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

2018 - 2022 Batch

2018 Scheme

Semester-I/II

Subject: ELEMENT OF MECHANICAL ENGINEERING												**Subject Code:**18EME15/25		
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: ENGINEERING GRAPHICS												**Subject Code:**18EGDL15/25		
Course Outcomes														
CO1	Analyze orthogonal projection theory, dimensions and annotations in engineering drawing													
CO2	Develop engineering drawings as per BIS codes and conventions													
CO3	Compose manual and computerized drawings using 2D and 3D modeling software packages													
CO4	Build geometric objects using Isometric and development concepts													
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										
Average	**3**				3										

Semester-III

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: MECHANICS OF MATERIALS	**Subject Code:** 18ME32

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: BASIC THERMODYNAMICS	**Subject Code:**18ME33

Course Outcomes

CO1	Explain fundamentals of thermodynamics and evaluate energy interactions across the boundary of thermodynamic systems.
CO2	Apply 1st law of thermodynamics to closed and open systems and determine quantity of energy transfers and change in properties.
CO3	Apply the knowledge of entropy and 2nd law of thermodynamics to solve numerical problems.
CO4	Interpret the behavior of pure substances and its application in practical problems, reversibility and irreversibility to solve numerical problems.
CO5	Evaluate thermodynamic properties of ideal and real gas mixtures 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	1										2		
CO5	3		1										2		

Average	**3**	**2**	**1**										**2**		

Subject: MATERIAL SCIENCE												**Subject Code:**18ME34		
Course Outcomes														
CO1	**Understand** the fundamentals of structure and behavior of engineering materials for various mechanical applications													
CO2	**Analyse** the various modes of failure of engineering material													
CO3	**Assess** the structural and physical properties of engineering materials through various heat treatment process													
CO4	**Perceive** various properties of composites, its application and to provide an alternate to conventional structural materials													
CO5	**Propose** alternate materials which are sustainable, economic and enable new product generation													
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												2		
CO4		2											2		
CO5	3												2		
Average	3	2											2		

Subject: METAL CUTTING AND FORMING												**Subject Code:** 18ME35A		
Course Outcomes														
CO1	Apply the knowledge of metal cutting using basic machine tools fro the production of components													
CO2	Choose the right cutting material and fluids and also evaluate cutting tool parameters for different machining operations													
CO3	Evaluate tool life on the basis of wear and wear rate and also discuss the economics of machining process of various cutting tool													
CO4	Apply the knowledge of sheet metal forming for production of components													
CO5	Design different sheet metal dies for simple sheet metal components													
CO-PO-PSO Mapping														
COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2	1										2		
CO2	3	2											2		
CO3	3	2	1										2		
CO4	3	2											2		
CO5	3	2											2		
Average	3	2	1										2		

Subject: COMPUTER AIDED MACHINE DRAWING												**Subject Code:** 18ME36A		
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: MATERIAL TESTING LAB	**Subject Code:** 18ME37A
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: WORKSHOP AND MACHINE SHOP PRACTICE	**Subject Code:** 18ME38A
Course Outcomes	
CO1	Understand integral parts of lathe, shaping and milling machines and various accessories and attachments used.
CO2	Select cutting parameters like cutting speed, feed, depth of cut, and tooling for various machining operations
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	Perform machining operations such as plain shaping, inclined shaping, keyway cutting, Indexing and Gear cutting and estimate cutting time
CO5	Prepare fitting models according to drawings using hand tools- V-block, marking gauge, files, hack saw, drills etc

CO-PO-PSO Mapping

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

Subject: CONSTITUTION OF INDIA, PROFESSIONAL ETHICS AND CYBER LAW	**Subject Code:** 18ME39
Course Outcomes	
CO1	Have constitutional knowledge and legal literacy.
CO2	Understand Engineering and Professional ethics and responsibilities of Engineers.
CO3	Understand the cybercrimes and cyber laws for cyber safety measures.

CO-PO-PSO Mapping

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

CO3	3	3										3	2		
Average	**3**	**3**										**3**	**2**		

Semester-IV

Subject: Engineering Mathematics-IV												**Subject Code:**18MAT41		
Course Outcomes														
CO1														
CO2														
CO3														
CO4														
CO5														
CO-PO-PSO Mapping														
COs	**POs**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1															
CO2															
CO3															
CO4															
CO5															
Average															

Subject: APPLIED THERMODYNAMICS												**Subject Code:**18ME42		
Course Outcomes														
CO1	Apply thermodynamic concepts to analyze the performance of gas power cycles.													
CO2	Apply thermodynamic concepts to analyze the performance of vapour power cycles.													
CO3	Understand combustion of fuels and performance of I C engines.													
CO4	Apply Thermodynamic concepts to determine performance parameters of refrigeration and air-conditioning systems.													
CO5	Understand the working principle of Air compressors and Steam nozzles, 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	2												2		
CO2	2												2		
CO3	2	2											2		
CO4	2	2	1										2		
CO5	2	2	1										2		
Average	2	2	1										2		

Subject: FLUID MECHANICS	**Subject Code:**18ME43
Course Outcomes	
CO1	Identify and calculate the key fluid properties used in the analysis of fluid behavior. Explain the principles of pressure, buoyancy and floatation
CO2	Apply the knowledge of fluid statics, kinematics and dynamics while addressing problems mechanical and chemical engineering.
CO3	Describe the principles of fluid kinematics and dynamics.
CO4	Explain the concept of boundary layer in fluid flow and apply dimensional analysis to for dimensionless numbers in terms of input output variables.
CO5	Illustrate and explain the basic concept of compressible flow and CFD

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: KINEMATICS OF MACHINES	**Subject Code:**18ME44
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: METAL CASTING AND WELDING	**Subject Code:**18ME45B
Course Outcomes	
CO1	Describe the casting process and prepare different types of cast products.
CO2	Compare the Gas fired pit, Resistance, Coreless, Electrical and Cupola Metal Furnaces.
CO3	Understand the Solidification process and Casting of Non-Ferrous Metals
CO4	Describe the Metal Arc, TIG, MIG, Submerged and Atomic Hydrogen Welding processes etc. used in manufacturing
CO5	Describe 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		
CO2	3												2		
CO3	3	2											2		
CO4	3												2		
CO5	3	2											2		
Average	3	2											2		

Subject: MECHANICAL MEASUREMENTS AND METROLOGY	**Subject Code:**18ME46B
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:**18MEL47B

Course Outcomes

CO1	Understand the 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	Determine the screw thread parameters using 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: FOUNDRY, FORGING AND WELDING LAB	**Subject Code:**18MEL48B

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 s ection and dimensions.
CO4	Demonostrate the forging operations
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										3		
CO2	3		2										3		
CO3	3		2										3		
CO4	3		2										3		
Average	3		2										3		

Semester-V

Subject: MANAGEMENT AND ECONOMICS	**Subject Code:**18ME51
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												2		
CO2	2												2		
CO3	3											1	2		
CO4	3	2											2		
CO5	2	2									1		2		
Average	2.4	2									1	1	2		

Subject: DESIGN OF MACHINE ELEMENTS I	**Subject Code:**18ME52
Course Outcomes	
CO1	Apply the concepts of selection of materials for given mechanical components
CO2	List the functions and uses of machine elements used in mechanical systems.
CO3	Apply codes and standards in the design of machine elements and select an element based on the Manufacturer's catalogue.
CO4	Analyse the performance and failure modes of mechanical components subjected to combined loading and fatigue loading using the concepts of theories of failure.
CO5	Demonstrate the application of engineering design tools to the design of machine components like shafts, couplings, power screws, fasteners, welded and riveted joints.
CO6	Understand the art of working in a team

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										2		
CO4	3	3											2		
CO5	2	2	2										2		
CO6	2	2	2										2		
Average	**2.7**	**2.5**	**2.3**										**2**		

Subject: DYNAMICS OF MACHINES	**Subject Code:**18ME53
Course Outcomes	
CO1	Estimate the forces and couples for four bars and slider crank mechanisms to keep the system in equilibrium
CO2	Analyze and estimate balancing of rotating & reciprocating masses in same and different planes

CO3	Applying principles of governors and gyroscope and its applications
CO4	Analyze different modes of vibration for damped vibration with single degree of freedom systems
CO5	Compare modes of vibration for forced and damped vibration with single degree of freedom systems

CO-PO-PSO Mapping

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

Subject: TURBO MACHINES	**Subject Code:**18ME54

Course Outcomes

CO1	Model studies and thermodynamics analysis of turbo machines.
CO2	Analyze the energy transfer in Turbo machine with degree of reaction and utilization factor.
CO3	Classify, analyze and understand various type of steam turbine.
CO4	Classify, analyze and understand various type of hydraulic turbine.
CO5	Understand the concept of radial power absorbing machine and the problems involved during its operation.

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: FLUID POWER ENGINEERING	**Subject Code:**18ME55

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												1		
CO4	1		2		2								2	2	
CO5	2		3		2							1	2	2	
Average	2	2	2.5		2							1	1.45	2	

Subject: OPERATIONS MANAGEMENT	**Subject Code:**18ME56

Course Outcomes

CO1	Understand the fundamental basis and nature of operation management techniques for the manufacturing Industry and also to assess a range of strategies for improving the efficiency and effectiveness of organizational operations
CO2	Analyze the appropriateness and applicability of a range of operations management systems/models in decision making and forecasting techniques.
CO3	Evaluate various facility alternatives and their capacity decisions and sequencing techniques in operations management environment.
CO4	Summarize Aggregate Planning & Master Scheduling methods by graphical, charting techniques and mathematical techniques as applied to product and process industries.
CO5	Assess the operational issues between Industry, vendor and customer by using Material Requirement Planning (MRP), Purchasing and Supply Chain Management (SCM).

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

Subject: FLUID MECHANICS/MACHINES LAB	**Subject Code:**18MEL57

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	Determine the frictional losses for flow through pipe.
CO4	Apply the momentum equation for determination of coefficient of impact of jet on vanes.
CO5	Test the performance of reciprocating air compressor and air blower.

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	3	2							1				2		
CO3	3	1											2		
CO4	3	1											2		
CO5	3	2							1				2		
Average	3	1.4							1				2		

Subject: ENERGY CONVERSION LAB	**Subject Code:**18MEL58

Course Outcomes

CO1	Perform experiments to determine the properties of Fuels and Oils.
CO2	Conduct experiments on Internal Combustion engines to determine performance parameters.
CO3	Identify Exhaust Emission and factors affecting them.
CO4	Exhibit his competency towards preventive maintenance of Internal Combustion engines.
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					1	1	1					2		
CO4	3											1	2		
CO5															
Average	3	2				1	1	1				1	2		

Subject: ENVIRONMENTAL STUDIES	**Subject Code:**18CIV59

Course Outcomes

CO1	Understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale
CO2	Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment
CO3	Demonstrate ecology knowledge of a complex relationship between biotic and abiotic components
CO4	Apply their ecological knowledge to illustrate and graph a problem and describe the realities that managers face when dealing with complex issues.

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									
CO4						2									
Average						2									

Semester-VI

Subject: FINITE ELEMENT METHODS	**Subject Code:**18ME61

Course Outcomes

CO1	Identify the application and characteristics of FEA elements such as bars, beams, plane and iso-parametric elements.
CO2	Develop element characteristic equation and generation of global equation.
CO3	Formulate and solve Axi-symmetric and heat transfer problems
CO4	Apply suitable boundary conditions to a global equation for bars, trusses, beams, circular shafts, heat transfer, fluid flow, axi-symmetric and dynamic problems
CO5	Solve for field variables in heat transfer , fluid flow problems, axi-symmetric and dynamic problems

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

Subject: DESIGN OF MACHINE ELEMENTS II	**Subject Code:**18ME62

Course Outcomes

CO1	Apply design principles for the design of mechanical system involving springs, belts, pulleys and wire ropes
CO2	Design different types of gears and simple gear boxes for relevant applications
CO3	Understand the design principles of brakes and clutches
CO4	Apply design concepts of hydrodynamics bearings for different applications and select anti friction bearings for different applications using the manufacturers, catalogue
CO5	Apply the engineering design tools to product design

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

Subject: Heat transfer	**Subject Code:**18ME63

Course Outcomes

CO1	Understand the modes of heat transfer and apply the basic laws to formulate engineering systems.
CO2	Understand and apply the basic laws of heat transfer to extended surface, composite material and unsteady state heat transfer problems
CO3	Analyze heat conduction through numerical methods and apply the fundamental principle to solve radiation heat transfer problems.
CO4	Analyze heat transfer due to free and forced convective heat transfer.
CO5	Understand the design and performance analysis of heat exchangers and their practical applications, Condensation and Boiling phenomena

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: NON-TRADITIONAL MACHINING											**Subject Code:**18ME641			
Course Outcomes														
CO1	Understand the compare traditional and non-traditional machining process and recognize the need for Non- traditional machining process.													
CO2	Understand the constructional features, performance parameters, process characteristics, applications, advantages and limitations of USM, AJM and WJM													
CO3	Identify the need of Chemical and electro-chemical machining process along with the constructional features, process parameters, process characteristics, applications, advantages and limitations.													
CO4	Understand the constructional feature of the equipment, process parameters, process characteristics, applications, advantages and limitations EDM & PAM.													
CO5	Understand the LBM equipment, LBM parameters, and characteristics. EBM equipment and mechanism of metal removal, applications, advantages and limitations LBM & EBM													
CO-PO-PSO Mapping														
COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	2											2		
CO2	2	2											2		
CO3	2	2											2		
CO4	2	2											2		
CO5	2	2											2		
Average	2	2											2		

Subject: ENTREPRENEURSHIP DEVELOPMENT											**Subject Code:**18ME646			
Course Outcomes														
CO1	Understand the selection, prioritization and initiation of individual projects													
CO2	Understand the strategic role of project management and work breakdown structure by integrating it with organization.													
CO3	Understand the scheduling and uncertainty in projects; analyze risk management planning using project quality tools.													
CO4	Understand the activities like purchasing, acquisition, contracting, partnering and collaborations related to programming projects.													
CO5	Determine project progress and results scorecard, draw the network diagram to calculate duration of the project.													
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		1	3	2	3	2	2		
CO2	1					2		1	3	2	3	2	2		
CO3	1					2		1	3	2	3	2	2		
CO4	1					2		1	3	2	3	2	2		
CO5	1					2		1	3	2	3	2	2		
Average	1					2		1	3	2	3	2	2		

Subject: NON-CONVENTIONAL ENERGY SOURCES	**Subject Code:**18ME651
Course Outcomes	
CO1	To introduce the concepts of solar energy, its radiation, collection, storage and application.
CO2	To introduce the concepts and applications of Wind energy, Biomass energy, Geothermal energy and Ocean energy as alternative energy sources.
CO3	To explore society's present needs and future energy demands
CO4	To examine energy sources and conversion of energy including non-renewable ,renewable energy sources into useful energy .

CO5	To get exposed to energy conservation methods

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

Subject: SUPPLY CHAIN MANAGEMENT	**Subject Code:**18ME653

Course Outcomes

CO1	Understand the framework and scope of supply chain management
CO2	Build and manage a competitive supply chain using strategies, models, techniques and information technology.
CO3	Analyze the material handling transportation and traffic management
CO4	Plan the demand, inventory and supply and optimize supply chain network.
CO5	Understand the emerging trends and impact of IT on Supply chain.

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														
CO4	2														
CO5	2	2										2			
Average	2	2										2			

Subject: COMPUTER AIDED MODELLING AND ANALYSIS LAB	**Subject Code:**18MEL66

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	

Subject: HEAT TRANSFER LAB	**Subject Code:**18MEL67

Course Outcomes

CO1	
CO2	
CO3	
CO4	

CO5	

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

Subject: MINI-PROJECT	**Subject Code:**18MEMP68
Course Outcomes	
CO1	Practice acquired knowledge within the chosen area of technology for project development.
CO2	Identify, discuss and justify the technical aspects of the chosen project with a comprehensive and systematic approach.
CO3	Reproduce, improve and refine technical aspects for engineering projects by applying the knowledge of design/solve complex engineering problems by the usage of modern tools.
CO4	Work as an individual or in a team in development of technical projects.
CO5	Communicate and report effectively project related activities and findings.

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		3								2		
CO4	2								2				2		
CO5	2									2	2		2		
Average	2.8		2	2	3				2	2	2		2		

Subject:	**Subject Code:**
Course Outcomes	
CO1	
CO2	
CO3	
CO4	
CO5	

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

Semester-VII

Subject: CONTROL ENGINEERING	**Subject Code:**18ME71

Course Outcomes	
CO1	Identify the control system and its types , control actions
CO2	Construct the system governing equations for physical models(Electrical, Thermal, Mechanical, Electro Mechanical
CO3	Analyze the gain of the system using block diagram and signal flow graph
CO4	Evaluate the stability of Control system in complex domain and frequency domain
CO5	Employ state equations to study the Bode's plot

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		
CO2	2	2	1										1		
CO3	2	2											1		
CO4	2	2	1									1	1		
CO5	1	2	1									1	1		
Average	1.8	1.6	0.6									1	1		

Subject: COMPUTER AIDED DESIGN AND MANUFACTURING	**Subject Code:**18ME72

Course Outcomes	
CO1	Define automation, CIM,CAD,CAM& explain differences between these concepts. Solve simple problems of transformations of entities on computer screen
CO2	Explain the basics of automated manufacturing industries through mathematical models and analyze different types of automated flow lines
CO3	Analyze the automated flowlines to reduce time and enhance productivity
CO4	Explain the use of different computer applications in manufacturing and able to prepare part program for simple jobs on CNCand Robot Programming
CO5	Visualize and appreciate the modern trends in manufacturing 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	3	2											1		
CO2	3	2											1		
CO3	3	2											1		
CO4	3	2											1		
CO5	3	2											1		
Average	3	2											1		

Subject: TOTAL QUALITY MANAGEMENT	**Subject Code:**18ME734

Course Outcomes	
CO1	Explain the various approaches of TQM
CO2	Infer the customer perception of quality
CO3	Analyze customer needs and perception to design feed back systems
CO4	Apply statistical tools for continuous improvement of systems
CO5	Apply the tools and technology for effective improvement of TQM

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		

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

Subject: OPERATIONS RESEARCH	**Subject Code:**18ME735

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 machines and 2 jobs-n machines using Johnson's 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: MECHATRONICS	**Subject Code:**18ME744

Course Outcomes

CO1	Illustrate various components of Mechatronics systems.
CO2	Assess various control systems used in automation
CO3	Design and conduct experiments to evaluate the performance of a mechatronics system or component with respect to specifications, as well as to analyse and interpret data.
CO4	Apply the principles of Mechatronics design to product design.
CO5	Function effectively as members of multidisciplinary teams.

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

Subject: PROJECT MANAGEMENT	**Subject Code:**18ME745

Course Outcomes

CO1	Understand the selection, prioritization and initiation of individual projects
CO2	Understand the strategic role of project management.work breakdown structure by integrating it with organization.

CO3	Understand the scheduling and uncertainty in projects. analyse risk management planning using project quality tools.
CO4	Understand the activities like purchasing, acquisitions, contracting, partnering and collaborations related to performing projects.
CO5	Determine project progress and results through a balanced scorecard approach. draw the network diagram to calculate the duration of the project and reduce it using crashing.

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

Subject: ENERGY AND ENVIRONMENT	**Subject Code:**18ME751
Course Outcomes	
CO1	To understand the fundamentals of energy sources, energy use, energy efficiency, and resulting environmental implications of various energy supplies
CO2	To introduce various aspects of environmental pollution and its control
CO3	To understand the causes and remedies related to social issues like global warming, ozone layer depletion, climate change etc
CO4	To introduce various acts related to prevention and control of pollution of water and air, forest protection act, wild life protection act etc.

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	1										1	1		
CO3	2	1										1	1		
CO4	2	1										1	1		
Average	2	1										1	1		

Subject: COMPUTER INTEGRATED MANUFACTURING LAB	**Subject Code:**18MEL76
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		

Subject: DESIGN LAB	**Subject Code:**18MEL77

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: Project Phase I	**Subject Code:**18MEP78

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		

Semester-VIII

Subject: ENERGY ENGINEERING	**Subject Code:**18ME81

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: TRIBOLOGY	**Subject Code:**18ME822

Course Outcomes

CO1	Understand the fundamentals of tribology and associated parameters
CO2	Apply concepts of tribology for the performance analysis and design of components experiencing relative motion
CO3	Analyse the requirements and design hydrodynamic journal and plane slider bearings for a given application
CO4	Select proper bearing materials and lubricants for a given tribological application
CO5	Apply the principles of surface engineering for different applications of tribology

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

Subject: AUTOMOBILE ENGINEERING	**Subject Code:**18ME824

Course Outcomes

CO1	Understand the structure and working principles pertaining to Power plant, Transmission, Control &Accessory systems employed in Automobiles.
CO2	Apply the knowledge of Automobile systems to Contribute to enhancement of Efficiency.
CO3	Appreciate the recent developments in engine and Emission control systems.
CO4	
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				1	1					2		
CO4														
CO5														
Average	3	2										2		

Subject: PROJECT WORK PHASE - 2	**Subject Code:**18MEP83
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: TECHNICAL SEMINAR	**Subject Code:**18MES84
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		

Subject: Internship	**Subject Code:**18MEI84
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 a 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	2				2								2	2	
CO2						2							2		
CO3							2	2							
CO4									3		3				
CO5										3		3		2	
Average	2				2	2	2	2	3	3	3	3	2	2	

Coordinator

HOD

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