**17ME35A

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

Average	2	2											2		

Subject: COMPUTER AIDED MACHINE DRAWING											**Subject Code:**17ME36A				
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	

Subject: MATERIALS TESTING LAB											**Subject Code:**17MEL37A				
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 to analyze a material failure and determine the failure inducing agents														
CO4	Apply the knowledge of testing methods in related areas														
CO5	Understand 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:**17MEL38A				
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	Demonostrate the forging operations														
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		
Average	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	2													
CO2	3	2													
CO3	3	2													
CO4	3	2													
CO5	3	2													
Average	3	2													

Subject: KINEMATICS OF MACHINERY	**Subject Code:**17ME42

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	Analyse different cams and sketch the cam profiles for various motions of the follower, motion characteristics.
CO5	Evaluate the velocity ratio and torque in various types of gear trains.

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												2		
CO3	2	3											2		
CO4	2	2											2		
CO5	2	2											2		
Average	**2.2**	**2.3**											**1.8**		

Subject: APPLIED THERMODYNAMICS	**Subject Code:**17ME43

Course Outcomes	
CO1	Apply thermodynamic concepts to analyze the performance of gas power cycles including propulsion systems.
CO2	Evaluate the performance of steam turbine, IC engines and effect of pollution on environment.
CO3	Determine performance parameters, principles and applications of refrigeration systems refrigeration and air-conditioning systems.
CO4	Analyze air-conditioning processes using the principles of psychrometry and Evaluate cooling and heating loads in an air conditioning system.
CO5	Understand the working, applications, relevance of air and identify methods for performance improvement.

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

Subject: FLUID MECHANICS	**Subject Code:**17ME44

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:**17ME45B

Course Outcomes	
CO1	Demonstrate the construction & specification of machine tools
CO2	Demonstrate the various machining processes pertaining to relative motions between tool and work piece

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 & to estimate calculator the various forces & power requirement in metal cutting operation
CO5	Analyze 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:**17ME46B

Course Outcomes

CO1	Understand the objectives of metrology, methods of measurement, standards of measurement & various measurement parameters
CO2	Understand limits, fits and tolerance and the working of comparators
CO3	Describe measurement of major & minor diameter, pitch, angle and effective diameter of screw threads and gears
CO4	Explain measurement systems, transducers, intermediate modifying devices and terminating devices
CO5	Understand the measurement of force, Torque and Pressure

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	1										2		
CO3	3	1											2		
CO4	3												2		
CO5	3												2		
Average	3	1.67	1										2		

Subject: MECHANICAL MEASUREMENTS AND METROLOGY LAB	**Subject Code:**17MEL47B

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											**Subject Code:**17MEL48B			
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:**17ME51			
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 coordination 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	2														
CO2	2														
CO3	3											1			
CO4	3	2													
CO5	2	2									1				
Average											1				

Subject: DYNAMICS OF MACHINERY	**Subject Code:**17ME52

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:**17ME53

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:**17ME54

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	Design and development of the systems related to the facilitation of the existing system designs

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	2	3			1									
CO4	3	3													
CO5	2	2	2			1									
Average	2.8	2.6	2.5			1									

Subject: NON TRADITIONAL MACHINING	**Subject Code:**17ME554
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												2	2	
CO2	2	2												2	
CO3		2											2		
CO4	2														
CO5		2													
Average	2	2											2	2	

Subject: AUTOMATION AND ROBOTICS	**Subject Code:**17ME563
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	2												2		
CO2			1												

CO3		2	2											
CO4		2												
CO5		2										2		
Average	2	2	1.5									2		

Subject: FLUID MECHANICS & MACHINERY LAB	**Subject Code:**17MEL57
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:**17MEL58
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													2		
Average	3	2							2				2		

Semester-VI

Subject: FINITE ELEMENT ANALYSIS	**Subject Code:**17ME61
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:**17ME62

Course Outcomes

CO1	Explain the CAD, CAM, CNC, CIM and Flexible Manufacturing System.
CO2	Understand the Robotic application in processing, assembly and inspection.
CO3	Describe the Additive manufacturing and IOT.
CO4	Apply the CNC programming, CAPP and Line balancing for manufacturing.
CO5	Analyze the production rate, capacity utilization and material flow in automatedManufacturing.

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	2											3		
CO5	3												3		
Average	3	2											3		

Subject: HEAT TRANSFER	**Subject Code:**17ME63

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:**17ME64

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

Subject: AUTOMOBILE ENGINEERING	**Subject Code:**17ME655

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: METAL FORMING	**Subject Code:**17ME653

Course Outcomes

CO1	Understand the mechanism involved in deformation for different metal forming process
CO2	Interpret different variables affecting the metal forming process under different working condition
CO3	Analyze forging, rolling, drawing, & extrusion metal forming process based on parameters of pressure, load and friction
CO4	Apply the knowledge of sheet metal forming for production of components
CO5	Understand the methods involved in HERF & powder metallurgy process with their application of usage

CO-PO-PSO Mapping

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

Subject: INDUSTRIAL SAFETY	**Subject Code:**17ME662

Course Outcomes

CO1	Apply the knowledge of safety parameters, fire fighting devices to be implemented in the workplace
CO2	Analyze the cause and types of fire accidents and formulate remedial actions
CO3	Analyze probable accident prone activities and implement proper PPE while working on machines and chemical plant
CO4	Identify the electrical hazards and formulate remedial measures with safety precautions at both residential and workplace
CO5	Demonstrate the knowledge of standards, norms and legal issues towards safety in ones professional engineering practice in risk management

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

Subject: HEAT TRANSFER LAB												**Subject Code:**17MEL67		
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		
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: MODELING AND ANALYSIS LAB(FEA)												**Subject Code:**17MEL68		
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	
CO5															
Average	3	3	3		3							3	3	3	

Semester-VII

Subject: ENERGY ENGINEERING	**Subject Code:**17ME71
Course Outcomes	

CO1	Summarize the basic concepts of thermal energy systems
CO2	Identify renewable energy sources and their utilization
CO3	Understand the basic concepts of solar radiation and analyze the working of solar PV and thermal systems.
CO4	Understand principles of energy conversion from alternate sources including wind, geothermal, ocean, biomass, and biogas.
CO5	Understand the concepts and applications of fuel cells, thermoelectric convertor and MHD generator.Identify methods of energy storage for specific 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		
CO2	3						2						2		
CO3	3						2						2		
CO4	3						1						2		
CO5	3						2						2		
Average	3						1.75						2		

Subject: FLUID POWER SYSTEMS	**Subject Code:**17ME72

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**	**3**
CO1	3												2		
CO2	2	2											2		
CO3	2												2		
CO4	1		2		2								2		2
CO5	2		3		2							1	2		2
Average	2	2	2.5		2							1	2		2

Subject: CONTROL ENGINEERING	**Subject Code:**17ME73

Course Outcomes

CO1	Identify control system & its types,control actions
CO2	Deterimine the system governing equations for physical modes
CO3	Analyze the gain of the systems using block diagrams & SFG
CO4	Evaluate the stability of transfer functions in complex domain &frequency domain
CO5	Empoly state equations to study the controlability & observability

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								1	1		
CO2	2	2											1		
CO3	2	2											1		
CO4	2	2	1										1		
CO5	1	1	1									1	1		
Average	1.8	1.4	1	1								1	1		

Subject: SMART MATERIALS & MEMS	**Subject Code:**17ME745

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: MECHATRONICS	**Subject Code:**17ME754

Course Outcomes

CO1	Illustrate various components of mechatronics system
CO2	Develop electronic, , hydraulic, pneumatic an electrical actuation circuits using , sensors, transducers, Microprocessors and PLC programming
CO3	Construct hydraulic and pneumatic circuits using Automation studio software
CO4	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	3												2		
CO2	3												2	2	
CO3	3	2	2										2	2	
CO4	3	2											2		

Average	3	2	2										2	2	

Subject: DESIGN LAB												**Subject Code:**17MEL76		
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													
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:**17MEL77		
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 Toolpath 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													
CO2			2												
CO3						2	2								
CO4									2	2					
Average	3	2	2			2	2		2	2					

Semester-VIII

Subject: OPERATIONS RESEARCH	**Subject Code:**17ME81

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		
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:**17ME82

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, Employ various material characterization technique

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									2		
CO5				2											
Average	3	2	2	2									2		

Subject: PRODUCT LIFE CYCLE MANAGEMENT	**Subject Code:**17ME835

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											1	1		
Average	3	2		3	1	2					1	0.6	1	1	

Subject: INTERNSHIP	**Subject Code:**17ME84

Course Outcomes

CO1	Apply modern techniques, resources, engineering and IT tools while addressing complex engineering problems.
CO2	Demonstrate the contextual knowledge to access societal, health, safety and cultural issues normally encountered in industries.
CO3	Contribute through engineering solutions for the sustainable development in societal and environmental context and exercise professional ethics, norms, standards and responsibilities in engineering practice.
CO4	Effectively work as a team member as well as a leader while demonstrating the knowledge of project management, finance handling and other management practices in multidisciplinary environment.
CO5	Demonstrate 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	1				2								2	2	
CO2						2							2		
CO3							2	2							
CO4									3		3				
CO5										3		3		2	
Average	1				2	2	2	2	3	3	3	3	2	2	

Subject: PROJECT PHASE II	**Subject Code:**17ME85

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:**17MES86

Course Outcomes

CO1	Reviewing of advanced or recent technologies in the field of mechanical engineering
CO2	Investigate and study the literature of recent technologies from various sources
CO3	Skill to write detailed technical report describing the gained knowledge.
CO4	Enhances the effective communication and presentation skill.
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		
CO2		3											3		
CO3										3		3	3		
CO4										3			3		
CO5															
Average		3								3		3	3		

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