ADITYA ENGINEERING COLLEGE

An Autonomous Institutuion

Approved by AICTE • Permanently Affiliated to JNTUK • Accredited by NAAC with 'A' Grade

Recognised by UGC under sections 2(f) and 12(B) of UGC Act, 1956

Aditya Nagar, ADB Road, Surampalem - 533437, Near Kakinada, E.G.Dt., Ph:99498 76662

DEPARTMENT OF MECHANICAL ENGINEERING

B.Tech - AR19 - Course Articulation Matrix

Note: Correlation Levels are 1 or 2 or 3. Where 1- Slight(Low), 2 - Moderate(Medium), 3 - Substantial (High).

	CO Statements	POs												PSOs	
I SEM															
Course Code	**191HS1T01 - ENGLISH – I**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Identify the ways to overcome fear and use of words paradoxically, interpret the developing conditions and the core competences of the state to prioritize education system.	-	-	-	-	-	-	1	-	-	3	-	-	-	-
CO2	Explain about world's most precious natural resources.	-	-	-	-	-	-	1	-	-	3	-	-	-	-
CO3	Explain about importance of unity to aboilish war.	-	-	-	-	-	-	-	-	-	3	-	-	-	-
CO4	Respond well to the changing situations in life with independent knowledge for better decision making.	-	-	-	-	-	-	-	-	2	3	-	2	-	-
CO5	Demonstrate writing and concepts of effective writing skills.	-	-	-	-	-	-	-	-	1	3	-	-	-	-
Course Code	**191BS1T01 - DIFFERENTIAL EQUATIONS AND LINEAR ALGEBRA**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Apply the concepts of Mean Value theorem, Partial Differentiation and identify the maxima and minima of a given function.	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Solve the linear differential equations and model various situations involving differential equations of first order.	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Solve linear differential equations of higher order and model various situations involving second order differential equations.	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO4	Calculate Rank of a matrix and solve the system of Linear equations and find the Eigen values and Eigen vectors.	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO5	Compute various powers of a matrix and identify the nature of the quadratic form.	3	2	-	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191BS1T02 - ENGINEERING PHYSICS**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the basic concepts of crystal structure and X-ray diffraction Techniques.	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Apply the knowledge of acoustics to improve acoustic quality of concert halls and understand the concepts of flaw detection techniques using ultrasonics.	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Apply the structure- property relationship exhibited by solid materials within the elastic limit.	3	2	-	-	-	-	-	-	-	-	-	-	-	-

	CO Statements	POs												PSOs	
CO4	Explain thebasic concepts of LASERs along with its Engineering applications andfamiliarize with types of sensors for various engineering applications	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO5	Explain about magnetic and dielectric properties of different materials.	2	1	-	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191ES1T01-PROGRAMMING FOR PROBLEM SOLVING USING C**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Illustrate the fundamental concepts of computers and basics of computer programming	1	-	-	-	-	-	-	-	-	-	-	1	-	-
CO2	Make use of control structures and arrays in solving complex problems.	3	-	-	-	-	-	-	-	-	-	-	1	-	-
CO3	Develop modular program aspects and strings fundamentals.	3	-	-	-	-	-	-	-	-	-	-	1	-	-
CO4	Demonstrate the ideas of pointers usage.	2	-	-	-	-	-	-	-	-	-	-	1	-	-
CO5	Solve real world problems using the concept of structures, unions and File operations.	3	2	1	-	2	-	-	-	-	-	-	1	-	-
Course Code	**191HS1L01-COMMUNICATIVE ENGISH LAB - I**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Make use of the concepts to communicate confidently and competently in English Language in all spheres.	-	-	-	-	1	-	-	-	-	3	-	1	-	-
CO2	Express Creative skills to construct Dialogues / Conversations in Spoken and Written forms.	-	-	-	-	1	-	-	-	-	3	-	2	-	-
CO3	Identify Accent for intelligibility.	-	-	-	-	1	-	-	-	-	3	-	2	-	-
CO4	Demonstrate communicative ability in everyday Conversation, JAM Sessions and Public Speaking.	-	-	-	-	1	-	-	-	-	3	-	1	-	-
CO5	Demonstrate nuances of Language through Audio – Visual Experience and group activities.	-	-	-	-	1	-	-	-	-	3	-	1	-	-
Course Code	**191BS1L01-ENGINEERING PHYSICS LAB**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Determine the rigidity and young's modulus to understand material properties.	3	2	-	-	-	-	-	-	2	-	-	1	-	-
CO2	Determine Acceleration due to Gravity and Radius of Gyration and spring constant by oscillatory mechanics.	3	2	-	-	-	-	-	-	2	-	-	1	-	-
CO3	Find the strength of the magnetic field.	2	1	-	-	-	-	-	-	2	-	-	1	-	-
CO4	Determine wave length of unknown source, particle size using lasers.	3	2	-	-	-	-	-	-	2	-	-	1	-	-
CO5	Determination of velocity of sound, moment of inertia.	3	2	-	-	-	-	-	-	2	-	-	1	-	-
Course Code	**191ES1L01-PROGRAMMING FOR PROBLEM SOLVING USING C LAB**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Develop the basic programs in C and draw the flowcharts using Raptor.	2	-	-	-	1	-	-	-	-	-	-	3	-	-
CO2	Make use of conditional and iterative statements to solve real time scenarios in C.	3	-	-	-	1	-	-	-	-	-	-	3	-	-
CO3	Apply the concept of arrays, modularity and strings to handle complex problems.	3	-	-	-	1	-	-	-	-	-	-	3	-	-

	CO Statements	POs												PSOs	
CO4	Apply the dynamic memory allocation functions using pointers.	2	-	-	-	1	-	-	-	-	-	-	3	-	-
CO5	Develop programs using structures, and Files.	3	-	-	-	1	-	-	-	-	-	-	3	-	-
Course Code	**191ES1L02-BASIC ENGINEERING WORKSHOP**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Prepare carpentry joints using carpentry tools	1	-	-	-	-	-	-	-	1	-	-	1	1	-
CO2	Develop various fitting joints using fitting tools.	1	-	-	-	-	-	-	-	1	-	-	1	1	-
CO3	Develop component drawings for making the sheet metal models.	1	-	-	-	-	-	-	-	1	-	-	1	1	-
CO4	Prepare sheet metal models using drawings and tin smithy tools	1	-	-	-	-	-	-	-	1	-	-	1	1	-
CO5	Experiment with the various house wiring connections.	1	-	-	-	-	-	-	-	1	-	-	1	1	-
Course Code	**191MC1A01-ENVIRONMENTAL SCIENCE**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Outline the natural resources and their importance for the sustenance of the life	-	-	-	-	-	1	2	-	-	-	-	-	-	-
CO2	Explain about the biodiversity of India, threats and its conservation methods	-	-	-	-	-	1	2	-	-	-	-	-	-	-
CO3	Illustrate various attributes of the pollution, impacts and measures to control the pollution along with waste management practices	-	-	-	-	-	1	2	-	-	-	-	-	-	-
CO4	Describe social issues of both rural and urban environment to combat the challenges and the legislations of India in environmental protection	-	-	-	-	-	1	2	-	-	-	-	-	-	-
CO5	Explain the population growth and its implications	-	-	-	-	-	1	2	-	-	-	-	-	-	-
Course Code	**191MC1A02-CONSTITUTION OF INDIA**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain historical background ofthe constitution making and its importance for building a democratic India.	-	-	-	-	-	1	-	-	-	-	-	-	-	-
CO2	Compare the functioning of three wings of the government i.e. executive, legislative and judiciary.	-	-	-	-	-	1	-	-	-	-	-	-	-	-
CO3	Interpret the value of the fundamental rights and duties for becoming good citizen of India.	-	-	-	-	-	1	-	-	-	-	-	-	-	-
CO4	Compare the decentralization of power between central, state and local self-government.	-	-	-	-	-	1	-	-	-	-	-	-	-	-
CO5	Extend the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.	-	-	-	-	-	1	-	-	-	-	-	-	-	-
	II SEM														
Course Code	**191BS2T05-PARTIAL DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Solve improper integrals using beta and gamma functions.	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Solve partial differential equations of first order.	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Compute the double integral over a region and triple integral over a volume.	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO4	Calculate the gradient of a scalar function, divergence and curl of a vector function.	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO5	Apply line, surface and volume integrals.	3	2	-	-	-	-	-	-	-	-	-	-	-	-

	CO Statements	POs												PSOs	
Course Code	**191BS2T06-CHEMISTRY OF MATERIALS**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Compare the quality of drinking water and problems associated with hardwater.	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Explain the fundamentals and applications of Electrochemical energy systems.	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Explain fundamentals and applications of polymers and building materials.	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	Explain the fundamentals and controlling methods of corrosion.	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	Explain the properties and applications of nano materials, conductors, Semiconductors and Super conductors.	3	-	-	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191ES2T02-ENGINEERING GRAPHICS AND DESIGN**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Make use of fundamentals of Engineering Drawing to sketch basic curves, conic sections, cycloid, epicycloid, hypocycloid and involute.	3	-	-	-	-	-	-	-	-	2	-	-	-	-
CO2	Apply the principles of orthographic projections for points, lines and planes.	3	-	-	-	-	-	-	-	-	2	-	-	-	-
CO3	Apply the principles of orthographic projections for solids.	3	-	-	-	-	-	-	-	-	2	-	-	-	-
CO4	Apply the AutoCAD software for the orthographic projection of the machine parts.	3	-	-	-	2	-	-	-	-	2	-	2	-	-
CO5	Apply the AutoCAD software for the isometric projection of the machine parts.	3	-	-	-	2	-	-	-	-	2	-	2	-	-
Course Code	**191ES2T03-ESSENTIAL ELECTRICAL ANDELECTRONICS ENGINEERING**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Construct simple electrical circuits using basic laws.	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Explain the constructional features of DC Machines and working.	3	2	2	-	-	-	-	-	-	-	-	-	-	-
CO3	Examine the performance of single phase transformer.	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO4	Illustrate the principle of AC rotating machines.	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO5	Analyze the device structure, operation and application of diode and BJT.	3	-	-	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191ES2T04-ENGINEERING MECHANICS**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Determine the resultant force and moment for a given force system.	2	2	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Solve the member forces in trusses.	1	2	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Apply concept of Virtual work to find the work done by force and couple.	1	2	-	-	-	-	-	-	-	-	-	-	-	-
CO4	Solve the centre of gravity and moment of inertia for various geometric shapes.	2	2	-	-	-	-	-	-	-	-	-	-	-	-
CO5	Determine the displacement, velocity and acceleration relations in dynamic systems.	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO6	Apply the concepts of kinematics, kinetics, work - energy and impulse - momentum methods to particle motion.	3	2	-	-	-	-	-	-	-	-	-	-	-	-

	CO Statements	POs												PSOs	
Course Code	**191HS2L02-COMMUNICATIVE ENGLISH LAB–II**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Make effective use of Body language in all situations and contexts to enhance effective communication in all aspects.	-	-	-	-	-	-	-	-	-	3	-	2	-	-
CO2	Identify communicative competency to respond to others in different situations.	-	-	-	-	-	-	-	-	-	3	-	2	-	-
CO3	Make use of effective delivery strategies to select, compile and synthesize information for oral presentation.	-	-	-	-	-	-	-	-	-	3	-	2	-	-
CO4	Demonstratein mock interviews, group discussion and public speaking.	-	-	-	-	-	-	-	-	-	3	-	2	-	-
CO5	Illustrate interpersonal skills using English language confidently and effectively for personal and professional growth.	-	-	-	-	-	-	-	-	-	3	-	2	-	-
Course Code	**191BS2L04-ENGINEERING CHEMISTRY LAB**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Analyze and generate experimental skills.	3	-	-	-	3	-	-	-	3	3	-	1	-	-
CO2	Calculate the hardness of water.	3	-	-	-	3	-	-	-	3	3	-	1	-	-
CO3	Calculate the strength of acids & bases by instrumental analysis.	3	-	-	-	3	-	-	-	3	3	-	1	-	-
CO4	Prepare advanced polymer materials.	3	-	-	-	3	-	-	-	3	3	-	1	-	-
CO5	Prepare alternative fuel like Bio-Diesel.	3	-	-	-	3	-	-	-	3	3	-	1	-	-
Course Code	**191ES2L03-ESSENTIAL ELECTRICAL AND ELECTRONICS ENGINEERING LAB**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Analyze the electrical networks using network theorems.	3	2	1	1	-	-	-	-	-	-	-	-	-	-
CO2	Analyze the performance of AC and DC Machines.	3	3	2	-	-	-	-	-	-	-	-	-	-	-
CO3	Estimate the performance of 1-phase transformer.	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO4	Explain diode characteristics and its applications	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO5	Explain the simulation of diode and transistor.	2	1	-	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191ES2L07-MECHANICAL ENGINEERING WORKSHOP**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Demonstrate pattern making process, mould making process by using greensand and casting process.	2	1	-	-	-	-	-	-	-	-	-	-	1	-
CO2	Distinguish among various metal fabrication processes such as Arc welding, Gas Welding, Resistance spot welding process and Soldering & Brazing**.**	3	3	-	-	-	-	-	3	-	-	-	-	1	-
CO3	Create the plastic object through different plastic processing techniques.	3	3	-	-	-	-	-	-	-	-	-	-	1	-
CO4	Experiment with assembling and disassembling of machine parts.	3	2	-	-	-	-	-	3	-	-	-	-	1	-
CO5	Make use of the basic machine tools and power tools used in manufacturing.	3	2	-	-	-	-	-	2	-	-	3	-	1	-
Course Code	**191PR2P01-ENGINEERING EXPLORATION PROJECT**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Analyze the surrounding environment and identify a design challenge	1	1	1	-	-	-	-	-	-	-	-	1	-	-
CO2	Foster team collaboration, find inspiration from the environment and learn how to identify problems	-	1	1	-	-	-	-	-	1	1	-	-	-	-
CO3	Encourage exploration to process the Design Challenge ,empathize & brainstorm the users effectively	-	-	1	1	-	1	1	-	-	-	-	-	-	-

	CO Statements	POs												PSOs	
CO4	Build effective prototypes as tangible models to use as communication tools	-	-	-	1	-	-	-	-	1	1	-	-	-	-
CO5	Test the prototype for design challenge and submit the report adhering to professional ethics	-	-	-	-	1	-	-	1	-	1	1	-	-	-
III SEM															
Course Code	**191BS3T11-INTEGRAL TRANSFORMS AND APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Compute the Fourier series of a function.	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Compute the Fourier transform of a function.	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Compute Laplace transform of a function.	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO4	Apply the concepts of various heat treatment methods to variety of steels.	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO5	Solve one dimensional heat equation, wave equation and two dimensional Laplace equation	3	2	-	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191ME3T01-FLUID MECHANICS AND HYDRAULIC MACHINERY**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the concepts of Fluid statics and Fluid kinematics.	1	1	-	-	-	-	-	-	-	-	-	-	-	1
CO2	Calculate the meta centric height of a submerged body.	1	1	-	-	-	-	-	-	-	-	-	-	-	1
CO3	Describe the concepts of Fluid dynamics.	1	1	-	-	-	-	-	-	-	-	-	-	-	1
CO4	Analyze the applications of Boundary Layer Theory in flow field	1	1	-	-	-	-	-	-	-	-	-	-	-	1
CO5	Solve the hydrodynamic force of jet on various vanes.	1	1	-	-	-	-	-	-	-	-	-	-	-	1
CO6	Evaluate the performance characteristics of types of Turbines and Pumps.	1	1	-	-	-	-	-	-	-	-	-	-	-	1
Course Code	**191ME3T02-COMPUTER AIDED ENGINEERING DRAWING PRACTICE**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Draw the sectional view of the solids.	1	-	-	-	-	-	-	-	-	1	-	1	1	-
CO2	Develop the surfaces of solids like prism, pyramid, cone and cylinder.	1	-	-	-	-	-	-	-	-	1	-	1	1	-
CO3	Sketch the intersection of solids and Isometric Views.	1	-	-	-	2	-	-	-	-	1	-	1	2	-
CO4	Draw the orthographic projections of the machine parts through AutoCAD.	1	-	-	-	2	-	-	-	-	1	-	1	2	-
CO5	Draw the isometric projections of the machine parts through AutoCAD.	1	-	-	-	2	-	-	-	-	1	-	1	2	-
Course Code	**191ME3T03-MECHANICS OF SOLIDS**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Calculate the stresses and strains in bodies of varying cross-section, Composite bars.	3	2	2	-	-	-	-	-	-	-	-	-	1	-
CO2	Sketch the shear force and bending moment diagrams for beams of various supports and loads.	3	2	1	-	-	-	-	-	-	-	-	-	1	-
CO3	Analyze the variation of bending and shear stresses across a beam cross-section.	3	2	1	-	-	-	-	-	-	-	-	-	1	-

	CO Statements	POs												PSOs	
CO4	Calculate the slope and deflection for beams of various load and support arrangements.	3	2	2	-	-	-	-	-	-	-	-	-	1	-
CO5	Compute the shear stresses due to application of twisting moment and buckling loads for various columns.	3	2	1	-	-	-	-	-	-	-	-	-	1	-
Course Code	**191ME3T04-THERMODYNAMICS**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO 1	Explain basic concepts, properties of substances and Laws of thermodynamics.	2	1	1	-	-	-	-	-	-	-	-	-	-	1
CO 2	Analyze thermodynamic processes using second law of thermodynamics.	3	2	1	-	-	-	-	-	-	-	-	-	-	1
CO 3	Analyze thermodynamic properties of pure substances.	3	2	1	1	-	-	-	-	-	-	-	-	-	1
CO 4	Analyze the Gas laws for perfect Gas mixtures.	3	2	1	1	-	-	-	-	-	-	-	-	-	1
CO 5	Analyze the thermodynamic cycles.	2	-	-	-	-	-	-	-	-	-	-	-	-	1
Course Code	**191ME3T05-METALLURGY AND MATERIALS SCIENCE**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO 1	Explain the concepts of structure of metals and mechanical behavior under different loading conditions	1	-	-	-	-	1	1	-	-	-	-	-	1	-
CO 2	Describe the process and advantages of equilibrium diagrams of various binary alloys	1	-	-	-	-	1	1	-	-	-	-	-	1	-
CO 3	Discuss the concept of solidification of metal alloys in Iron-Iron carbide equilibrium diagram	1	-	-	-	-	1	1	-	-	-	-	-	1	-
CO 4	Apply the heat treatment methods to steels with different composition	1	-	-	-	-	1	1	-	-	-	-	-	1	-
CO 5	Use the concepts of non-ferrous metals and alloys in metallurgical areas' applications	1	-	-	-	-	1	1	-	-	-	-	-	1	-
CO6	Summarize the properties and applications of ceramic and composite materials.	1	-	-	-	-	1	1	-	-	-	-	-	1	-
Course Code	**191ME3L01-FLUID MECHANICS AND HYDRAULIC MACHINERY LAB**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO 1	Calculate the head losses causing decrease in energy of flow experimentally and by the verification of Bernoulli's theorem.	-	1	2	-	-	-	-	-	2	1	-	-	-	2
CO 2	Compare the flow meters for their better performing characteristics when used in pipes of turbines, etc.	-	1	2	-	-	-	-	-	2	1	-	-	-	2
CO 3	Calculate the efficiencies of Centrifugal and Reciprocating pumps while maintaining similar conditions.	-	1	2	-	-	-	-	-	2	1	-	-	-	2
CO 4	Evaluate performance characteristic curves and efficiencies of different hydraulic turbines.	-	1	2	-	-	-	-	-	2	1	-	-	-	3
CO 5	Calculate the work done and efficiency of various vane shapes for turbine applications.	-	1	2	-	-	-	-	-	2	1	-	-	-	2
Course Code	**191ES3L06-MECHANICS OF SOLIDS AND METALLURGY LAB**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO 1	Demonstrate the material mechanical behavior under various direct loads	2	-	-	-	-	1	-	-	-	2	-	1	1	-
CO 2	Calculate the mechanical strength of spring and cube.	3	-	-	-	-	1	-	-	-	2	-	1	1	-

	CO Statements	POs												PSOs	
CO 3	Demonstrate the materials mechanical behavior under various indirect loads.	2	-	-	-	-	1	-	-	-	2	-	1	1	-
CO 4	Analyze the Structure of pure metals and alloys	3	-	-	-	-	1	-	-	-	2	-	1	1	-
CO 5	Estimate the hardness of various treated and untreated steels	2	-	-	-	-	1	-	-	-	2	-	1	1	-
Course Code	**191MC3A03 - EMPLOYABILITY SKILLS-I**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Solve problems of Series & Analogy for Numbers and Letters	1	-	-	-	-	-	-	-	-	-	-	1	-	-
CO2	Solve problems on Coding & Decoding and Divisibility rules	1	-	-	-	-	-	-	-	-	-	-	1	-	-
CO3	Solve problems on LCM & HCF and Simple Equations	1	-	-	-	-	-	-	-	-	-	-	1	-	-
CO4	Demonstrate Attitude, self-confidence and decision making in different situations	-	-	-	-	-	-	-	-	-	1	-	1	-	-
CO5	Develop out of box and lateral thinking, better goal setting and time management	-	-	-	-	-	-	-	-	-	1	-	1	-	-
Course Code	**191MC3A04 - ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Identify the concept of Traditional knowledge and its importance	-	-	-	-	-	1	1	-	-	-	-	-	-	-
CO2	Explain the need and importance of protecting traditional knowledge.	-	-	-	-	-	1	1	-	-	-	-	-	-	-
CO3	Illustrate the various enactments related to the protection of traditional knowledge.	-	-	-	-	-	1	1	-	-	-	-	-	-	-
CO4	Interpret the concepts of Intellectual property to protect the traditional knowledge.	-	-	-	-	-	1	1	-	-	-	-	-	-	-
CO5	Explain the importance of Traditional knowledge in Agriculture and Medicine	-	-	-	-	-	1	1	-	-	-	-	-	-	-
	IV SEM														
Course Code	**191BS4T16-NUMERICAL METHODS & STATISTICAL TECHNIQUES**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO 1	Apply numerical methods to solve equations and interpolation of polynomials.	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO 2	Apply numerical methods to solve initial value problems and problems involving integration.	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO 3	Apply discrete and continuous probability distributions.	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO 4	Compute the components of a classical hypothesis test.	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO 5	Apply the statistical inferential methods based on small and large sampling tests.	3	2	-	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191HS4T04-MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO 1	Explain the Managerial Economic concepts for decision making and forward planning.	1	-	-	-	-	-	-	-	-	-	-	1	1	-
CO 2	Illustrate the law of demand and its exceptions, to use different Forecasting methods for predicting demand for various products and services.	1	1	-	-	-	-	-	-	-	3	-	1	1	-

	CO Statements	POs												PSOs	
CO 3	Identify the cost behaviour, costs useful for managerial decision making and Break Even Point (BEP) of an enterprise.	-	1	-	-	-	-	-	-	-	-	3	1	1	-
CO 4	Outline the different types of business organizations along with basic knowledge on business cycle.	-	-	-	-	-	-	-	-	-	-	-	1	1	-
CO 5	Make use of the process & principles of accounting and prepare Journal, Ledger, Trial Balance, Trading A/c., Profit & Loss A/c. and Balance Sheet of an enterprise.	1	1	-	-	-	-	-	1	-	3	-	1	1	-
Course Code	**191ES4T15-INTERNET OF THINGS**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO 1	Explain the application areas of IoT.	1	2	1	-	3	-	-	-	-	-	-	-	1	-
CO 2	Illustrate revolution of Internet in Mobile Devices, Cloud & Sensor Networks.	3	1	1	-	3	-	-	-	-	-	-	-		-
CO 3	Explain communication protocols used in IoT.	3	1	1	-	3	-	-	-	-	-	-	-	1	-
CO 4	Make use of Raspberry PI programming to implement Internet of Things through Arduino	3	2	1	-	3	-	-	-	-	-	-	-	-	-
CO 5	Apply the principles of IoT in real world scenario.	3	1	1	-	3	-	-	-	-	-	-	-	-	-
Course Code	**191ME4T06-PRODUCTION TECHNOLOGY**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO 1	Explain the basics of casting and its applications.	1	-	-	-	-	1	1	-	-	-	-	-	1	-
CO 2	Demonstrate various special casting processes.	2	-	-	-	-	1	1	-	-	-	-	-	3	-
CO 3	Distinguish between the different joining techniques.	2	-	-	-	-	1	1	-	-	-	-	-	3	-
CO 4	Explain the basics of sheet metal forming and plastics processing techniques.	1	-	-	-	-	1	1	-	-	-	-	-	1	-
CO 5	Summarize the bulk metal deforming process.	1	-	-	-	-	1	1	-	-	-	-	-	1	-
Course Code	**191ME4T07-KINEMATICS OF MACHINERY**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO 1	Explain the inversions of a kinematic chain and its applications.	1	1	1	1	-	-	-	-	-	-	-	-	1	-
CO 2	Construct the velocity and acceleration diagrams using Relative velocity method and Instantaneous Centre method.	2	2	1	1	-	-	-	-	-	-	-	-	1	-
CO 3	Construct displacement diagram and profile of Cam with different types of follower motions.	2	2	1	-	-	-	-	-	-	-	-	-	1	-
CO 4	Calculate the velocities of different components of a gear train.	1	2	1	-	-	-	-	-	-	-	-	-	1	-
CO 5	Explain how real time machines work and operate.	1	1	1	1	-	-	-	-	-	-	-	-	1	-
Course Code	**191ME4T08-THERMAL ENGINEERING-I**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO 1	Differentiate the ideal, air standard cycles and actual thermodynamic cycles.	2	-	-	-	-	-	1	-	-	-	-	1	-	2
CO 2	Evaluate the Engine performance based on the experimental data	3	-	-	-	-	3	1	-	-	-	-	1	-	3
CO 3	Analyze the fueling system and combustion behaviour of SI engine	3	-	-	-	-	3	1	-	-	-	-	1	-	3
CO 4	Analyze the fueling system and combustion behaviour of CI engine	3	-	-	-	-	3	1	-	-	-	-	1	-	3
CO 5	Explain the formation of emissions and its control strategies of both SI & CI Engines.	3	-	-	-	-	3	2	-	-	-	-	1	-	2
Course Code	**191ME4L03-PRODUCTION TECHNOLOGY LAB**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO 1	Demonstrate mould making process for casting process and sand preparation methods.	3	2	-	-	-	-	-	-	2	2	-	-	3	-

	CO Statements	POs												PSOs	
CO 2	Identify the casting defects and select the remedial action	2	-	-	-	-	-	-	-	-	2	-	-	2	-
CO 3	Differentiate between various gas welding, arc welding processes and Solid state welding process.	2	-	-	-	-	-	-	-	2	2	2	-	2	-
CO 4	Apply the principles of sheet-metal forming process for making a component.	3	2	-	-	-	-	-	-	2	-	2	-	3	-
CO 5	Produce the plastic object through different plastic processing techniques.	3	2	-	-	-	-	-	-	2	-	-	-	3	-
Course Code	**191ME4L04-COMPUTER AIDED MACHINE DRAWING**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO 1	Discuss the conventional representation of materials and machine components.	-	1	-	-	2	-	-	-	-	2	-	1	1	-
CO 2	Apply the principles of engineering drawing in machine drawing.	-	1	-	-	2	-	-	-	-	2	-	1	1	-
CO 3	Construct various types of temporary fasteners.	-	1	-	-	2	-	-	-	-	2	-	1	1	-
CO 4	Sketch various types of permanent fasteners.	-	1	-	-	2	-	-	-	-	2	-	1	1	-
CO 5	Practice assembly drawings from the given part drawings for manufacturing.	-	1	-	-	2	-	-	-	-	2	-	1	1	-
CO 6	Construct part drawings from the given assembly drawing.	-	1	-	-	2	-	-	-	-	2	-	1	1	-
Course Code	**191MC4A05-EMPLOYABILITY SKILLS – II**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO 1	Examine the symbols, notations and Venn -diagrams.	1	-	-	-	-	-	-	-	-	-	-	1	-	-
CO 2	Solve different types of number systems problems.	1	-	-	-	-	-	-	-	-	-	-	1	-	-
CO 3	Solve ratio & proportion, ages and averages by using simple logic.	1	-	-	-	-	-	-	-	-	-	-	1	-	-
CO 4	Apply negotiation skills and leadership skills in a team	-	-	-	-	-	-	-	-	-	1	-	1	-	-
CO 5	Apply listening skills and verbal skills of communication in a team	-	-	-	-	-	-	-	-	-	1	-	1	-	-
Course Code	**191MC4A06- BIOLOGY FOR ENGINEERS**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Apply biological engineering principles, procedures needed to solve real-world problems.	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Demonstrate the fundamentals of living things, their classification, cell structure and biochemical constituents.	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Apply the concept of plant, animal and microbial systems and growth in real life situations.	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	Explain genetics and the immune system to know the cause, symptoms, diagnosis and treatment of common diseases.	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	Demonstrate basic knowledge of the applications of biological systems in relevant industries.	1	-	-	-	-	-	-	-	-	-	-	-	-	-
		V SEM													
Course Code	**191ME5T09-DYNAMICS OF MACHINERY**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO 1	Analyze stabilization of sea vehicles, aircrafts and automobile vehicles.	3	2	2	1	-	-	-	-	-	-	-	-	2	-
CO 2	Compute frictional losses and torque transmission of mechanical systems.	3	2	2	1	-	-	-	-	-	-	-	-	1	-
CO 3	Analyze the forces acting on the flywheels and governors.	2	2	2	1	-	-	-	-	-	-	-	-	1	-

	CO Statements	POs												PSOs	
CO 4	Apply analytical and graphical methods of calculating balancing of rotary and reciprocating masses.	2	2	2	1	-	-	-	-	-	-	-	-	1	-
CO 5	Determine the natural frequencies of vibrating system.	2	2	2	1	-	-	-	-	-	-	-	-	1	-
Course Code	**191ME5T10-DESIGN OF MACHINE MEMBERS-I**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO 1	Apply the design procedure to engineering problems, including the consideration of technical and manufacturing constraints.	3	2	1	1	-	-	-	-	-	-	-	-	1	-
CO 2	Evaluate the strength, stiffness and fatigue of machine elements.	2	2	3	3	-	-	-	-	-	-	-	-	1	-
CO 3	Analyze various types of stresses on mechanical components subjected to both static and dynamic loads.	2	3	2	2	-	-	-	-	-	-	-	-	1	-
CO 4	Explain the design of fasteners subjected to eccentric & fluctuating loads.	2	2	2	2	-	-	-	-	-	-	-	-	1	-
CO 5	Calculate the design parameters of various components like springs and pressure vessels.	3	2	1	1	-	-	-	-	-	-	-	-	1	-
Course Code	**191ME5T11-THERMAL ENGINEERING - II**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO 1	Apply different methods used to improve the efficiency of Rankine Cycle.	3	1	-	-	-	-	-	-	-	-	-	-	-	1
CO 2	Solve problems related to boiler efficiency and chimney.	3	2	-	-	-	-	-	-	-	-	-	1	-	1
CO 3	Analyze the performance of Steam nozzles and steam turbines.	3	2	-	-	-	-	-	-	-	-	-	1	-	1
CO 4	Distinguish different types of condenser used in a steam power plant.	3	1	-	-	-	-	-	-	-	-	-	-	-	1
CO 5	Explain the methods to increase the performance of Gas Turbine and its applications.	3	1	-	-	-	-	-	-	-	-	-	1	-	1
Course Code	**191ME5E01-AUTOMOBILE ENGINEERING (PROFESSIONAL ELECTIVE – I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO 1	Summarize the Vehicle Chassis Layouts of 4-wheelers and Motor Vehicle Act.	2	1	2	-	-	-	3	-	-	-	-	-	-	1
CO 2	Identify the different constructional features and working principles of Un-Sprung components of the given vehicle.	2	1	1	-	-	-	3	-	-	-	-	-	-	2
CO 3	Identify the different constructional features and working principles Sprung components of the given vehicle.	2	1	1	-	-	-	3	-	-	-	-	-	-	2
CO 4	Summarize the functionalities of various Electrical systems of typical Automobile.	2	1	-	-	1	-	-	-	-	-	-	-	-	1
CO 5	Explain the different Active and Passive Vehicle Safety Systems.	3	2	3	-	-	-	1	-	-	-	-	-	-	1
Course Code	**191ME5E02-COMPOSITE MATERIALS (PROFESSIONAL ELECTIVE – I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO 1	Explain about the composite materials, matrix, fibers etc.	1	-	-	-	-	-	-	-	-	-	-	-	1	-
CO 2	Select the composites based on the matrix materials.	3	-	-	-	-	-	-	-	-	-	-	1	3	-
CO 3	Select the composites based on the reinforcements.	3	-	-	-	-	-	-	-	-	-	-	1	3	-
CO 4	Calculate the stress and strain of various types of laminates.	3	2	2	1	-	-	-	-	-	-	-	-	3	-
CO 5	Evaluate stiffness and strength of unidirectional composites.	3	1	2	2	-	-	-	-	-	-	-	-	3	-

	CO Statements	POs												PSOs	
Course Code	**191ME5E03-FLUID ENGINEERING (PROFESSIONAL ELECTIVE – I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the working of various types of reciprocating compressor	2	1	-	-	2	2	-	-	-	-	-	-	-	2
CO2	Evaluate efficiency of various types of rotary compressors	3	2	-	-	2	2	-	-	-	-	-	-	-	2
CO3	Compare different types of Turbines and its characteristics	2	2	1	-	-	-	-	-	-	-	-	-	-	3
CO4	Calculate performance of centrifugal pump.	3	2	1	-	-	-	-	-	-	-	-	-	-	2
CO5	Calculate performance of Reciprocating Pump	3	2	1	-	-	-	-	-	-	-	-	-	-	2
Course Code	**191ME5E04-MECHANICAL VIBRATIONS (PROFESSIONAL ELECTIVE – I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Analyze the various 1-D periodic and periodic responses of an vibrating system with and without damping.	3	2	2	1	-	-	-	-	-	-	-	-	1	-
CO2	Analyze the two degree freedom systems with and without damping for free and forced vibrations.	3	2	2	1	-	-	-	-	-	-	-	-	1	-
CO3	Solve Multi-degree freedom systems emphasing on modal analysis techniques.	2	2	2	1	-	-	-	-	-	-	-	-	1	-
CO4	Estimate frequency of multi degree freedom systems using numerical methods.	2	2	2	1	-	-	-	-	-	-	-	-	1	-
CO5	Apply the knowledge of the various physical vibration measuring instruments.	2	2	2	1	-	-	-	-	-	-	-	-	1	-
Course Code	**191ME5E05-METROLOGY & INSTRUMENTATION (PROFESSIONAL ELECTIVE – I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the concept of systems of limits and fits and theory of linear and angular measurement.	2	1	1	-	1	-	-	-	-	-	-	-	1	-
CO2	Explain the surface roughness measurement, screw thread measurement and gear measurement.	2	1	1	-	-	-	-	-	-	-	-	-	1	-
CO3	Explain the concepts of machine tool alignments.	3	2	1	2	-	-	-	-	-	-	-	-	2	-
CO4	Select appropriate elements of a measurement system and select instruments for displacement measurement.	2	3	2	-	1	-	-	-	-	-	-	-	3	-
CO5	Select instruments for temperature, pressure and flow measurement.	2	3	2	-	2	-	-	-	-	-	-	-	3	-
Course Code	**191ME5E06-ORGANIZATIONAL BEHAVIOUR (PROFESSIONAL ELECTIVE – I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the O.B a range of organizational behavior models key elements and roles of O.B.	-	-	-	-	-	-	-	-	1	-	1	-	1	-
CO2	Analyze the behavior of individuals and groups in organizations in terms of organizational behavior interpersonal behavior and personality traits concepts.	-	-	-	-	-	-	-	-	-	1	-	1	1	-
CO3	Utilize various stress and emotional organizational behavior concepts, models and theories to real life management situations through case analysis	-	-	-	-	-	-	-	-	1	-	-	-	1	-

	CO Statements	POs												PSOs	
CO4	Make use of organizational communication and organization culture to understanding of organizational communication and culture to cope up with the organization better way.	-	-	-	-	-	-	-	-	-	1	1	-	1	-
CO5	Classify the different groups and teams in the organization and its features for dealing these groups in a good way for better result and motivate them.	-	-	-	-	-	-	-	-	-	1	-	-	1	-
Course Code	**191CE5O01-BASIC CONCRETE TECHNOLOGY (OPEN ELECTIVE – I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the basic concepts of concrete and admixtures	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Explain the properties of ingredients of concrete.	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Select the suitability of different types of aggregate for their use	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO4	Explain the destructive and non-destructive tests on Hardened Concrete	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO5	Illustrate the concept of special concrete and their use.	2	1	-	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191EE5O01-ELECTRICAL SAFETY(OPEN ELECTIVE – I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Describe electrical hazards and safety equipment	-	-	1	-	-	-	-	-	-	-	-	-	-	-
CO2	Apply various grounding and bonding techniques	**1**	-	-	-	1	-	-	-	-	-	-	-	-	-
CO3	Select appropriate safety method for low, medium and high voltage equipment	-	-	1	-	-	-	-	-	-	-	-	-	-	-
CO4	Discuss safety managmenet and organizing structure	-	-	1	-	-	-	-	-	-	-	-	-	-	-
CO5	Demonstrate proper maintenance of electrical equipment by understanding various standards	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191EE5O02-ELECTRICAL MATERIALS (OPEN ELECTIVE – I)**	**PO1**	**PO2**	PO3	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Identify various types of dielectric materials, their properties in various conditions.	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Analyze magnetic materials and their behaviour.	3	1	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Evaluate semiconductor materials and technologies.	3	1	-	-	-	-	-	-	-	-	-	-	-	-
CO4	Explain the application of Materials in electrical engineering	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO5	Explain the application of Special Purpose Materials in electrical engineering.	3	2	-	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191EE5O03-BASIC ELECTRICAL MEASUREMENTS (OPEN ELECTIVE – I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Analyze the behaviour of different types of torques in instruments.	1	1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Select the right type of instrument for measurement of voltage, current, power &energy.	1	1	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Develop the suitable bridge for the measurement of electrical parameters.	1	1	-	-	-	-	-	-	-	-	-	-	-	-
CO4	Analyze the behaviour of different types of Transducers and Sensors.	1	1	-	-	-	-	-	-	-	-	-	-	-	-
CO5	Explain frequency and phase difference between signals using CRO.	1	1	-	-	-	-	-	-	-	-	-	-	-	-

	CO Statements	POs												PSOs	
Course Code	**191ME5O01-RENEWABLE ENERGY SOURCES (OPEN ELECTIVE – I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Analyze solar radiation data, extraterrestrial radiation, and radiation on earth's surface.	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Examine the solar photo voltaic systems.	3	2	1	1	-	-	-	-	-	-	-	-	-	-
CO3	Develop maximum power point techniques in solar PV and wind energy systems.	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO4	Illustrate the wind energy conversion systems, wind generators and power generation.	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	Explain basic principle and working of tidal, biomass, fuel cell and geothermal systems.	2	3	2	2	-	-	-	-	-	-	-	-	-	-
Course Code	**191ME5O02-FUNDAMENTALS OF MECHANICAL ENGINEERING (OPEN ELECTIVE – I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Compare the different types of boilers, mountings and accessories.	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Interpret different manufacturing methods.	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Explain the working of air compressors and refrigeration.	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	Explain the working principle of Internal Combustion Engines and their performance.	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	Compute the parameters of mechanical components for power transmission.	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191ME5O03-SUPPLY CHAIN MANAGEMENT (OPEN ELECTIVE – I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the framework and scope of supply chain network and functions.	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Appraise the importance of the design and redesign of a supply chain as key components of an organization's strategic plan.	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Explain the strategic importance of logistic elements and describe how they affect supply chain management.	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	Analyze the creation of new value in the supply chain for customers, society and the environment.	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	Develop coordinated and collaborative processes and activities among the business partners in a supply chain, leveraging current and emerging technologies.	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191ME5O04-3D PRINTING (OPEN ELECTIVE – I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Summarize the basics of Additive manufacturing (AM) technologies.	1	-	-	-	-	2	-	-	-	-	-	1	-	-
CO2	Explain about vat photo polymerization, material jetting and binder jetting AM technologies.	1	-	-	-	-	-	-	-	-	-	-	1	-	-
CO3	Explain material extrusion and sheet lamination AM technologies.	1	-	-	-	-	-	-	-	-	-	-	1	-	-
CO4	Illustrate Powder Bed Fusion and Directed Energy Deposition AM technologies.	1	-	-	-	-	-	-	-	-	-	-	1	-	-

	CO Statements	POs												PSOs	
CO5	Apply the AM techniques in different industries	1	-	-	-	-	-	-	-	-	-	-	1	-	-
CO6	Select AM technologies using decision methods	1	-	-	-	-	-	-	-	-	-	-	1	-	-
Course Code	**191ME5O05-ENTREPRENEURSHIP DEVELOPMENT AND INCUBATION (OPEN ELECTIVE – I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Describe the meaning and concepts of entrepreneurship development	-	-	-	-	-	1	2	-	-	2	-	-	-	-
CO2	Apply the business plan for preparation and evaluation of project.	-	-	-	-	-	1	2	-	-	2	-	-	-	-
CO3	Explain about Institutional Support to Entrepreneur and MSMEs	-	-	-	-	-	2	3	-	-	2	2	-	-	-
CO4	Explain about the Opportunities of Entrepreneurship Internationally.	-	-	-	-	-	2	3	-	-	2	2	-	-	-
CO5	Explain about Informaal Risk Capital, Venture capital and Social responsibility for entrepreneurship	-	-	-	-	-	1	2	-	-	2	-	-	-	-
Course Code	**191EC5O01-SIGNALS & SYSTEMS (OPEN ELECTIVE – I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Categorize signals and systems based on their characteristics.	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Demonstrate the spectral characteristics of signals using Fourier series	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Demonstrate the spectral characteristics of signals using Fourier Transform	2	2	1	1	-	-	-	-	-	-	-	-	-	-
CO4	Identify system characteristics in time domain and frequency domain.	2	2	1	1	-	-	-	-	-	-	-	-	-	-
CO5	Apply Laplace transform techniques for the analysis of continuous time signals and Systems...	2	2	2	2	-	-	-	-	-	-	-	-	-	-
Course Code	**191EC5O02-DIGITAL ELECTRONICS AND LOGIC DESIGN (OPEN ELECTIVE – I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Interpret numeric information in different code formats.	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Develop optimized logic by using various optimization algorithms.	2	2	1	-	-	-	-	-	-	-	-	-	-	-
CO3	Construct various combinational logic circuits for required specifications.	2	2	2	-	-	-	-	-	-	-	-	-	-	-
CO4	Build different Programmable Logic Device for required specifications.	2	2	2	1	-	-	-	-	-	-	-	-	-	-
CO5	Build different sequential logic circuits for required specifications.	2	2	2	1	-	-	-	-	-	-	-	-	-	-
Course Code	**191EC5O03-SEMI CONDUCTOR DEVICES (OPEN ELECTIVE – I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Interpret the characteristics of semiconductor diodes.	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Apply the knowledge of semiconductors in the functioning of BJT.	2	2	1	-	-	-	-	-	-	-	-	-	-	-
CO3	Demonstrate the switching and amplification application of FET.	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO4	Classify the semiconductor devices for special Applications.	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO5	Identify the sensor types used in various applications and explain their principle of operation.	2	2	1	1	-	-	-	-	-	-	-	-	-	-
Course Code	**191CS5O01-DATA STRUCTURES (OPEN ELECTIVE – I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Illustrate time and space complexities of an algorithm	2	3	2	1	-	-	-	-	-	-	-	-	-	-
CO2	Apply various searching and sorting techniques to solve computing problems.	3	2	2	1	-	-	-	-	-	-	-	-	-	-
CO3	Make use of linear data structures to solve real time problems.	3	1	2	-	-	-	-	-	-	-	-	-	-	-

	CO Statements	POs												PSOs	
CO4	Develop applications using Tree Data Structures.	2	1	3	-	-	-	-	-	-	-	-	-	-	-
CO5	Solve problems using Graph Algorithms.	1	2	3	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191CS5O02-OBJECT ORIENTED PROGRAMMING THROUGH C++ (OPEN ELECTIVE – I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Compare and contrast object oriented programming and procedural oriented programming.	2	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Summarize the OOPS concepts.	2	1	3	-	-	-	-	-	-	-	-	-	-	-
CO3	Make use of constructor and destructor to initialize and destroy class objects.	2	1	3	-	-	-	-	-	-	-	-	-	-	-
CO4	Develop programs using virtual functions and Polymorphism.	3	1	2	-	-	-	-	-	-	-	-	-	-	-
CO5	Apply inheritance to build real time applications, Exception handling mechanism to handle runtime errors.	2	3	2	-	-	-	-	-	-	-	-	-	-	-
CO6	Develop C++ classes with templates and STL.	1	2	3	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191CS5O03-JAVA PROGRAMMING (OPEN ELECTIVE – I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Apply object oriented programming features and concepts for solving given problem.	3	2	2	-	-	-	-	-	-	-	-	-	-	-
CO2	Solve real time problems using the concepts of class, inheritance, interface and packages.	2	3	2	-	-	-	-	-	-	-	-	-	-	-
CO3	Test for runtime exceptions arise in java applications.	3	2	1	-	-	-	-	-	-	-	-	-	-	-
CO4	Develop real time applications using multithreading and I/O streams.	2	2	3	-	-	-	-	-	-	-	-	-	-	-
CO5	Develop GUI applications using event handlers, adapter classes, AWT and Swing components.	2	1	2	-	3	-	-	-	-	-	-	-	-	-
Course Code	**191CS5O04-R PROGRAMMING (OPEN ELECTIVE – I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Illustrate the basic concepts and advanced data structures of R programming.	3	1	-	-	1	-	-	-	-	-	-	-	-	-
CO2	Explain the control statements and operators in R.	2	3	1	-	-	-	-	-	-	-	-	-	-	-
CO3	Implement simulation, Probability and linear algebra operations.	3	2	1	-	2	-	-	-	-	-	-	-	-	-
CO4	Make use of graph functions for better visualization of results.l	2	1	3	-	2	-	-	-	-	-	-	-	-	-
CO5	Develop programs for distribution functions and regression models.	2	2	3	-	2	-	-	-	-	-	-	-	-	-
Course Code	**191IT5O01-DATABASE MANAGEMENT SYSTEMS (OPEN ELECTIVE – I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Identify the database characteristics and various database architectures.	3	-	-	-	1	-	-	-	-	-	-	-	-	-
CO2	Interpret relational database using SQL.	3	-	1	-	1	-	-	-	-	-	-	-	-	-
CO3	Examine issues in data storage and query processing for appropriate solutions.	1	-	1	-	3	-	-	-	-	-	-	-	-	-
CO4	Make use of normalization techniques to build database system for real world problems.	1	2	1	-	3	-	-	-	-	-	-	-	-	-
CO5	Illustrate the mechanisms of transaction management.	2	2	1	-	3	-	-	-	-	-	-	-	-	-

	CO Statements	POs												PSOs	
Course Code	**191IT5O02-COMPUTER GRAPHICS (OPEN ELECTIVE – I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Identify the applications of computer graphics and Video Display devices for implementing Graphical user interface.	3	1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Analyze output primitives and filled area primitives in implementing various algorithms.	1	3	1	-	-	-	-	-	-	-	-	-	-	-
CO3	Make use of Geometric Transformations, Viewing and Clipping in 2D & 3D Graphics.	2	3	-	-	-	-	-	-	-	-	-	-	-	-
CO4	Illustrate various Visual Surface detection Methods in 3D Graphics.	2	2	3	-	-	-	-	-	-	-	-	-	-	-
CO5	Apply OpenGL for General Computer Animations.	2	1	2	-	3	-	-	-	-	-	-	-	-	-
CO6	Explain different object color modeling techniques, Fractals and Ray tracing concepts.	3	2	-	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191MI5O01-OVERVIEW OF MINING (OPEN ELECTIVE – I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Analyze different stages in the life of a mine.	1	-	-	-	-	1	1	-	-	-	-	-	-	-
CO2	Choose a suitable location for opening to a deposit.	1	-	-	-	-	1	1	-	-	-	-	-	-	-
CO3	Organize for building appropriate permanent lining, drift with proper ventilation and lighting arrangements.	1	-	-	-	-	1	1	-	-	-	-	-	-	-
CO4	Select the special methods need to be adopted for a particular situation.	1	3	-	-	-	1	1	-	-	-	-	-	-	-
CO5	Explain the impact of mining activities on environment	1	3	-	-	-	1	1	-	-	-	-	-	-	-
Course Code	**191PT5O01-PROCESS INTENSIFICATION IN PETROLEUM INDUSTRY (OPEN ELECTIVE – I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the basic principles and mechanisms that are responsible for process intensification.	2	1	-	-	-	-	-	-	-	-	-	-	-	2
CO2	Analyze various modifications to process equipment and designs with which process intensification becomes a reality in unit operations and unit processes.	2	1	-	-	-	-	-	-	-	-	-	-	-	2
CO3	Analyze various case studies available in petrochemical, fine chemical, bioprocesses for Downhole separation	2	1	-	-	-	-	-	-	-	-	-	-	-	2
CO4	Explain the role of photo voltaic cells, solar power in offshore oil and gas operations.	2	1	-	-	-	-	-	-	-	-	-	-	-	2
CO5	Apply the working principles of Divided wall distillation for separation of natural gas -liquid	2	-	-	-	-	-	-	-	-	-	-	-	-	2
Course Code	**191PT5O02-FUNDAMENTALS OF PETROLEUM INDUSTRY (OPEN ELECTIVE – I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Apply the basic principles and mechanisms that are responsible for petroleum industry.	2	-	-	-	-	-	-	-	-	-	-	-	-	2
CO2	Analyze various modifications to equipment and designs with which evaluate the lithological characteristics and behavior of reservoir.	2	-	-	-	-	-	-	-	-	-	-	-	-	2

	CO Statements	POs												PSOs	
CO3	Explain the hydro carbon activity in reservoir, logging, testing and completion.	2	-	-	-	-	-	-	-	-	-	-	-	-	2
CO4	Analyze various case studies available in petrochemical, chemical, bioprocesses for treatment of wastage.	2	-	-	-	-	-	-	-	-	-	-	-	-	2
CO5	Analyze various modifications to well for better production rate.	2	-	-	-	-	-	-	-	-	-	-	-	-	2
Course Code	**191AG5O01-BASIC CROP PRODUCTION PRACTICES (OPEN ELECTIVE – I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain factors affecting on crop growth and production.	1	1	-	-	1	-	-	-	-	-	-	2	-	-
CO2	Explain crop selection and establishment of an adequate crop stand and ground cover.	1	-	-	-	2	-	-	-	-	-	-	-	-	-
CO3	Explain crop water management using integrated water management methods.	1	1	-	-	2	-	-	-	-	-	-	-	-	-
CO4	Apply agricultural crops production practices in field.	1	-	1	1	3	-	-	-	-	-	-	-	-	-
CO5	Apply the horticulture crops production practices in field.	1	-	1	1	3	-	-	-	-	-	-	2	-	-
Course Code	**191ME5L05-METROLOGY& ICS LAB**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Measure the bores by internal micrometers and dial bore indicators.	1	-	-	-	-	-	-	-	2	1	-	1	2	-
CO2	Measure the angle and taper using bevel protractor and sinebar.	1	-	-	-	-	-	-	-	2	1	-	1	2	-
CO3	Measure screw threadparameters.	1	-	-	-	-	-	-	-	2	1	-	1	2	-
CO4	Find the errors and calibrate photo and magnetic pickups.	1	-	-	-	-	-	-	-	2	1	-	1	2	-
CO5	Find the errors and calibrate the pressure gauge, temperature detectors and LVDT.	1	-	-	-	-	-	-	-	2	1	-	1	2	-
Course Code	**191ME5L06-THEORY OF MACHINES LAB**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Determine the critical speed of whirling of shaft and the position of sleeve against the controlling force and speed in governors.	3	2	1	-	-	-	-	-	-	-	-	1	1	-
CO2	Analyze the motion of motorized gyroscopic couple and cam profiles for various cam follower systems.	2	3	1	-	-	-	-	-	-	-	-	1	1	-
CO3	Calculate the frequency of damped as well as un-damped vibrations of a spring mass system and the moment of inertia of flywheel.	3	2	2	-	-	-	-	-	-	-	-	1	1	-
CO4	Apply the principles of balancing of masses to various links, mechanisms and engines.	2	3	1	-	-	-	-	-	-	-	-	1	1	-
CO5	Analyze the displacement, velocity and acceleration against crank rotation in Slider crank mechnism.	3	2	1	-	-	-	-	-	-	-	-	1	1	-
Course Code	**191ME5L07-THERMAL ENGINEERING LAB**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Identify the various parts of an IC Engine.	2	1	-	-	-	-	-	-	-	1	-	-	-	2
CO2	Sketch the Valve and Port Timing diagrams for IC Engines.	3	2	-	-	-	-	-	-	-	1	-	-	-	2
CO3	Determine the performance of various types of IC Engines and heat balance sheet.	3	2	-	1	-	-	1	-	-	-	-	3	-	2
CO4	Calculate the frictional power in various types of IC Engines.	3	2	-	-	-	-	-	-	-	1	-	-	-	2
CO5	Analyze the performance of reciprocating air compressor.	3	2	-	1	-	-	1	-	-	-	-	3	-	2

	CO Statements	POs												PSOs	
Course Code	**191ES5T16 EMPLOYABILITY SKILLS – III**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain different types of puzzles,group reasoning,clock and calender problems	1	-	-	-	-	-	-	-	-	-	-	1	-	-
CO2	Solve problems on cubes & dice, partnership, percentages.	1	-	-	-	-	-	-	-	-	-	-	1	-	-
CO3	Solve problems on profit and loss, simple interest and compound interest	1	-	-	-	-	-	-	-	-	-	-	1	-	-
CO4	Apply interviewing skills, Group discussion skills and personal priorities	-	-	-	-	-	-	-	-	-	1	-	1	-	-
CO5	Apply resume writing skills, e-mail writing & business etiquette	-	-	-	-	-	-	-	-	-	1	-	1	-	-
Course Code	**191PR5P01 SOCIALLY RELEVANT PROJECT**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Conduct a literature survey in the selected area	1	-	-	-	-	-	-	-	1	1	1	-	-	-
CO2	Use scientific reasoning to gather, evaluate and interpret the survey data to identify the problem	-	2	-	-	-	2	2	-	-	-	-	2	-	-
CO3	Design and develop many solutions in the light of societal, cultural, legal and environmental issues	-	-	2	2	-	-	-	1	-	-	-	-	-	-
CO4	Select a final solution to the social problem and submit as a working prototype	-	-	-	2	-	-	-	-	-	-	-	-	-	-
CO5	Use modern tools to prepare the results of the project as a report adhering to professional ethics	-	-	-	-	2	-	-	2	-	-	1	1	-	-
Course Code	**191MC5A08 INTELLECTUAL PROPERTY RIGHTS AND PATENTS**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Compare various types of Intellectual Property rights.	-	-	-	-	-	-	-	3	-	-	-	2	-	-
CO2	Discuss Intellectual Property and infer rights on such Intellectual Property owners	-	-	-	-	-	-	-	3	-	-	-	2	-	-
CO3	Explain the process of patenting	-	-	-	-	-	-	-	3	-	-	-	2	-	-
CO4	Apply for trade marks and trade secrets.	-	-	-	-	-	-	-	3	-	-	-	2	-	-
CO5	Interpret the legal issues on Intellectual Property Rights and cyber laws	-	-	-	-	-	-	-	3	-	-	-	2	-	-
VI SEM															
Course Code	**191ME6T12-HEAT TRANSFER**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the principle of conductive heat transfer for different bodies.	3	2	-	-	-	-	-	-	-	-	-	-	-	1
CO2	Analyze the dimensional analysis principle and heat transfer rate through forced convection.	3	2	-	-	-	-	-	-	-	-	-	-	-	1
CO3	Analyze the heat transfer rate through free convection in various bodies.	3	2	-	-	-	-	-	-	-	-	-	-	-	1
CO4	Explain the principle of boiling, condensation, and the performance of the heat exchanger.	3	2	-	-	-	-	-	-	-	-	-	-	-	1
CO5	Evaluate the law of radiation and heat transfer rate through radiation.	3	2	-	-	-	-	-	-	-	-	-	-	-	1

	CO Statements	POs												PSOs	
Course Code	**191ME6T13-DESIGN OF MACHINE MEMBERS-II**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Classify the various types of bearings.	2	1	-	-	2	-	-	-	-	-	-	-	2	-
CO2	Analyze the various engine parts like connecting rod, piston, crankshaft etc.	3	2	2	-	-	-	-	-	-	-	-	-	2	-
CO3	Identify the various stresses in curved beams.	3	2	1	-	-	2	-	-	-	-	-	-	3	-
CO4	Explain the power transmission systems and power screws.	3	2	-	-	-	2	-	-	-	-	-	-	2	-
CO5	Inspect the various load factors, strength of spur and helical gear drives.	3	2	2	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191ME6T14-METAL CUTTING AND MACHINE TOOLS**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Apply cutting mechanics to metal machining based on cutting force and power consumption.	1	1	-	-	-	1	-	-	-	-	-	1	1	-
CO2	Explain working of Lathe, Shaper, Slotter and Planar machine.	1	1	-	-	-	1	-	-	-	-	-	1	1	-
CO3	Select appropriate machining processes and tool geometries in drilling and milling machines	2	2	-	-	-	1	-	-	-	-	-	1	1	-
CO4	Classify jigs and fixtures, Principles of location and finishing processes.	1	1	-	-	-	1	-	-	-	-	-	1	1	-
CO5	Discuss principles of industrial safety and maintenance of machine tools.	1	1	-	-	-	1	-	-	-	-	-	1	1	-
Course Code	**191ME6E07 INDUSTRIALENGINEERINGANDMANAGEMENT (PROFESSIONAL ELECTIVE – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Identify the role of an industrial engineer and required managerial skill set.	1	-	-	-	-	-	-	-	-	-	-	1	1	-
CO2	Compare and contrast product layout, process layout and combinational layout in Plant layout	1	-	-	-	-	-	-	-	-	-	-	1	1	-
CO3	Develop the efficient work system using concepts of Method study and Time study	1	1	-	-	-	-	-	-	-	-	-	1	1	-
CO4	Analyze the production flow parameters by means of Control charts of Variable and Attributes	1	2	-	-	-	-	-	-	-	-	-	1	1	-
CO5	Analyze Job evaluation and Wage incentive system in an Industrial Human Resource Environment	1	-	-	-	-	-	-	-	-	-	-	1	1	-
CO6	Calculate the optimal project duration using CPM and PERT techniques	1	2	-	-	-	-	-	-	-	-	-	1	1	-
Course Code	**191ME6E08 MECHATRONICS (PROFESSIONAL ELECTIVE – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO 1	Summarize the different types of mechatronics systems and sensors.	1	2	2	-	-	1	-	-	-	-	-	-	1	-
CO 2	Classify the different types of solid-state electronic devices, microprocessor, and micro controller.	-	2	-	-	1	-	-	-	-	-	-	-	-	-
CO 3	Describe various types of actuators.	1	2	2	-	-	1	-	-	-	-	-	-	1	-
CO 4	Construct a program in PLC.	-	-	-	-	1	-	-	-	-	-	1	-	-	-
CO 5	Make use of data interfacing and data acquisition.	-	1	-	-	2	-	-	-	-	-	1	-	-	-

	CO Statements	POs												PSOs	
Course Code	**191ME6E09 NON-DESTRUCTIVE EVALUATION (PROFESSIONAL ELECTIVE – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO 1	Explain the basic principles of different non-destructive evaluation techniques.	-	1	-	-	2	-	-	-	-	-	-	-	2	-
CO 2	Distinguish between various non-destructive evaluations techniques.	2	1	1	1	-	-	-	-	-	-	-	-	-	-
CO 3	Explain the basic requirement for conducting different NDE test	-	1	-	-	2	-	1	-	-	-	-	-	2	-
CO 4	Apply the knowledge of non-destructive evaluations for test specimens.	-	1	-	-	3	2	1	-	-		-	-	-	-
CO 5	List the application of non-destructive evaluation techniques.	-	3	2	2	-	-	1	-	-	-	-	-	-	-
Course Code	**191ME6E10 REFRIGERATION AND AIR CONDITIONING (PROFESSIONAL ELECTIVE – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO 1	Explain the principles and applications of refrigeration systems.	2	1	-	-	2	1	-	-	-	-	-	-	-	2
CO 2	Describe vapour compression refrigeration system and identify methods for performance improvement.	2	1	-	-	2	-	1	-	-	-	-	-	-	2
CO 3	Explain the working principles of air, vapour absorption, thermoelectric and steam-jet refrigeration systems.	3	2	-	-	2	1	-	-	-	-	-	-	-	2
CO 4	Analyze air-conditioning processes using the principles of Psychrometry and cooling and heating loads in an air-conditioning system.	-	3	-	2	-	1	1	-	-	-	-	-	-	3
CO 5	Evaluate different heat pump circuits and various equipment used in air conditioning systems.	-	-	3	2	-	1	1	-	-	-	-	-	-	3
Course Code	**191ME6E11 ROBOTICS (PROFESSIONAL ELECTIVE – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO 1	Explain the basic concepts, parts of robots and types of robots.	2	-	-	-	-	-	-	-	-	-	-	1	1	-
CO 2	Identify various robot configuration and components,	2	-	-	-	-	-	-	-	-	-	-	1	1	-
CO 3	Analyze the transformations and manipulator kinematics of robot using DH Notation	2	1	-		-	-	-	-	-	-	-	1	1	-
CO 4	Analyze the differential transformations and dynamics of robots	3	2	-	-	-	-	-	-	-	-	-	1	1	-
CO 5	Analyze the trajectory planning for a manipulator by avoiding Obstacles	1	2	1	-	-	-	-	-	-	-	-	1	1	-
Course Code	**191ME6E12-ADDITIVE MANUFACTURING (PROFESSIONAL ELECTIVE – III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO 1	Summarize the basics of AM technologies.	3	-	-	-	1	1	1	-	-	-	-	-	1	-
CO 2	Explain about vat photo-polymerization, material jetting and binder jetting, AM technologies.	2	-	-	-	1	1	1	-	-	-	-	-	1	-
CO 3	Explain material extrusion and sheet lamination AM technologies.	2	-	-	-	1	1	1	-	-	-	-	-	1	-
CO 4	Illustrate powder bed fusion and directed energy deposition AM technologies.	2	-	-	-	1	1	1	-	-	-	-	-	1	-
CO 5	Apply the AM techniques in different industries	3	-	-	-	2	1	1	-	-	-	-	-	1	-

	CO Statements	POs												PSOs	
Course Code	**191ME6E14 -ALTERNATIVE FUELS (PROFESSIONAL ELECTIVE – III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the fuel economy, need of alternative fuels and production of alternative fuels in an IC Engine	3	2	1	-	-	-	1	-	-	-	-	-	-	2
CO2	Explain the properties, performance, and emission characteristics of liquid fuels like gasoline, alcohol, vegetable oils in both SI and CI engines	2	3	1	-	-	-	2	-	-	-	-	-	-	2
CO3	Explain the properties, performance, and emission characteristics of gaseous fuels in various vegetable oil	2	3	-	-	-	-	-	-	-	1	-	1	-	2
CO4	Estimate the modification of SI and CI engines for various alternative fuels like hydrogen.	3	2	-	-	-	-	-	-	-	2	-	-	-	2
CO5	Compare various gaseous fuels like LPG and CNG	2	3	1	-	-	-	-	-	-	-	-	2	-	2
Course Code	**191ME6E14 DESIGN FOR MANUFACTURING (PROFESSIONAL ELECTIVE – III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Differentiate DFM and DFA, also steps in design the product for the economy.	2	1	-	-	-	-	-	-	-	-	-	-	1	-
CO2	Analyze the components for machining by considering the designing rules.	3	2	1	-	-	-	-	-	-	-	-	-	1	-
CO3	Explain the casting design and choose the best casting process for a specific product.	2	1	-	-	-	-	-	-	-	-	-	-	1	-
CO4	Illustrate the effect of thermal stresses in welded joints also illustrate the important of parting lines in forging.	3	2	-	-	-	-	-	-	-	-	-	-	1	-
CO5	Illustrate design guidelines for extruded sections for metals, also Select a proper process for machining and joining different plastic components.	2	3	-	-	-	-	-	-	-	-	-	-	1	-
Course Code	**191ME6E15 GREEN ENGINEERING SYSTEMS (PROFESSIONAL ELECTIVE – III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Describe the principles and working of solar radiation and solar radiation Collection	1	1	-	1	-	1	-	-	-	-	-	-	1	-
CO2	Explain the principles and working of wind, biomass, geothermal, Ocean energies	1	1	-	1	-	1	-	-	-	-	-	-	1	-
CO3	Illustrate various electrical and mechanical energy efficient systems.	1	-	-	-	-	1	2	-	-	-	-	-	1	-
CO4	Explain Energy Efficient Processes for the current manufacturing practices.	1	-	-	-	-	1	-	-	-	-	-	-	1	-
CO5	Explain concept of planning, Building materials and Resources for green buildings.	1	-	-	-	-	1	2	-	-	-	-	-	1	-
Course Code	**191ME6E16 LEAN MANUFACTURING (PROFESSIONAL ELECTIVE – III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Understand the concepts of six sigma and quality circle	1	1	-	-	-	-	3	-	-	-	-	1	1	-
CO2	Differentiate the primary and secondary tools of manufacturing	1	1	-	-	-	-	3	-	-	-	-	1	1	-
CO3	Acquire the ability to apply tools like TQM and QFD	1	-	-	-	-	-	3	-	-	-	2	1	1	-

	CO Statements	POs												PSOs	
CO4	Perform minimal repairs and maintenance during breakdowns	1	2	-	-	1	-	-	-	-	-	-	1	3	-
CO5	Analyze the concept of DOE and FMEA	1	-	1	-	-	-	-	-	-	-	-	1	1	-
Course Code	**191CE6O02-DISASTER MANAGEMENT (OPEN ELECTIVE – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the aspects of disaster management and adopt remedial measures	1	1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Explain the disaster vulnerability profile of India	1	1	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Explain the hazard assessment and mitigation measures	1	1	-	-	-	-	-	-	-	-	-	-	-	-
CO4	Explain landslides and earthquake disasters and management	1	1	-	-	-	-	-	-	-	-	-	-	-	-
CO5	Explain about cyclone, fire disasters and rehabilitation programmes	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191EE6O04 -ENERGY AUDIT AND CONSERVATION MANAGEMENT (OPEN ELECTIVE – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain energy efficiency, conservation and various technologies.	2	3	2	1	-	-	-	-	-	-	-	-	-	-
CO2	Design energy efficient lighting systems.	3	1	2	2	-	-	-	-	-	-	-	-	-	-
CO3	Calculate power factor of systems and propose suitable compensation techniques.	2	3	1	1	-	-	-	-	-	-	-	-	-	-
CO4	Explain energy conservation in HVAC systems.	2	3	1	1	-	-	-	-	-	-	-	-	-	-
CO5	Calculate life cycle costing analysis and return on investment on energy efficient technologies.	1	2	1	3	-	-	-	-	-	-	-	-	-	-
Course Code	**191EE6O05-NON CONVENTIONAL ENERGY RESOURCES (OPEN ELECTIVE – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Interpret renewable energy sources and solar radiation.	1	-	-	-	-	-	1	-	-	-	-	-	-	-
CO2	Apply the knowledge of solar principles for its applications.	1	-	-	-	-	-	1	-	-	-	-	-	-	-
CO3	Discuss the working principles of wind and Bio-mass energy resources.	1	-	-	-	-	-	1	-	-	-	-	-	-	-
CO4	Illustrate the techniques and conversion principles of Geothermal and tidal energy resources.	1	-	-	-	-	-	1	-	-	-	-	-	-	-
CO5	Make use of working principles in energy conversion	1	-	-	-	-	-	1	-	-	-	-	-	-	-
Course Code	**191EE6O06-INSTRUMENTATION (OPEN ELECTIVE – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain various types of signals	1	2	3	1	-	-	-	-	-	-	-	-	-	-
CO2	Explain various types of Transducers principles	1	2	1	3	-	-	-	-	-	-	-	-	-	-
CO3	Measure various parameters such as strain, velocity, temperature, pressure etc.	1	2	1	3	-	-	-	-	-	-	-	-	-	-
CO4	Explain the working principle of various types of digital Voltmeters and measure various parameter like phase and frequency of a signal with the help of CRO.	1	2	1	3	-	-	-	-	-	-	-	-	-	-
CO5	Analyze the different signals using various types of signal analyzers	1	2	1	3	-	-	-	-	-	-	-	-	-	-
Course Code	**191ME6O06-SOLAR ENERGY UTILISATION (OPEN ELECTIVE – II)**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	**PSO2**
CO1	Explain the concept of solar radiation and its measurement.	1	-	-	-	-	-	1	-	-	-	-	1	-	-

	CO Statements	POs												PSOs	
CO2	Describe the working principle of different types of collectors and its types	2	-	-	-	-	2	1	-	-	-	-	2	-	-
CO3	Explain the various solar thermal energy technologies and their applications	2	-	-	-	-	2	1	-	-	-	-	2	-	-
CO4	Analyze the various solar PV cell materials and conversion techniques.	2	-	-	-	-	1	1	-	-	-	-	2	-	-
CO5	Apply solar passive building techniques for cooling and heating applications.	2	-	-	-	-	1	1	-	-	-	-	2	-	-
Course Code	**191ME6O07-BASIC THERMODYNAMICS AND HEAT TRANSFER (OPEN ELECTIVE – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain basic thermodynamic concepts and laws of thermodynamics	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Make use of steam tables to solve problems on properties of pure substance and gas mixture	2	2	1	-	-	-	-	-	-	-	-	-	-	-
CO3	Find the efficiency of a thermodynamic cycle	1	2	1	-	-	-	-	-	-	-	-	-	-	-
CO4	Explain basic heat transfer mechanisms	1	2	1	-	-	-	-	-	-	-	-	-	-	-
CO5	Evaluate the performance of heat exchangers	1	2	-	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191ME6O08-INTRODUCTION TO HYDRAULICS AND PNEUMATICS (OPEN ELECTIVE – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Describe the fundamentals of fluid power systems.	1	1	1	-	-	-	3	-	-	-	-	-	-	-
CO2	Illustrate the working of fluid power actuators, hydraulic motors, and Hydraulic Components.	1	1	1	-	-	-	3	-	-	-	-	-	-	-
CO3	Analyze the design and drawings of hydraulic circuits.	1	1	1	-	-	-	-	-	-	-	-	-	-	-
CO4	Explain the working of pneumatic systems.	1	1	2	-	-	-	-	-	-	-	-	-	-	-
CO5	Examine the concepts of pneumatic circuits.	1	1	2	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191ME6O09-3D PRINTING (OPEN ELECTIVE – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Summarize the basics of AM technologies.	1	-	-	-	-	1	-	-	-	-	-	1	-	-
CO2	Explain about vat photo polymerization, material jetting and binder jetting AM technologies.	1	-	-	-	-	1	-	-	-	-	-	1	-	-
CO3	Explain material extrusion and sheet lamination AM technologies.	1	-	-	-	-	-	1	-	-	-	-	1	-	-
CO4	Illustrate powder bed fusion and directed energy deposition AM technologies.	1	-	-	-	-	-	1	-	-	-	-	1	-	-
CO5	Apply the AM techniques in different industries	1	-	-	-	-	1	-	-	-	-	-	1	-	-
CO6	Select AM technologies using decision methods	1	-	-	-	-	-	-	-	-	-	-	1	-	-
Course Code	**191ME6O10-ROBOTICS (OPEN ELECTIVE – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the basic concepts, parts of robots and types of robots.	2	-	-	-	-	-	-	-	-	-	-	1	-	-
CO2	Identify various robot configuration and components,	2	-	-	-	-	-	-	-	-	-	-	1	-	-
CO3	Analyze the transformations and manitulator kinematics of robot using DH Notation	2	1	-	-	-	-	-	-	-	-	-	1	-	-
CO4	Analyze the differential transformations and dynamics of robots	3	2	-	-	-	-	-	-	-	-	-	1	-	-
CO5	Analyze the trajectory planning for a manipulator by avoiding Obstacles	1	2	1	-	-	-	-	-	-	-	-	1	-	-

	CO Statements	POs												PSOs	
Course Code	**191ME6O11-MANAGEMENT SCIENCE (OPEN ELECTIVE – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Apply management and motivation theories to renovate the practice of management.	**1**	**1**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
CO2	Explain concepts of quality management and use process control charts, concepts, and tools of quality engineering in the design of products and process controls.	1	1	-	-	-	1	-	-	-	-	-	1	-	-
CO3	Appraise the functional management challenges associated with high levels of change in the organizations.	1	1	-	-	-	1	-	-	-	-	-	1	-	-
CO4	Use scheduling techniques of project management PERT/CPM to calculate Critical path and Probabiltiy of completion of the project.	1	1	-	-	-	-	1	-	-	-	-	1	-	-
CO5	Develop global vision and management skills both at strategic level and interpersonal level.	1	1	-	-	-	-	1	-	-	-	-	1	-	-
Course Code	**191ME6O12-ENTREPRENEURSHIP DEVELOPMENT AND INCUBATION (OPEN ELECTIVE – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Describe the meaning and concepts of entrepreneurship development	-	-	-	-	-	1	2	-	-	2	-	-	-	-
CO2	Apply the business plan for preparation and evaluation of project.	-	-	-	-	-	1	2	-	-	2	-	-	-	-
CO3	Explain about Institutional Support to Entrepreneur and MSMEs	-	-	-	-	-	2	3	-	-	2	2	-	-	-
CO4	Utilize the Opportunities of Entrepreneurship Internationally.	-	-	-	-	-	2	3	-	-	2	2	-	-	-
CO5	Explain Informal Risk capital, Venture capital , Social & Rural entrepreneurship	-	-	-	-	-	1	2	-	-	2	-	-	-	-
Course Code	**191EC6O04-BIOMEDICAL INSTRUMENTATION (OPEN ELECTIVE – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Summarize the physiological relation of the human body with the environment.	2	2	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Make use of different electrodes and transducers for biomedical applications.	2	2	2	1	-	-	-	-	-	-	-	-	-	-
CO3	Demonstrate the working principle of different biomedical instruments for heart and respiratory system monitoring.	2	3	2	1	-	-	-	-	-	-	-	-	-	-
CO4	Illustrate Intensive-Care Monitoring system for patient management.	2	2	3	-	-	-	-	-	-	-	-	-	-	-
CO5	Outline different diagnostic techniques for telemedicine.	2	2	3	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191EC6O05-ECAD TOOLS (OPEN ELECTIVE – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Illustrate the basic concepts on ECAD tools and PSPICE.	2	1	-	-	-	-	-	-	-	-	-	2	-	-
CO2	Summarize the fundamental concepts of passive circuits using PSPICE.	2	2	-	-	-	-	-	-	-	-	-	2	-	-
CO3	Demonstrate the performance active circuits using PSPICE.	2	2	1	-	-	-	-	-	-	-	-	2	-	-
CO4	Develop the various functionality of MATLAB.	2	2	1	-	-	-	-	-	-	-	-	2	-	-
CO5	Apply the fundamentals and applications of MATLAB Simulink.	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**

	CO Statements	POs												PSOs	
Course Code	**191CS6O05-PYTHON PROGRAMMING (OPEN ELECTIVE – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Develop programs using fundamental concepts and control statements in python.	2	2	3	-	2	-	-	-	-	-	-	-	-	-
CO2	Utilize data structures in Python to solve various problems.	2	3	2	-	-	-	-	-	-	-	-	-	-	-
CO3	Develop programs using functions and Standard libraries like math, datetime, random etc. in building real time applications.	2	2	3	-	2	-	-	-	-	-	-	-	-	-
CO4	Apply Object Oriented Programming concepts.	3	-	2	-	2	-	-	-	-	-	-	-	-	-
CO5	Apply concept of exception handling in solving runtime issues.	3	-	2	-	2	-	-	-	-	-	-	-	-	-
CO6	Build various applications using files.	**2**	**3**	**2**	**-**	-	**-**	-	**-**	-	-	-	-	-	-
Course Code	**191CS6O06-OPERATING SYSTEMS (OPEN ELECTIVE – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Illustrate the basic structure, services, system calls and architectural components of Operating Systems.	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Solve problems related to process scheduling, synchronization in unit and multi-processing systems.	2	2	2	3	-	-	-	-	-	-	-	-	-	-
CO3	Explain the deadlock handling Mechanism in the processing System	2	3	1	2	-	-	-	-	-	-	-	-	-	-
CO4	Summarize the concepts of Memory Management, Virtual Memory Management and Thrashing	2	2	3	2	-	-	-	-	-	-	-	-	-	-
CO5	Describe the concepts of file system and mass storage structure.	2	3	2	2	-	-	-	-	-	-	-	-	-	-
Course Code	**191CS6O07-WEB TECHNOLOGIES (OPEN ELECTIVE – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Develop static web pages using HTML and CSS.	2	-	3	-	-	-	-	-	-	-	-	-	-	-
CO2	Apply JavaScript for Client-side validations and Node.JS to learn server-side applications using JavaScript.	3	2	2	-	2	-	-	-	-	-	-	-	-	-
CO3	Make use of Angular JS for developing dynamic and responsive web pages.	2	2	3	-	2	-	-	-	-	-	-	-	-	-
CO4	Utilize React JS for developing dynamic and responsive web pages.	2	3	2	-	-	-	-	-	-	-	-	-	-	-
CO5	Create and deploy secure, usable database driven web applications using PHP and MySQL/Mongo DB.	2	-	2	-	3	-	-	-	-	-	-	-	-	-
Course Code	**191CS6O08-CYBER SECURITY (OPEN ELECTIVE – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the cyber security and security management methods to maintain security protection.	3	1	-	-	2	-	-	2	-	-	-	-	-	-
CO2	Illustrate the nature of secure software development and operating systems.	2	3	-	-	2	-	-	-	-	-	-	-	-	-
CO3	Summarize the Network management and cloud computing security issues.	1	2	-	-	3	-	-	-	-	-	-	-	-	-
CO4	Analyze the data privacy techniques for data management.	1	3	-	-	2	-	-	-	-	-	-	-	-	-
CO5	Demonstrate the role security management plays in cyber security defense and legal and social issues at play in developing solutions.	3	1	-	-	2	-	-	2	-	-	-	-	-	-

	CO Statements	POs												PSOs	
Course Code	**191CS6O09-AR / VR (OPEN ELECTIVE – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain VR, its environments and hardware technologies for 3D interfaces.	3	-	-	1	1	-	-	-	-	-	-	-	-	-
CO2	Summarize 3D user interface input hardware in VR environment.	3	1	-	2	1	-	-	-	-	-	-	-	-	-
CO3	Make use of software technologies to build VR applications.	2	2	3	-	2	-	-	-	-	-	-	-	-	-
CO4	Develop 3D user interfaces using 3D interaction techniques.	2	2	3	-	2	-	-	-	-	-	-	-	-	-
CO5	Describe the fundamental concepts of AR	2	3	2	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191IT6O03-COMPUTER ORGANIZATION (OPEN ELECTIVE – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Describe the basic structure of a computer system, various number systems and arithmetic operations.	3	2	1	1	-	-	-	-	-	-	-	-	-	-
CO2	Explain the Operation of CPUs including RTL, ALU, Instruction Cycle and Buses	2	2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	Demonstrate the architecture and functionality of central processing unit	2	2	3	1	-	-	-	-	-	-	-	-	-	-
CO4	Illustrate the I/O and memory organization in an efficient way.	1	2	2	3	-	-	-	-	-	-	-	-	-	-
CO5	Make use of multi processors and pipelining to improve the efficiency of computer system.	1	2	2	3	-	-	-	-	-	-	-	-	-	-
Course Code	**191IT6O04-AI TOOLS & TECHNIQUES (OPEN ELECTIVE – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the fundamentals of Artificial Intelligence and its applications.	-	3	-	2	-	-	-	-	-	-	-	-	-	-
CO2	Describe various problems solving techniques and searching techniques.	-	2	-	-	3	-	-	-	-	-	-	-	-	-
CO3	Apply various logical systems to inference the different logical problems.	-	2	3	1	2	-	-	-	-	-	-	-	-	-
CO4	Demonstrate the concept of Knowledge Representation Techniques.	-	2	2	1	2	-	-	-	-	-	-	-	-	-
CO5	Explain the phases in Expert System and its applications.	-	2	1	-	-	-	-	-	-	-	-	-	-	-
CO6	Identify various interpretations of probability theory, basic knowledge of fuzzy sets and fuzzy logic.	-	2	-	2	-	-	-	-	-	-	-	-	-	-
Course Code	**191IT6O05-ROBOTIC PROCESS AUTOMATION (OPEN ELECTIVE – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Describe the fundamentals of Robotic Process Automation Technology.	-	3	1	2	-	-	-	-	-	-	-	-	-	-
CO2	Summarize the UiPath programming techniques to deploy robot configurations.	-	1	3	1	-	-	-	-	-	-	-	-	-	-
CO3	Explore various data extraction techniques and learn about integrations with various popular applications like SAP and MS Office	-	2	-	3	2	-	-	-	-	-	-	-	-	-
CO4	Develop a programmed robot including logging and exception handling	-	2	2	2	3	-	-	-	-	-	-	-	-	-
CO5	Create and Deploy the Bots and control it with UiPath Orchestrator.	-	2	1	3	2	-	-	-	-	-	-	-	-	-

	CO Statements	POs												PSOs	
Course Code	**191MI6O02-INDUSTRIAL SAFETY PRACTICES (OPEN ELECTIVE – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the different hazards and its prevention in mining industries.	1	-	-	-	-	1	-	-	-	-	-	-	-	-
CO2	Distinguish the mine accidents occurring in surface and underground mining area.	1	-	-	-	-	1	-	-	-	-	-	-	-	-
CO3	Explain the safety concepts, emergency preparation and response in disaster	1	-	-	-	-	1	-	-	-	-	-	-	-	-
CO4	Assess and minimize the risk using safety analysis techniques	1	-	-	-	-	1	-	-	-	-	-	-	-	-
CO5	Explain Safety standards, safety information system and safety audit	1	-	-	-	-	1	-	-	-	-	-	-	-	-
Course Code	**191MI6O03-ELECTRICAL EQUIPMENT'S IN MINES (OPEN ELECTIVE – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain about power systems used in mines.	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Analyze various earthing methods used in mines.	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Summarize various electrical equipment used in mines.	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO4	Explain the instrumentation and control systems used in mines	2	2	-	-	-	-	-	-	-	-	-	-	-	-
CO5	Analyze about mine telephone system and intrinsic safety.	3	2	-	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191PT6O03-UNCONVENTIONAL HYDROCARBON RESOURCES (OPEN ELECTIVE – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Outline the fundamentals of Coal Bed Methane	2	-	-	-	-	-	-	-	-	-	-	-	-	2
CO2	Estimate the shale gas reserves for Indian Scenario	2	-	-	-	-	-	-	-	-	-	-	-	-	2
CO3	Determine the extent of gas hydrates resource estimation	2	-	-	-	-	-	-	-	-	-	-	-	-	2
CO4	Illustrate the Origin and Characterize Shale Gas.	2	-	-	-	-	-	-	-	-	-	-	-	-	2
CO5	Explain the Heavy oil reservoirs and their Challenges	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
Course Code	**191PT6O04-ASSET MANAGEMENT (OPEN ELECTIVE – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the Asset Management in corporate approach	2	-	-	-	-	-	-	-	-	-	1	-	-	2
CO2	Estimate the running cost and value for Asset Management	2	-	-	-	-	-	-	-	-	-	1	-	-	2
CO3	Determine value using Asset Management Interpretation	2	-	-	-	-	-	-	-	-	-	1	-	-	2
CO4	Illustrate Asset Management Decision making framework	2	-	-	-	-	-	-	-	-	-	1	-	-	2
CO5	Explain the Capital Planning System	2	-	-	-	-	-	-	-	-	-	1	-	-	2
Course Code	**191AG6O02-WEATHER FORECAST IN AGRICULTURE (OPEN ELECTIVE – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the weather elements and their impact on crop production.	1	-	-	-	1	-	-	-	-	-	-	-	-	-
CO2	Identify the type of crop production risk and their management.	-	1	-	-	-	-	1	1	-	-	-	-	-	-
CO3	Explain crop weather relationships and their responses.	-	2	-	1	1	-	1	-	-	-	-	-	-	-
CO4	Classify the types of weather forecast and their characteristics.	1	-	-	-	-	-	1	-	-	-	-	-	-	-
CO5	Apply weather thumb rules and verification of weather forecast with real events.	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Course Code	**191AG6O03-BIO-ENERGY SYSTEMS DESIGN AND APPLICATIONS (OPEN ELECTIVE – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the importance of Bioenergy.	2	-	-	-	-	2	3	-	-	-	-	-	-	-

	CO Statements	POs												PSOs	
CO2	Compare and contrast Biomass and Agrochemical Conversion techniques.	3	2	-	1	-	2	-	-	-	-	-	-	-	-
CO3	Categorize different ways of biomass production.	2	1	-	-	-	2	3	-	-	-	-	-	-	-
CO4	Classify Gasification and Liquefaction.	2	1	-	-	-	3	1	-	-	-	-	-	-	-
CO5	Analyze advanced Bio-diesel production from Oils and Seeds.	2	1	-	-	-	3	1	-	-	-	-	-	-	-
Course Code	**191ME6L08 METAL CUTTING AND MACHINE TOOLSLAB**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Learn about tool geomentry and various convenctional machining process.	2	2	-	-	-	-	-	-	-	2	-	2	1	-
CO2	Produce models by turning, facing, threading operations on lathe machine	2	2	-	-	-	-	-	-	-	2	-	2	3	-
CO3	Produce different holes using drilling machine.	2	1	-	-	-	-	-	-	-	2	-	2	1	-
CO4	Produce different types of grooves using shaper and slotter machine.	1	1	-	-	-	-	-	-	-	2	-	2	2	-
CO5	Produce surfaces on flat surface machining, milling and grinding operations	1	1	-	-	-	-	-	-	-	1	-	1	2	-
Course Code	**191ME6L09 HEATTRANSFERLAB**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Determine the thermal conductivity of various materials.	3	2	-	-	-	-	-	-	2	2	-	-	-	2
CO2	Estimate the convective heat transfer coefficient in various conditions.	3	2	-	-	-	-	-	-	2	2	-	-	-	2
CO3	Evaluate the performance of parallel and counter flow heat exchanger.	3	2	-	-	-	-	-	-	2	2	-	-	-	2
CO4	Calculate the heat transfer through a pin-fin.	3	2	-	-	-	-	-	-	2	2	-	-	-	2
CO5	Evaluate the emissivity of different bodies and Stefan Boltzman constrant	3	2	-	-	-	-	-	-	2	2	-	-	-	2
Course Code	**191HS6T07-EMPLOYABILITY SKILLS – IV**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Solve problems of seating arrangements ,syllogism	1	-	-	-	-	-	-	-	-	-	-	1	-	-
CO2	Solve problems of Time and Work, Pipes and Cisterns, Time and Distance, Races and trains	1	-	-	-	-	-	-	-	-	-	-	1	-	-
CO3	Solve Problems on Boats and Streams, Permutation and Combination, Probability and Data Interpretation	1	-	-	-	-	-	-	-	-	-	-	1	-	-
CO4	Apply processes of Group discussion ,Phonetics, Leadership skills in real world	-	-	-	-	-	-	-	-	-	2	-	1	-	-
CO5	Apply principles of Group Dynamics, Interview Skills & Evaluation criteria in organizations	-	-	-	-	-	-	-	-	-	2	-	1	-	-
Course Code	**191MC6A09 PROFESSIONAL ETHICS AND HUMAN VALUES**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Make use of values, morals and ethics in their day to day life.	-	-	-	-	-	-	-	2	-	-	-	-	-	-
CO2	Identify what is right and wrong through moral ethics.	-	-	-	-	-	-	-	2	-	-	-	-	-	-
CO3	Analyze experimental learning while developing the society with ethics.	-	-	-	-	-	-	-	2	-	-	-	-	-	-

	CO Statements	POs												PSOs	
CO4	Apply ethical principles to resolve the problems that arise in work place.	-	-	-	-	-	-	-	2	-	-	-	-	-	-
CO5	Apply adequate knowledge on global code of conduct.	-	-	-	-	-	-	-	2	-	-	-	-	-	-
VII SEM															
Course Code	**191ME7T15 - OPERATIONS RESEARCH**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Apply mathematical modeling to formulate and solve real-world problems involving decision making as Linear Programming Problem using Graphical method and Simplex method.	2	2	-	-	-	1	-	-	-	-	-	2	**2**	-
CO2	Find the optimal parameters in Transportation problem, Assignment problem and Replacement problem.	2	-	-	-	-	1	-	-	-	-	-	2	**2**	-
CO3	Find the optimal quantities in Inventory Control problem and Job Sequencing problem.	2	-	-	-	-	1	-	-	-	-	-	2	**2**	-
CO4	Apply Game theory, Queuing theory in Decision making problems.	2	2	-	-	-	1	-	-	-	-	-	2	**2**	-
CO5	Apply Dynamic programming & Simulation techniques in real-world problems.	1	1	-	-	-	1	-	-	-	-	-	2	**2**	-
Course Code	**191ME7T16 - FINITE ELEMENT METHODS**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Summarize the finite element methods and involved procedure	2	1	-	-	2	-	-	-	-	-	-	1	**2**	-
CO2	Apply finite element methods to trusses and beams	3	2	-	-	-	-	-	-	-	-	-	1	**3**	-
CO3	Solve structural problems using CST and axis - symmetric formulation	3	2	-	-	-	-	-	-	-	-	-	1	**3**	-
CO4	Apply finite elements to higher order, Isoparametric elements, and one-dimensional heat transfer analysis	3	2	-	-	-	-	-	-	-	-	-	1	**3**	-
CO5	Apply finite element methods to dynamic analysis	3	2	-	-	-	-	-	-	-	-	-	1	**3**	-
Course Code	**191ME7E17-ADVANCED AUTOMOBILE ENGINEERING (PROFESSIONAL ELECTIVE – IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Calculate the dimensions of the sprung mass systems of a typical 4-wheeler	3	1	2	-	1	-	-	-	-	-	-	-	-	3
CO2	Calculate the dimensions of the unsprung mass systems of a typical 4-wheeler	3	1	2	-	1	-	-	-	-	-	-	-	-	3
CO3	Predict the behavior of subsystem integrated with main system.	3	1	2	-	1	-	-	-	-	-	-	-	-	3
CO4	Develop the Mathematical model for the given physical system	3	1	2	-	1	-	-	-	-	-	-	-	-	3
CO5	Estimate the overall vehicle performance under dynamic behaviour	3	1	2	-	1	-	-	-	-	-	-	-	-	3
Course Code	**191ME7E18 - ADVANCED FLUID MECHANICS (PROFESSIONAL ELECTIVE – IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the fundamental concepts in the fluid mechanics and of the fluid flow.	2	1	1	-	-	-	3	-	-	-	-	-	-	1
CO2	Summarize the applied numerical methods, governing equations related to fluid flow.	2	2	1	-	-	-	3	-	-	-	-	-	-	1
CO3	Solve the numerical systems using differential equations of fluid flow for different flow regimes.	3	1	1	2	-	-	-	-	-	-	-	-	-	2
CO4	Apply the Boundary Conditions for fluid problems.	3	1	1	2	-	-	-	-	-	-	-	-	-	2

	CO Statements	POs												PSOs	
CO5	Calculate the velocity distributions and frictional resistance in smooth and rough pipes, and the characteristics of fluid elements while undergoing compression.	3	2	2	1	-	-	-	-	-	-	-	-	-	1
Course Code	**191ME7E19 - COMPUTATIONAL FLUID MECHANICS (PROFESSIONAL ELECTIVE – IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explains the numerical systems and errors involved in CFD.	2	-	-	1	2	-	2	-	-	-	-	-	-	1
CO2	Summarize applied numerical methods, governing equations related to fluid flow and heat transfer.	3	-	-	1	2	-	2	-	-	-	-	-	-	1
CO3	Do analysis on how grids are generated.	3	-	-	1	2	-	1	-	-	-	-	-	-	1
CO4	Apply FDM concepts for CFD problems.	3	-	-	1	2	-	1	-	-	-	-	-	-	1
CO5	Make use the concepts of FVM for CFD Problems.	3	-	-	1	2	-	1	-	-	-	-	-	-	1
Course Code	**191ME7E20 - NANO MATERIALS & TECHNOLOGY (PROFESSIONAL ELECTIVE – IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the structure and properties of Nano materials	2	1	-	-	-	-	-	-	-	-	-	-	**2**	-
CO2	Summarize the classification of Nano materials	2	1	-	-	-	-	-	-	-	-	-	-	**1**	-
CO3	Illustrate various methods of synthesizing different Nano materials	2	1	-	-	-	-	-	-	-	2	-	-	**1**	-
CO4	Analyze the Nano structure of materials using various characterization techniques	3	2	-	1	-	-	-	-	-	-	-	-	**2**	2
CO5	Make use of different Advanced Nano materials for Engineering and Technological applications	3	2	-	-	-	2	-	2	-	-	-	2	**2**	-
Course Code	**191ME7E21 - POWER PLANT ENGINEERING (PROFESSIONAL ELECTIVE – IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the source of energy, resources, and working of steam power plant.	2	-	-	-	-	-	1	-	-	-	-	1	-	1
CO2	Demonstrate the basic parts and area of steam power plant	2	-	-	-	-	-	1	-	-	-	-	1	-	1
CO3	Describe the concept of different power plant	2	1	-	-	-	-	1	-	-	-	-	1	-	1
CO4	Explain the combined operations of different power plants	2	-	-	-	-	-	1	-	-	-	-	1	-	1
CO5	Analyze the power plant economics and environmentalconsiderations	3	1	-	-	-	-	-	-	-	-	-	-	-	1
Course Code	**191ME7E22 - CAD/CAM (PROFESSIONAL ELECTIVE – V)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Describe the fundamentals of CAD/CAM and the geometric transformation techniques.	2	2	-	-	-	-	-	-	-	-	-	1	1	-
CO2	Develop the mathematical models to represent curves and surfaces.	2	2	-	-	-	-	-	-	-	-	-	1	1	-
CO3	Evaluate part programming for part profiles in NC, CNC, and DNC machines.	2	2	-	-	-	-	-	-	-	-	-	1	1	-
CO4	Apply group technology and Computer Aided Process Planning for product development.	2	2	-	-	-	-	-	-	--	-	-	1	1	-
CO5	Illustrate the elements of an automated manufacturing environment.	2	1	-	-	-	3	-	3	-	-	-	-	1	-
Course Code	**191ME7E23 - CONDITION MONITORING (PROFESSIONAL ELECTIVE – V)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	PSO1	**PSO2**
CO1	Distinguish different modes of vibrations and measure them.	-	-	3	2	-	2	-	-	-	-	-	-	2	-
CO2	Analyze different types of vibration	-	3	2	2	-	-	-	-	-	-	-	-	1	-

	CO Statements	POs												PSOs	
CO3	Decide faults in bearings, gears, and other mechanical devices and measure the energy loss as heat in machinery.	-	3	2	2	-	-	-	-	-	-	-	-	2	-
CO4	Illustrate various oil and wear debris analysis.	-	2	1	1	3	-	-	-	-	-	-	-	2	-
CO5	Illustrate various ultrasonic monitoring techniques.	-	2	1	1	-	3	-	-	-	-	-	-	1	-
Course Code	**191ME7E24 - PRODUCT DESIGN & DEVELOPMENT (PROFESSIONAL ELECTIVE – V)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Analyse the role of multiple functions like manufacturing, assembly, marketing, usage of product	1	-	2	-	2	-	-	-	-	-	-	-	1	-
CO2	Explain the decision making and concept selection in a specific product	1	-	2	-	2	-	-	-	-	-	-	-	1	-
CO3	Analyse and evaluate the design processes steps	1	-	2	-	2	-	-	-	-	-	-	-	1	-
CO4	Explain the modelling and simulation techniques and material selection in design	2	2	-	-	2	1	-	-	-	-	-	-	1	-
CO5	Explain the best casting and forging design for a specific product	2	-	2	-	2	1	-	-	-	-	-	-	1	-
Course Code	**191ME7E25 - FLEXIBLE MANUFACTURING SYSTEMS (PROFESSIONAL ELECTIVE – V)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain how flexible manufacturing systems can be implemented	2	1	-	-	-	-	3	-	-	-	-	1	1	-
CO2	Identify various workstations, system support equipment FMS	2	-	-	-	1	-	3	-	-	-	-	1	1	-
CO3	Summarize the concepts of Advanced FMS like JIT,KANBAN	2	1	-	-	-	-	3	-	-	-	-	1	1	-
CO4	Compare FMS with cellular manufacturing	2	1	-	-	-	-	-	-	-	-	-	1	3	-
CO5	Evaluate the role of computers in FMS	2	1	-	-	1	2	-	-	-	-	-	-	1	-
Course Code	**191ME7E26 - GAS DYNAMICS (PROFESSIONAL ELECTIVE – V)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Apply the fundamentals of compressible flow concepts and the use of gas tables.	3	2	-	-	-	-	-	-	-	-	-	-	3	1
CO2	Analyze the one- dimensional compressible flow in various regions.	3	2	-	-	-	-	-	-	-	-	-	-	3	1
CO3	Explain the quasi-one-dimensional flows of nozzles and diffusers	3	2	-	-	-	-	-	-	-	-	-	-	3	1
CO4	Analyze the two - dimensional compressible flow in various regions.	3	2	-	-	-	-	-	-	-	-	-	-	3	1
CO5	Evaluate the flow properties on shock waves in various flow regions	3	2	-	-	-	-	-	-	-	-	-	-	3	1
Course Code	**191CE7O03 WASTE WATER MANAGEMENT (OPEN ELECTIVE – III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Summarize the importance of sanitation and waste water management.	2	1	-	-	-	2	3	-	-	-	-	-	-	-
CO2	Estimatethe rate of sewage flow and storm water drainage	1	1	-	-	-	1	2	-	-	-	-	-	-	-
CO3	Identify the various characteristics of sewage and plan the treatment system.	3	2	-	-	-	2	2	-	-	-	-	-	-	-
CO4	Outline various waste water treatment technologies.	2	1	-	-	-	2	3	-	-	-	-	-	-	-
CO5	Explain the different treated effluent disposal methods.	2	1	-	-	-	2	3	-	-	-	-	-	-	-
Course Code	**191EE7O07 ELECTRICAL AND HYBRID VEHICLES (OPEN ELECTIVE – III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the characteristics of electrical and hybrid vehicles.	1	-	-	-	-	1	1	-	-	-	-	-	-	-

	CO Statements	POs												PSOs	
CO2	Analyze the models to describe electric trains and their performance.	1	-	-	-	-	1	1	-	-	-	-	-	-	-
CO3	Compare and evaluate the different possible ways of energy storage.	1	-	-	-	-	1	1	-	-	-	-	-	-	-
CO4	Demonstrate the sizing of the drive system.	1	-	-	-	-	1	1	-	-	-	-	-	-	-
CO5	Apply the different strategies related to energy management.	1	-	-	-	-	1	1	-	-	-	-	-	-	-
Course Code	**191EE7O08 SPECIAL ELECTRICAL MACHINES (OPEN ELECTIVE – III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Distinguish between brush dc motor and brush less dc motor.	1	1	1	-	-	-	-	-	-	-	-	-	-	-
CO2	Explain the performance and control of stepper motors and their applications.	1	1	1	-	-	-	-	-	-	-	-	-	-	-
CO3	Describe theory of operation and control of switched reluctance motor.	1	1	1	-	-	-	-	-	-	-	-	-	-	-
CO4	Explicate the theory of travelling magnetic field and applications of linear motors.	1	1	1	-	-	-	-	-	-	-	-	-	-	-
CO5	Explain the significance of electrical motors for traction drives.	1	1	1	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191EE7O09 INDUSTRIAL ELECTRICAL SYSTEMS (OPEN ELECTIVE – III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the electrical wiring systems for residential, commercial, and industrial consumers, representing the systems with standard symbols and drawings, SLD.	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Illustrate the residential and commercial electrical systems.	3	1	1	1	-	-	-	-	-	-	-	-	-	-
CO3	Design the residential and commercial lightning systems.	3	1	1	-	-	-	-	-	-	-	-	-	-	-
CO4	Explain various components of industrial electrical systems.	3	2	2	1	-	-	-	-	-	-	-	-	-	-
CO5	Analyze and select the proper size of various electrical system components.	3	2	-	1	-	-	-	-	-	-	-	-	-	-
Course Code	**191ME7O13 OPTIMIZATION TECHNIQUES (OPEN ELECTIVE – III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Use advanced optimization techniques to solve real-life problems.	3	2	1	-	-	-	-	-	-	-	-	1	-	-
CO2	Formulate and solve various practical optimization problems in manufacturing and service organizations	3	2	1	-	-	-	-	-	-	-	-	1	-	-
CO3	Use non-linear optimization techniques such as classical optimization methods, integer programming.	2	2	1	-	-	-	-	-	-	-	-	1	-	-
CO4	Apply unconstrained optimization and constrained non-linear programming and dynamic programming	1	2	1	-	-	-	-	-	-	-	-	1	-	-
CO5	Use Advance techniques to formulate and solve the optimization problems.	1	2	1	-	-	-	-	-	-	-	-	1	-	-
Course Code	**191ME7O14 ENERGY CONSERVATION (OPEN ELECTIVE – III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the concepts of National Energy consumption, Energy Auditing, and its types	2	2	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Explain the improvement in efficiency of various electrical equipment's like capacitors and electric motors etc.	1	2	1	-	-	-	-	-	-	-	-	-	-	-

	CO Statements	POs												PSOs	
CO3	Explain the improvement in efficiency of various mechanical equipment like boilers, condensers, and steam lines etc.	1	-	-	1	-	-	-	-	-	-	-	1	-	-
CO4	Explain the energy efficiency of components like pumps, blowers, fans, and various refrigeration equipment.	1	2	-	-	-	-	-	-	-	-	-	2	-	-
CO5	Apply the concepts of energy economics like payback period, internal rate of returns life cycle costing etc.	1	-	-	-	-	-	-	-	-	-	-	2	-	-
Course Code	**191ME7O15 INTRODUCTION TO MATERIAL HANDLING SYSTEMS (OPEN ELECTIVE – III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Demonstrate ability to complete successfully Forklift Certification to safely and operate effectively in the manufacturing environment.	3	-	-	-	-	-	-	-	-	-	1	-	-	-
CO2	Discuss proficiency in supply chain operations, utilizing appropriate methods to plan and implement processes necessary for the purchase and conveyance of goods in a timely and cost-effective manner.	3	-	-	-	-	-	-	-	-	-	2	-	-	-
CO3	Summarize different types of material handling systems, advantages, and disadvantages and suggest the selection procedure for the material handling along with its specifications.	3	-	-	-	-	-	-	-	-	-	2	-	-	-
CO4	Explain different techniques of Material handling systems like Automated Material handling Design Program, and Computerized material handling planning	3	-	-	-	-	-	-	-	-	-	2	-	-	-
CO5	Analyze different models of Material handling system and selection procedure of material handling on different function-oriented systems related with plant layout by which the minimization of the handling charges.	3	-	-	-	-	-	-	-	-	-	2	-	-	-
Course Code	**191ME7O16-ROBOTICS (OPEN ELECTIVE – III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the basic concepts, parts of robots and types of robots.	2	-	-	-	-	-	-	-	-	-	-	1	-	-
CO2	Identify various robot configuration and components,	-	2	-	-	-	-	-	-	-	-	-	1	-	-
CO3	Select appropriate actuators and sensors for a robot based on specific application	1	-	1	1	-	-	-	-	-	-	-	1	-	-
CO4	Apply DH Notation for Joint coordinates and world coordinators in Manipulator kinematics problems	-	2	-	2	-	-	-	-	-	-	-	1	-	-
CO5	Analyze the trajectory planning for a manipulator by avoiding Obstacles	-	2	2	2	-	-	-	-	-	-	-	1	-	-
Course Code	**191ME7O17 ENTREPRENEURSHIP DEVELOPMENT AND INCUBATION (OPEN ELECTIVE – III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Describe the meaning and concepts of entrepreneurship development	-	-	-	-	-	1	2	-	-	2	-	-	-	-
CO2	Apply the business plan for preparation and evaluation of project.	-	-	-	-	-	1	2	-	-	2	-	-	-	-
CO3	Explain about Institutional Support to Entrepreneur and MSMEs	-	-	-	-	-	2	3	-	-	2	2	-	-	-
CO4	Explain about the Opportunities of Entrepreneurship Internationally.	-	-	-	-	-	2	3	-	-	2	2	-	-	-
CO5	Explain about Informaal Risk Capital, Venture capital and Social responsibility for entrepreneurship	-	-	-	-	-	1	2	-	-	2	-	-	-	-

	CO Statements	POs												PSOs	
Course Code	**191EC7O06 OVERVIEW OF DIGITAL SIGNAL PROCESSING (OPEN ELECTIVE – III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Analyze Discrete Time Signals and Systems.	2	2	1	1	-	-	-	-	-	-	-	-	-	-
CO2	Apply various DFT properties to evaluate the given sequence.	2	1	1	-	-	-	-	-	-	-	-	-	-	-
CO3	Make use of FFT Algorithms for the computation of DFT.	2	2	1	1	-	-	-	-	-	-	-	-	-	-
CO4	Design digital filters and implement with different structures.	2	2	1	1	-	-	-	-	-	-	-	-	-	-
CO5	Apply the knowledge of Multirate signal processing in the real time applications.	2	2	2	2	-	-	-	-	-	-	-	-	-	-
Course Code	**191EC7O07 BASICS OF VLSI DESIGN (OPEN ELECTIVE – III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Demonstrate the fundamental concepts of basic MOS theory of fabrication process and the electrical properties of MOS and Bi-CMOS Circuits.	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Develop the stick and layout models of MOS circuits using design rules.	2	3	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Develop various CMOS logic structures using different MOS logic technologies.	2	2	1	2	-	-	-	-	-	-	-	-	-	-
CO4	Demonstrate the scaling factors in determining the characteristics and performance of MOS circuits in silicon.	2	3	1	1	-	-	-	-	-	-	-	-	-	-
CO5	Explain different architectural issues of subsystem design process and testability.	2	1	3	1	-	-	-	-	-	-	-	-	-	-
Course Code	**191EC7O08 MICRO ELECTRO MECHANICAL SYSTEMS (OPEN ELECTIVE – III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Summarize the operation of micro systems, and their applications	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Classify the materials for micro system applications	2	1	2	-	-	-	-	-	-	-	-	-	-	-
CO3	Explain the state-of-the-art for lithography and packaging techniques	3	2	1	1	-	-	-	-	-	-	-	-	-	-
CO4	Extend the knowledge of basic approaches for various sensors and actuators design	2	2	1	-	-	-	-	-	-	-	-	-	-	-
CO5	Apply the expertise on micro systems for interdisciplinary applications	2	2	2	1	-	-	-	-	-	-	-	-	-	-
Course Code	**191EC7O09 IMAGE PROCESSING (OPEN ELECTIVE – III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the concepts of digital image processing.	2	1	1	1	-	-	-	-	-	-	-	-	-	-
CO2	Identify various image enhancement and image restoration techniques.	2	2	2	2	-	-	-	-	-	-	-	-	-	-
CO3	Outline the color fundamentals and different color image processing methods.	2	1	1	1	-	-	-	-	-	-	-	-	-	-
CO4	Utilize different morphological operators for image processing.	2	2	2	2	-	-	-	-	-	-	-	-	-	-
CO5	Analyze different image segmentation techniques for image processing.	2	2	2	2	-	-	-	-	-	-	-	-	-	-

	CO Statements	POs												PSOs	
Course Code	**191CS7O10 BIG DATA ANALYTICS (OPEN ELECTIVE – III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Illustrate big data challenges in different domains including social media, transportation, finance, and medicine.	-	2	3	-	2	2	-	-	-	-	-	-	-	-
CO2	Use various techniques for mining data stream.	-	2	2	-	3	2	-	-	-	-	-	-	-	-
CO3	Demonstrate building blocks of Hadoop.	-	2	3	-	2	2	-	-	-	-	-	-	-	-
CO4	Apply map reduce procedure to solve big data problems.	-	3	2	-	2	2	-	-	-	-	-	-	-	-
CO5	Make use of Pig & Hive Frameworks to work with big data.	-	2	2	-	3	2	-	-	-	-	-	-	-	-
Course Code	**191CS7O11 MOBILE APPLICATION DEVELOPMENT (OPEN ELECTIVE – III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Make use of Android Studio to develop Android application.	3	-	2	-	2	-	-	-	-	-	-	-	-	-
CO2	Develop user Interfaces using Android platform.	2	2	3	-	2	-	-	-	-	-	-	-	-	-
CO3	Make Use of state information across important operating system events	2	3	2	-	2	-	-	-	-	-	-	-	-	-
CO4	Apply Java programming concepts to Android application development	3	2	2	-	2	-	-	-	-	-	-	-	-	-
CO5	Explain the concepts of GPS and mobile security	2	2	3	-	2	-	-	-	-	-	-	-	-	-
Course Code	**191CS7O12 DATA SCIENCE (OPEN ELECTIVE – III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Describe Data Science and the skill sets needed to be a data scientist.	2	3	-	2	-	-	-	-	-	-	-	-	-	-
CO2	Apply basic tools for visualizing Data& optimization.	2	2	-	2	3	-	-	-	-	-	-	-	-	-
CO3	Describe the process of reading and exploring data.	2	2	-	3	2	-	-	-	-	-	-	-	-	-
CO4	Implement various machine learning algorithms for analyzing various datasets.	2	2	-	3	-	-	-	-	-	-	-	-	-	-
CO5	Analyze datasets using clustering and recommender systems	2	2	-	3	-	-	-	-	-	-	-	**2**	-	-
Course Code	**191IT7O06 MACHINE LEARNING (OPEN ELECTIVE – III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Identify machine learning techniques suitable for a given problem	2	3	-	2	-	-	-	-	-	-	-	-	-	-
CO2	Evaluate the performance of an algorithm used in an ML model	3	2	-	2	-	-	-	-	-	-	-	-	-	-
CO3	Apply probability approximations and frame ordered and unordered rules for given machine learning problem	3	2	-	2	-	-	-	-	-	-	-	-	-	-
CO4	Design multilayer model using techniques like back propagation, quadratic programming solution.	2	3	2	2	-	-	-	-	-	-	-	-	-	-
CO5	Design models using conditional probability, logistic regression, and distance-based techniques.	2	3	2	2	-	-	-	-	-	-	-	-	-	-
Course Code	**191IT7O07 QUANTUM COMPUTING (OPEN ELECTIVE – III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Illustrate fundamentals of quantum information processing	3	2	1	-	-	-	-	-	-	-	-	-	-	-
CO2	Explain quantum basics and principles	3	2	1	-	-	-	-	-	-	-	-	-	-	-
CO3	Apply various quantum algorithms for solving problems	1	2	3	1	-	-	-	-	-	-	-	-	-	-

	CO Statements	POs												PSOs	
CO4	Apply simple quantum algorithms and information channels in the quantum circuit model	1	2	3	1	-	-	-	-	-	-	-	-	-	-
CO5	Demonstrate Performance, Security and Scalability of quantum computing	2	3	1	2	-	-	-	-	-	-	-	-	-	-
CO6	Analyze various quantum computing models and approaches	1	2	3	2	-	-	-	-	-	-	-	-	-	-
Course Code	**191IT7O08 BLOCK CHAIN TECHNOLOGIES (OPEN ELECTIVE – III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Demonstrate the foundation of the Blockchain technology and understand the processes in payment and funding.	2	2	1	-	-	-	-	-	-	-	-	2	-	-
CO2	Identify the risks involved in building Blockchain applications.	2	3	1	-	-	-	-	-	-	-	-	2	-	-
CO3	Explain the legal implications using smart contracts.	2	2	1	-	-	-	-	-	-	-	-	2	-	-
CO4	Choose the present landscape of Blockchain implementations and Understand Crypto currency markets	2	2	1	-	-	-	-	-	-	-	-	2	-	-
CO5	Examine how to profit from trading crypto currencies.	2	2	1	-	-	-	-	-	-	-	-	2	-	-
Course Code	**191MI7O04 COMMUNICATION SYSTEM IN MINES (OPEN ELECTIVE – III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Demonstrate types of signals and relation of time domain representation to frequency domain.	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Apply signal concepts to continuous wave modulation.	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Interpret the basic concepts of pulse modulation.	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO4	Analyze the concepts of digital modulation techniques.	2	2	-	-	-	-	-	-	-	-	-	-	-	-
CO5	Summarize different advanced communication networks.	3	2	-	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191MI7O05 DRILLING & BLASTING (OPEN ELECTIVE – III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Differentiate between explosives.	1	3	2	-	-	-	-	-	-	-	-	-	-	-
CO2	Use blasting accessories along with monitoring and assessment.	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Analyze problems associated with open cast blasting and mitigation.	1	3	-	-	-	-	-	-	-	-	-	-	-	-
CO4	Analyze problems associated with underground blasting and mitigation.	1	3	-	-	-	-	-	-	-	-	-	-	-	-
CO5	Assess blasting in metal mines.	1	3	-	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191PT7O05 INTRODUCTION TO EARTH SCIENCES (OPEN ELECTIVE – III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain various branches of earth sciences and universe	2	-	-	-	-	-	-	-	-	-	-	1	-	2
CO2	Explain the origin of the universe and solar systems	2	-	-	-	-	-	-	-	-	-	-	-	-	2
CO3	Explain the concepts of earth's magnetic field	2	-	-	-	-	-	-	-	-	-	-	-	-	2
CO4	Illustrate the concepts of the plate tectonics	2	-	-	-	-	-	-	-	-	-	-	1	-	2
CO5	Explain the origin of the oceans, continents, mountains, and valleys	2	-	-	-	-	-	-	-	-	-	-	1	-	2
Course Code	**191PT7O06 BASIC CONCEPTS IN PETROLEUM DRILLING AND COMPLETIONS (OPEN ELECTIVE – III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the types of drilling equipment and drilling hydraulics.	2	1	-	-	-	-	-	-	-	-	-	-	-	2

	CO Statements	POs												PSOs	
CO2	Explain about Casings, cement slurry design, directional drilling, and fishing, well control concepts.	2	1	-	-	-	-	-	-	-	-	-	-	-	2
CO3	Explain different types of wells, well testing, surface, and subsurface equipment.	2	1	-	-	-	-	-	-	-	-	-	-	-	2
CO4	Explain well completion equipment and different perforation techniques.	2	1	-	-	-	-	-	-	-	-	-	-	-	2
CO5	Illustrate different Subsurface circulating equipment and different types of packers	2	1	-	-	-	-	-	-	-	-	-	-	-	2
Course Code	**191AG7O04 GREENHOUSE TECHNOLOGY (OPEN ELECTIVE – III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Design small scale polyhouse for drying purpose.	3	2	1	-	-	-	-	-	-	-	2	-	-	-
CO2	Classify greenhouses based on construction materials.	3	2	-	-	1	-	-	1	-	-	-	-	-	-
CO3	Explain the scenario of protective cultivation around the globe and in India.	3	1	-	-	-	-	-	-	-	-	-	-	-	-
CO4	Make use of non-chemical and chemical pesticides and growth regulators effectively in an environmentally responsible way.	1	-	1	-	-	-	2	3	-	-	-	-	-	-
CO5	Assess the basic production requirements and the knowledge of horticulture crop cultivation in greenhouse.	3	-	-	-	-	-	2	-	-	-	-	-	-	-
Course Code	**191AG7O05 FLOODS AND CONTROL MEASURES (OPEN ELECTIVE – III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Determine the peak rate of flood by rational, empirical methods and flood frequency by log normal, Gumbel's extreme value and log-Pearson type-III distribution methods.	2	2	1	-	3	-	-	-	-	-	-	-	-	-
CO2	Explain importance of various flood routing techniques and flood control measures.	3	2	1	-	1	-	-	-	-	-	-	-	-	-
CO3	Design of flood control projects and their cost economics estimation.	3	2	1	-	2	-	-	-	-	-	-	-	-	-
CO4	Estimate seepage through earth embankments and understand causes of failures.	3	2	1	-	-	-	-	-	-	-	-	-	-	-
CO5	Design of earthen dam and its stability analysis by different methods	3	2	1	-	2	-	-	-	-	-	-	-	-	-
Course Code	**191ME7L10-CAM/MECHATRONICS LAB**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Analyze the different transducers by using DYNA 1750 Transducers Kit.	-	3	-	2	-	-	-	-	-	-	-	-	1	-
CO2	Construct a ladder diagram for logical operations.	3	2	-	1	-	-	-	-	-	-	-	-	1	-
CO3	Develop a Hydraulic circuit in AUTOMATION STUDIO Software.	3	2	-	1	-	-	-	-	-	-	-	-	1	-
CO4	Make use of Automated CNC Tool path & G-Code generation using Pro/E/Master CAM	3	2	-	1	-	-	-	-	-	-	-	-	1	-
CO5	Construct a CNC programming for turning and milling process.	3	2	-	1	-	-	-	-	-	-	-	-	1	-
Course Code	**191ME7L11-CAD/CFD LAB**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Develop the various components using Cad software	-	3	-	-	-	-	-	-	-	2	-	3	-	3
CO2	Explain the concepts of Drafting.	-	1	-	-	-	-	-	-	-	1	-	3	-	2
CO3	Analyze deflection and stresses in 2D and 3D Beams	-	3	-	-	1	-	-	-	-	2	-	3	-	3

	CO Statements	POs												PSOs	
CO4	Model the temperature distribution in case of Fin by using the BC.	-	3	-	-	1	-	-	-	-	-	-	3	-	3
CO5	Solve heat equations, conduction equation & Parabolic PDE	-	3	-	-	1	-	-	-	-	-	-	3	-	3
CO6	Apply the concepts FDM to solve problems in heat transfer.	-	3	-	-	1	-	-	-	-	-	-	3	-	-
Course Code	**191PR7P02 INTERNSHIP**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Conduct a technical survey to identify a real world engineering problem	1	1	-	-	-	-	-	-	-	1	-	1	-	-
CO2	Analyze the industrial plant layout using technical expertise	2	-	-	-	-	1	1	-	-	-	-	1	-	-
CO3	Compare theoretical and real work environments in technical perspective	2	-	-	-	-	-	-	-	-	1	1	1	-	-
CO4	Identify the challenges in the execution of operations	1	1	1	1	-	-	-	-	-	-	-	-	-	-
CO5	Execute the operations and report the results of assigned tasks using modern tools adhering to professional ethics	-	-	-	-	2	-	-	2	1	1	-	-	-	-
Course Code	**191PT7P03 PROJECT PART 1**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Conduct technical survey to identify a real industrial problem to solve as a project work	1	1	-	-	-	-	-	-	-	1	-	1	-	-
CO2	Estimate the resources & constraints in the process of execution	1	1	1	-	-	-	-	-	-	-	-	1	-	-
CO3	Develop technical procedure of planning & scheduling to execute an identified project work in line with societal and environmental implications.	-	2	-	-	-	2	2	-	-	-	-	1	-	-
CO4	Estimate the costs of individual stages and overall cost of the project in light of optimum resources allocation	1	1	-	-	-	-	-	-	-	-	-	1	-	-
CO5	Estimate the optimum project duration using quantitative techniques	1	1	-	-	-	-	-	-	-	-	-	1	-	-
	VIII SEM														
Course Code	**191ME8E27 - ADVANCEDMATERIALS (PROFESSIONAL ELECTIVE – VI)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Summarize the properties and applications of composite materials	2	1	-	-	-	-	3	-	-	-	-	-	-	-
CO2	Identify and describe different types of material processing techniques and their applications.	3	2	-	-	-	-	1	-	-	-	-	-	3	-
CO3	Explain the concept of macro mechanical analysis of lamina.	3	1	-	-	-	-	2	-	-	-	-	-	2	-
CO4	Use the concept of functionally graded materials in industrial applications.	2	1	-	-	-	-	3	-	-	-	-	-	-	-
CO5	Understand the synthesis of Nano materials and their applications and impact of Nano materials on environment.	1	2	-	-	-	-	3	-	-	-	-	-	3	-
Course Code	**191ME8E28-MANUFACTURING METHODS IN PRECISION ENGINEERING (PROFESSIONAL ELECTIVE – VI)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the various classes to achieve the machining accuracy.	3	-	-	-	-	-	-	-	-	-	-	2	2	-
CO2	Explain Various accuracies required in machines and errors in numerical Positioning.	3	-	-	-	-	-	-	-	-	-	-	2	-	-
CO3	Explain the Micro finishing Processes in the machining of metals tools and surface texture measurements.	3	1	-	-	2	1	-	-	-	-	-	-	2	-

	CO Statements	POs												PSOs	
CO4	Explain the principle, construction, operations of bearing systems.	3	1	-	-	-	1	1	-	-	-	-	-	-	-
CO5	Explain the advances in precision grinding processes and various tool materials.	3	-	1	-	-	1	1	-	-	-	-	-	-	-
Course Code	**191ME8E29 - PRODUCTION PLANNING AND CONTROL (PROFESSIONAL ELECTIVE – VI)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Summarize the objectives, functions, applications of PPC	3	-	-	-	1	1	-	-	-	-	-	-	2	-
CO2	Explain different Forecasting techniques	2	2	1	-	-	-	-	-	-	-	-	1	1	-
CO3	Analyze Inventory management methods	2	2	1	-	-	-	-	-	-	-	-	1	2	-
CO4	Evaluate various routing and scheduling techniques	2	2	1	-	-	1	-	-	-	-	-	-	2	-
CO5	Examine line balancing, dispatching and follow up techniques in PPC.	3	-	-	-	2	1	-	-	-	-	-	1	1	-
Course Code	**191ME8E30-THERMAL EQUIPMENT AND DESIGN (PROFESSIONAL ELECTIVE – VI)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the different types of heat exchangers	-	3	2	-	-	-	-	-	-	-	-	-	-	-
CO2	Make use of the different design methods for heat exchangers.	3	2	1	-	-	-	-	-	-	-	-	-	3	2
CO3	Analyze the double pipe heat exchanger	-	3	2	-	-	-	-	-	-	-	-	-	-	-
CO4	Calculate the condensation of single vapours.	-	3	2	-	-	-	-	-	-	-	-	-	-	-
CO5	Estimate the heat transfer performance in vaporizer, evaporator	-	3	2	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191ME8E31-TOTAL QUALITY MANAGEMENT (PROFESSIONAL ELECTIVE – VI)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the quality management philosophies and frame works.	2	-	-	-	-	-	-	-	2	1	-	1	2	-
CO2	Explain qualitycostsand leadership.	2	-	-	-	-	-	-	-	2	1	-	1	2	-
CO3	Explain the concepts of customer focus, continuous quality improvement and supplier partnership.	2	-	-	-	-	-	-	-	2	1	-	1	2	-
CO4	Apply various TQM tools to improve management processes.	2	-	-	-	-	-	-	-	2	1	-	1	2	-
CO5	Determine the set of indicators to evaluate performance excellence of an organization.	2	-	-	-	-	-	-	-	2	1	-	1	2	-
Course Code	**191CE8O04-INTEGRATED WASTE MANAGEMENT FOR A SMART CITY (OPEN ELECTIVE – IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO 1	Describe generation rates, composition and issues of Solid waste	2	1	-	-	-	2	3	-	-	-	-	-	-	-
CO 2	Explain about issues, collection, recovery, reuse, processing of Municipal solid waste	2	1	-	-	-	2	3	-	-	-	-	-	-	-
CO 3	Illustrate the rules regarding MSW and current issues in Solid waste management	1	2	-	-	-	2	3	-	-	-	-	-	-	-
CO 4	Interpret Construction and demolition waste management	2	1	-	-	-	2	3	-	-	-	-	-	-	-
CO 5	Assess the issues related to E-waste generation and current management practices	1	2	-	-	-	2	3	-	-	-	-	-	-	-
Course Code	**191EE8O10-FUNDAMENTALS OF ELECTRICAL ENGINEERING (OPEN ELECTIVE – IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the concepts of basic circuits and basic laws for electrical networks.	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Summarize the behaviour of RLC networks	3	1	1	1	-	-	-	-	-	-	-	-	-	-

	CO Statements	POs												PSOs	
CO3	Analyse the network by obtaining solution through mesh and nodal analysis	3	1	1	1	-	-	-	-	-	-	-	-	-	-
CO4	Determine resonance frequency and Q factor of an AC Circuit.	2	1	1	1	-	-	-	-	-	-	-	-	-	-
CO5	Explain the operation of the Transformer	3	1	1	1	-	-	-	-	-	-	-	-	-	-
CO6	Explain the operation of the Induction motors and DC Machines	1	1	-	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191EE8O11-BASIC ELECTRICAL CIRCUITS (OPEN ELECTIVE – IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain various theories of electrical networks	3	2	1	1	2	-	-	-	-	-	-	-	-	-
CO2	Explain the importance of three phase circuits with Star& Delta connected balanced and unbalanced loads.	2	1	-	-	2	-	-	-	-	-	-	-	-	-
CO3	Illustrate various electrical networks by using principles of network theorems	2	1	-	-	2	-	-	-	-	-	-	-	-	-
CO4	Obtain the various network parameters for the given two port networks	3	2	1	-	2	-	-	-	-	-	-	-	-	-
CO5	Analyse the transient behaviour of electrical networks for DC excitations	2	1	-	-	2	-	-	-	-	-	-	-	-	-
Course Code	**191EE8O12-ELECTRICAL MACHINES (OPEN ELECTIVE – IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Evaluate the effects of armature reaction in dc machines	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Determine the torque production mechanism and control the speed of dc motors.	3	2	2	1	-	-	-	-	-	-	-	-	-	-
CO3	Determine the voltage regulation and efficiency of single-phase transformers.	2	2	1	1	-	-	-	-	-	-	-	-	-	-
CO4	Explain the operation and performance of three phase induction motor.	1	1	2	-	-	-	-	-	-	-	-	-	-	-
CO5	Apply methods of staring and correction of power factor with synchronous motor	3	2	1	1	-	-	-	-	-	-	-	-	-	-
Course Code	**191EE8O13-POWER ELECTRONICS (OPEN ELECTIVE – IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the different types of power semiconductor devices and their Characteristics.	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Distinguish between 1ϕ and 3ϕ phase-controlled converters.	3	2	2	1	-	-	-	-	-	-	-	-	-	-
CO3	Analyze the operation of AC voltage controllers and cycloconverters.	3	2	1	2	-	-	-	-	-	-	-	-	-	-
CO4	Analyze the operation of different types of DC-DC converters.	3	2	1	2	-	-	-	-	-	-	-	-	-	-
CO5	Illustrate the operation of Inverters and application of PWM techniques.	2	1	-	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191EE8O14-NON-CONVENTIONAL ENERGY SOURCES (OPEN ELECTIVE – IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the prospects of renewable energy and solar energy.	1	-	-	-	-	-	1	-	-	-	-	-	-	-
CO2	Apply the knowledge of solar principles for its applications.	1	-	-	-	-	-	1	-	-	-	-	-	-	-

	CO Statements	POs												PSOs	
CO3	Discuss the working principles of wind and Bio-mass energy resources.	1	-	-	-	-	-	1	-	-	-	-	-	-	-
CO4	Illustrate the techniques and conversion principles of Geothermal and tidal energy resources.	1	-	-	-	-	-	1	-	-	-	-	-	-	-
CO5	Explain the concept of Direct energy conversion	1	-	-	-	-	-	1	-	-	-	-	-	-	-
Course Code	**191ME8O18-FABRICATION PROCESSES (OPEN ELECTIVE – IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the fundamentals of Casting and Casting Processes.	-	2	-	2	-	2	-	-	-	-	-	1	-	-
CO2	Explain the basics of Welding and types of Welding processes.	-	2	-	2	-	2	-	-	-	-	-	1	-	-
CO3	Explain the various technological approaches applied to the different hot working and cold working operations.	1	-	-	2	2	-	-	-	-	-	-	1	-	-
CO4	Explain the concept of various Extrusion processes and forces in extrusion.	1	-	2	-	-	-	-	-	-	-	-	1	-	-
CO5	Explain the concept of Forging processes, Forging defects and forces in forging operations.	2	-	2	-	2	-	-	-	-	-	-	1	-	-
Course Code	**191ME8O19-SMART MATERIALS (OPEN ELECTIVE – IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Describe and characterize mechanical behaviour of smart materials.	2	1	-	-	-	-	1	-	-	-	-	1	-	-
CO2	Select materials for sensor applications based on required properties.	2	1	-	-	-	-	2	-	-	-	-	1	-	-
CO3	Characterize interaction between smart materials and simple structures in actuation and sensing.	2	1	-	-	-	-	2	-	-	-	-	1	-	-
CO4	Describe and characterize novel functions of smart materials using structure-property relationships.	1	1	-	-	-	-	2	-	-	-	-	1	-	-
CO5	Demonstrate the functions of smart structures.	1	1	-	-	-	-	2	-	-	-	-	1	-	-
Course Code	**191EC8O10-MICRO ELECTRO MECHANICAL SYSTEMS (OPEN ELECTIVE – IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Summarize the operation of micro systems, and their applications	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Classify the materials for micro system applications	2	1	2	-	-	-	-	-	-	-	-	-	-	-
CO3	Explain the state-of-the-art for lithography and packaging techniques	3	2	1	-	-	-	-	-	-	-	-	-	-	-
CO4	Extend the knowledge of basic approaches for various sensors and actuators design	3	2	1	-	-	-	-	-	-	-	-	-	-	-
CO5	Apply the experience on micro systems for interdisciplinary applications	2	2	2	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191EC8O11-BASIC ELECTRONIC CIRCUITS (OPEN ELECTIVE – IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain Superposition theorem and Phasors.	3	1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Interpret about BJT and BJT Amplifier.	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Develop Operations performed by OP-AMP circuits.	2	2	1	1	-	-	-	-	-	-	-	-	-	-
CO4	Develop Counters and Registers using Flip-flops.	2	2	1	1	-	-	-	-	-	-	-	-	-	-
CO5	Contrast Analog-to-digital and Digital-to -analog conversions.	3	2	2	2	-	-	-	-	-	-	-	-	-	-

	CO Statements	POs												PSOs	
Course Code	**191EC8O12-PRINCIPLES OF COMMUNICATIONS (OPEN ELECTIVE – IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Illustrate Analog communication systems using amplitude modulation and demodulation.	2	2	1	-	-	-	-	-	-	-	-	1	-	-
CO2	Demonstrate Analog communication systems using angle modulation and demodulation.	2	2	1	-	-	-	-	-	-	-	-	1	-	-
CO3	Analyze various pulse analog and pulse digital modulation techniques.	2	2	2	-	-	-	-	-	-	-	-	1	-	-
CO4	Explain the process of reproduction of baseband signal.	2	2	1	-	-	-	-	-	-	-	-	1	-	-
CO5	Compare and contrast various Multiplexing techniques used in Communication systems.	2	2	2	-	-	-	-	-	-	-	-	1	-	-
Course Code	**191EC8O13-ELECTRONIC INSTRUMENTATION (OPEN ELECTIVE – IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the fundamental characteristics of different Instruments	3	2	1	-	-	-	-	-	-	-	-	-	-	-
CO2	Compare different signal generators and function generators in terms of their performance	2	2	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Distinguish the operation of various types of analog and digital meters.	3	2	2	-	-	-	-	-	-	-	-	-	-	-
CO4	Interpret the working of various potentiometers and AC bridges	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO5	Compare various data acquisition systems for analog to digital conversion and digital to analog conversion.	2	2	1	1	-	-	-	-	-	-	-	-	-	-
Course Code	**191EC8O14-DIGITAL IMAGE PROCESSING (OPEN ELECTIVE – IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the concepts of digital image processing.	2	1	1	1	-	-	-	-	-	-	-	-	-	-
CO2	Utilize various image transforms techniques for image analysis.	3	2	2	2	-	-	-	-	-	-	-	-	-	-
CO3	Identify the image enhancement and restoration methods.	3	2	1	1	-	-	-	-	-	-	-	-	-	-
CO4	Utilize color fundamentals and different color image processing methods.	3	2	1	1	-	-	-	-	-	-	-	-	-	-
CO5	Explain different image segmentation techniques and image morphological operators for image processing.	2	2	1	1	-	-	-	-	-	-	-	-	-	-
Course Code	**191CS8O13-CYBER SECURITY (OPEN ELECTIVE – IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Illustrate cyber crime fundamentals.	2	1	-	-	2	-	-	-	-	-	-	-	-	-
CO2	Distinguish type of tools and methods used in cyber crimes.	3	2	2	-	2	-	-	-	-	-	-	-	-	-
CO3	Interpret the nature and effect of cyber crime in society and forensics fundamentals.	2	1	1	-	2	-	-	-	-	-	-	-	-	-
CO4	Utilize the history of Cyber Crimesand Liturgical Procedures to analyze the real time current scenarios.	3	2	2	-	2	-	-	-	-	-	-	-	-	-
CO5	Explain the importance of cyber security.	2	1	-	-	2	-	-	-	-	-	-	-	-	-
Course Code	**191CS8O14 -DATA SCIENCE (OPEN ELECTIVE – IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Describe Data Science and the skill sets needed to be a data scientist.	-	3	1	-	1	-	-	-	-	-	-	2	-	-
CO2	Apply basic tools for visualizing Data& optimization.	-	2	1	-	3	-	-	-	-	-	-	2	-	-

	CO Statements	POs												PSOs	
CO3	Describe the process of reading and exploring data.	-	2	3	-	2	-	-	-	-	-	-	2	-	-
CO4	Implement various machine learning algorithms for analyzing various datasets.	-	2	2	-	3	-	-	-	-	-	-	2	-	-
CO5	Analyze datasets using clustering and recommender systems	-	3	2	-	2	-	-	-	-	-	-	2	-	-
Course Code	**191IT8O12 -GAME PROGRAMMING (OPEN ELECTIVE – IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the concepts of Game design and development.	-	1	2	1	2	-	-	-	-	-	-	-	-	-
CO2	Design the processes and use mechanics for game development.	-	3	2	2	-	-	-	-	-	-	-	-	-	-
CO3	Explain the Core architectures of Game Programming.	-	1	3	1	2	-	-	-	-	-	-	-	-	-
CO4	Make use of Game programming platforms, frame works and engines to develop a game.	-	2	3	-	2	-	-	-	-	-	-	-	-	-
CO5	Create interactive Games.	-	3	2	-	2	-	-	-	-	-	-	-	-	-
Course Code	**191IT8O11-CLOUD COMPUTING (OPEN ELECTIVE – IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Interpret the key dimensions of the challenge of Cloud Computing	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Identify the economics, financial, and technological implications for selecting cloud computing for own organization	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Demonstrate the basic concepts of virtualization and implementation levels of Virtualization	2	-	1	-	-	-	-	-	-	-	-	1	-	-
CO4	Classify various storage systems and models in cloud computing environment.	2	-	1	-	-	-	-	-	-	-	-	2	-	-
CO5	Analyze the Cloud Security risks and Mechanisms.	2	-	1	-	-	-	-	-	-	-	-	-	-	-
CO6	Utilize cloud environment platform and tools for actively initiating, installing, and developing cloud-based applications	2	-	1	-	1	-	-	-	-	-	-	1	-	-
Course Code	**191CS8O16 -AR / VR (OPEN ELECTIVE – IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain VR, its environments and hardware technologies for 3D interfaces.	3	1	1	-	-	-	-	-	-	-	-	-	-	-
CO2	Summarize 3D user interface input hardware in VR environment.	3	2	1	-	-	-	-	-	-	-	-	-	-	-
CO3	Make use of software technologies to build VR applications.	2	1	2	-	3	-	-	-	-	-	-	-	-	-
CO4	Develop 3D user interfaces using 3D interaction techniques.	2	1	3	-	2	-	-	-	-	-	-	-	-	-
CO5	Describe the fundamental concepts of AR	2	3	1	-	-	-	-	-	-	-	-	-		-
Course Code	**191IT8O09-DEEP LEARNING (OPEN ELECTIVE – IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Demonstrate the mathematical foundation of neural network	3	2	-	2	-	-	-	-	-	-	-	-	-	-
CO2	Explain various machine learning algorithms and their importance for data analysis.	3	2	-	2	-	-	-	-	-	-	-	-	-	-
CO3	Illustrate the challenges and optimization strategies of deep neural network.	2	2	-	3	-	-	-	-	-	-	-	-	-	-
CO4	Build a convolutional neural network using different activation functions.	2	3	-	2	-	-	-	-	-	-	-	-	-	-
CO5	Build and train RNN and LSTMs using sequence modelling.	2	3	-	2	-	-	-	-	-	-	-	-	-	-

	CO Statements	POs												PSOs	
Course Code	**191IT8O10-BLOCK CHAIN TECHNOLOGIES (OPEN ELECTIVE – IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Demonstrate the foundation of the Blockchain technology and understand the processes in payment and funding.	2	2	1	-	-	-	-	-	-	-	-	2	-	-
CO2	Identify the risks involved in building Blockchain applications.	2	3	1	-	-	-	-	-	-	-	-	2	-	-
CO3	Review of legal implications using smart contracts.	2	2	1	-	-	-	-	-	-	-	-	2	-	-
CO4	Analyze the present landscape of Blockchain implementations to understand Crypto currency markets.	2	2	1	-	-	-	-	-	-	-	-	2	-	-
CO5	Examine how to profit from trading crypto currencies.	2	2	1	-	-	-	-	-	-	-	-	2	-	-
Course Code	**191PT8O07-CHEMICAL PROCESS SAFETY (OPEN ELECTIVE – IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the Process Safety, Accidents and Loss statistics, Toxicological Studies	2	-	-	-	-	1	-	-	-	-	-	1	-	2
CO2	Explain the fire and explosion and its prevention	2	-	-	-	-	1	-	-	-	-	-	1	-	2
CO3	Explain the Source model and dispersion, Relief sizing	2	-	-	-	-	1	-	-	-	-	-	1	-	2
CO4	Illustrate Hazard Identification, HAZOP analysis, Risk Assessment	2	-	-	-	-	1	-	-	-	-	-	1	-	2
CO5	Explain the Process of Accident Investigation, Reliability Engineering, Economics of loss prevention	2	-	-	-	-	1	-	-	-	-	-	1	-	2
Course Code	**191PT8O08-MECHANICAL UNIT OPERATIONS (OPEN ELECTIVE – IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the fundamentals of Mechanical unit operations	2	-	-	-	-	-	-	-	-	-	-	-	-	2
CO2	Explain storage of bulk solids and flow measurements.	2	-	-	-	-	-	-	-	-	-	-	-	-	2
CO3	Explain the Flow past immersed solid objects and motion of particles through fluids, beds of solids	2	-	-	-	-	-	-	-	-	-	-	-	-	2
CO4	Apply Filtration, flow through packed and fluidized beds, cross flow filtration	2	-	-	-	-	-	-	-	-	-	-	-	-	2
CO5	Explain the Gravity sedimentation, centrifugal separations, floatation	2	-	-	-	-	-	-	-	-	-	-	-	-	2
Course Code	**191AG8O06 -APPLICATIONS OF RS AND GIS IN LAND AND WATER RESOURCES MANAGEMENT (OPEN ELECTIVE – IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Apply the knowledge of RS and GIS in land and water resources management.	1	-	-	-	3	-	-	-	-	-	-	1	-	-
CO2	Explain DEM hydro-processing for watershed characterization.	1	-	-	-	2	-	-	-	-	-	-	-	-	-
CO3	Demonstrate the digital image processing techniques using ERDAS/ARC GIS software.	1	1	-	-	2	-	-	-	-	-	-	-	-	-
CO4	Apply the Geospatial techniques in irrigation water management.	1	-	1	-	3	-	-	-	-	-	-	1	-	-
CO5	Apply RS & GIS inputs for site suitability for various water related projects.	1	1	3	-	1	-	-	-	-	-	-	-	-	-

	CO Statements	POs												PSOs	
Course Code	**191AG8O07 -PLASTIC APPLICATIONS IN AGRICULTURE (OPEN ELECTIVE – IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Assess the types and quality of plastics used in soil and water conservation	2	1	-	-	-	-	3	-	-	-	2	-	-	-
CO2	Design, estimation and laying of plastic films in lining of canal, reservoir and water harvesting ponds	3	1	2	2	-	-	-	-	-	-	-	-	-	-
CO3	Design, estimation and installation of green, poly and shade net houses, low tunnels etc.	3	1	2	2	-	-	-	-	-	-	-	-	-	-
CO4	Explain plastics application in drying, preservation, handling and storage of agricultural produce.	3	1	-	2	-	2	-	-	-	-	-	-	-	-
CO5	Outline plastic usage due to hands on experience through visit to a greenhouse and farmer's field.	3	1	-	2	-	2	-	-	-	-	-	-	-	-
Course Code	**191PT8P04-PROJECT PART 2**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Demonstrate technical skills of data collection and data analysis adhering to professional ethics	1	1	-	-	-	-	-	2	-	-	-	1	-	-
CO2	Design the solutions for the critical problem areas marked in data analysis in the light of environmental and societal adherence	-	-	3	2	-	1	1	-	-	-	-	-	-	-
CO3	Build a team of people to work together and communicate well in the critical stages of project progress.	-	-	-	-	-	-	-	-	1	2	1	1	-	-
CO4	Use modern tools to derive conclusions of the project work effectively	-	-	-	-	3	-	-	-	-	2	1	1	-	-
CO5	Demonstrate the results of the project work as a functional product prototype/application/analytical solution for a specified operation	-	-	-	-	1	-	-	-	-	1	1	1	-	-