ADITYA ENGINEERING COLLEGE

An Autonomous Institution

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 Civil 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 Communicative English**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
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**	**PSO3**
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**	**PSO3**
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	-	-	-	-	-	-	-	-	-	-	-	-	

-	CO Statements	POs												PSOs		
CO3	Apply the structure- property relationship exhibited by solid materials within the elastic limit.	3	2	-	-	-	-	-	-	-	-	-	-	-	-	
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**	**PSO3**
CO1	Illustrate the fundamental concepts of computers and basics of computer programming	2	3	-	-	1	-	-	-	-	-	-	2	-	-	-
CO2	Make use of control structures and arrays in solving complex problems.	3	2	-	-	2	-	-	-	-	-	-	2	-	-	-
CO3	Develop modular program aspects and strings fundamentals.	2	2	3	-	-	-	-	-	-	-	-	1	-	-	-
CO4	Demonstrate the ideas of pointers usage.	2	3	-	-	2	-	-	-	-	-	-	2	-	-	-
CO5	Solve real world problems using the concept of structures, unions and File operations.	3	2	2	-	-	-	-	-	-	-	-	2	-	-	-
Course Code	**191HS1L01 Communicative English Lab-I**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
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**	**PSO3**
CO1	Determine the rigidity and young's modulus to understand material properties	3	2	-	-	-	-	-	-	2	-	-	1	-	-	-
CO2	Determine Acceleration due to Gravity, 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**	**PSO3**
CO1	Develop the basic programs in C and draw the flowcharts using Raptor.	2	1	-	-	3	-	-	-	-	2	-	-	-	-	-

-	CO Statements	POs												PSOs		
CO2	Make use of conditional and iterative statements to solve real time scenarios in C.	3	2	-	-	-	-	-	-	-	-	1	2	-	-	-
CO3	Apply the concept of arrays, modularity and strings to handle complex problems.	3	2	-	-	-	-	-	-	-	-	1	2	-	-	-
CO4	Apply the dynamic memory allocation functions using pointers.	2	3	-	-	-	-	-	-	-	2	-	1	-	-	-
CO5	Develop programs using structures, and Files.	3	2	-	-	-	-	-	-	-	-	2	2	-	-	-
Course Code	**191ES1L02 BASIC ENGINEERING WORKSHOP**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
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**	**PSO3**
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**	**PSO3**
CO1	Explain historical background of the 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**	**PSO3**
CO1	Solve improper integrals using beta and gamma functions.	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Solve partial differential equations of first order.	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-

-	CO Statements	POs												PSOs		
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	-	-	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191BS2T06 Chemistry of Materials**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
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**	**PSO3**
CO1	Make use of fundamentals of Engineering Drawing to sketch basic curves, conic sections, cycloid, epicycloid, hypocycloid and involute.	1	-	-	-	-	-	-	-	-	1	-	1	1	-	-
CO2	Apply the principles of orthographic projections for points, lines and planes.	1	-	-	-	-	-	-	-	-	1	-	1	1	-	-
CO3	Apply the principles of orthographic projections for solids.	1	-	-	-	-	-	-	-	-	1	-	1	1	-	-
CO4	Apply the AutoCAD software for the orthographic projection of the machine parts.	1	-	-	-	3	-	-	-	-	1	-	1	1	-	-
CO5	Apply the AutoCAD software for the isometric projection of the machine parts.	1	-	-	-	3	-	-	-	-	1	-	1	1	-	-
Course Code	**191ES2T03 Essential Electrical and Electronics Engineering**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
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**	**PSO3**
CO1	Determine the resultant force and moment for a given force system.	2	2	-	-	-	-	-	-	-	-	-	-	1	-	-
CO2	Solve the member forces in trusses.	1	2	-	-	-	-	-	-	-	-	-	-	1	-	-
CO3	Apply concept of Virtual work to find the work done by force and couple.	1	2	-	-	-	-	-	-	-	-	-	-	1	-	-

-	CO Statements	POs												PSOs		
CO4	Solve the centre of gravity and moment of inertia for various geometric shapes	2	2	-	-	-	-	-	-	-	-	-	-	1	-	-
CO5	Determine the displacement, velocity and acceleration relations in dynamic systems	3	2	-	-	-	-	-	-	-	-	-	-	1	-	-
CO6	Apply the concepts of kinematics, kinetics, work - energy and impulse - momentum methods to particle motion.	3	2	-	-	-	-	-	-	-	-	-	-	1	-	-
Course Code	**191HS2L02 Communicative English Lab-II**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
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	Demonstrate in 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**	**PSO3**
CO1	Demonstrate Complexometric titrations by volumetric analysis.	2	-	-	-	-	-	-	-	1	1	-	1	-	-	-
CO2	Demonstrate Acid – Base titrations by instrumental analysis.	2	-	-	-	-	-	-	-	1	1	-	1	-	-	-
CO3	Estimate Vitamin C using volumetric analysis.	2	-	-	-	-	-	-	-	1	1	-	1	-	-	-
CO4	Prepare polymer like Bakelite.	2	-	-	-	-	-	-	-	1	1	-	1	-	-	-
CO5	Prepare alternative fuel like Bio-Diesel.	2	-	-	-	-	-	1	-	1	1	-	1	-	-	-
Course Code	**191ES2L03 Essential Electrical and Electronics Engineering Lab**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Analyze the electrical networks using network theorems.	3	2	1	1	-	-	-	-	-	-	-	-	-	-	-
CO2	Analyze the performance of AC and DC Machines.	3	2	2	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Estimate the performance of 1-phase transformer.	3	2	1	1	-	-	-	-	-	-	-	-	-	-	-
CO4	Explain diode characteristics and its applications	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	Explain the simulation of diode and transistor.	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191ES2L04 CIVIL ENGINEERING WORKSHOP**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Develop a line diagram of a building by using chain/tape and other accessories.	3	2	-	-	-	-	-	-	-	-	-	-	2	-	-
CO2	Construct a brick wall using English bond.	3	2	-	-	-	-	-	-	-	-	-	-	2	-	-
CO3	Assemble a pipe line as per the piping layout using pipes and accessories.	2	2	-	-	-	-	-	-	-	-	-	-	2	-	-
CO4	Plaster a given brick surface and paint it.	3	2	-	-	-	-	-	-	-	-	-	-	2	-	-
CO5	Lay tiles for flooring.	3	2	-	-	-	-	-	-	-	-	-	-	2	-	-

-	CO Statements	POs												PSOs		
Course Code	**191PR2P01 ENGINEERING EXPLORATION PROJECT**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Analyze the surrounding environment and identify a design challenge	1	1	1	-	-	-	-	-	-	-	-	1	-	2	-
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	-	-	-	-	-	-	-	-
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**	**PSO3**
CO1	Compute the Fourier series of a function.	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Compute the Fourier transformof a function.	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Compute Laplace transform of a function.	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	Apply Laplace transform to solve initial value problems.	3	2	-	-	-	-	-	-	-	1	-	-	-	-	-
CO5	Solve one dimensional heat equation, wave equation and two-dimensionalLaplace equation	3	2	-	-	-	-	-	-	-	1	-	-	-	-	-
Course Code	**191ES3T10 INTERNET OF THINGS**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Identify the application areas of IoT.	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-
CO2	Illustrate revolution of Internet in Mobile Devices, Cloud & Sensor Networks.	2	-	-	-	1	-	-	-	-	-	-	-	-	-	-
CO3	Identify communication protocols used in IoT.	3	-	-	-	1	-	-	-	-	-	-	-	-	-	-
CO4	Make use of python programming to implement Internet of Things.	3	2	-	1	1	-	-	-	-	-	-	-	-	-	-
CO5	Design IoT applications using Raspberry Pi.	3	1	-	1	1	-	-	-	-	-	-	-	-	-	-
Course Code	**191HS3T02 MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain the Managerial Economic concepts for decision making and forward planning.	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
CO2	Illustrate the law of demand and its exceptions, to use different forecasting methods for predicting demand for various products and services.	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-
CO3	Identify the cost behavior, costs useful for managerial decision making and Break Even Point (BEP) of an enterprise.	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-
CO4	Outline the different types of business organizations along with basic knowledge on business cycle.	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-

-	CO Statements	POs												PSOs		
CO5	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.	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-
CO6	Utilize various techniques on investment project proposals with the help of capital budgeting techniques for decision making.	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-
Course Code	**191CE3T01 STRENGTH OF MATERIALS-I**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Calculate the behavior of basic materials under the influence of different external loading and the support conditions	3	2	1	-	-	-	-	-	-	-	-	-	-	1	-
CO2	Prepare the diagrams indicating the variation of the key performance features like bending moment and shear forces.	3	2	1	-	-	-	-	-	-	-	-	-	-	2	-
CO3	Compute the bending stresses in beams when subjected to bending.	3	-	1	-	-	-	-	-	-	-	-	-	-	2	-
CO4	Calculate the shear stress across various sections of a beam subjected to shear force	3	2	1	-	-	-	-	-	-	-	-	-	-	2	-
CO5	Calculate the deflections in various beams under different loading and support conditions.	3	2	1	-	-	-	-	-	-	-	-	-	-	2	-
Course Code	**191CE3T02 FLUID MECHANICS**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Apply physical properties of fluid and buoyancy phenomenon in fluid related problem.	3	2	-	-	-	-	-	-	-	-	-	-	2	-	-
CO2	Choose equations to calculate hydrostatic forces on submerged bodies and fluid kinematic flow problems.	3	2	-	-	-	-	-	-	-	-	-	-	2	-	-
CO3	Solve fluid dynamics and flow measurement problems using appropriate equations.	3	2	-	-	-	-	-	-	-	-	-	-	2	-	-
CO4	Identify concepts on laminar and turbulent flows and various losses in pipes.	3	2	-	-	-	-	-	-	-	-	-	-	2	-	-
CO5	Solve problems on boundary layer theory.	3	2	-	-	-	-	-	-	-	-	-	-	2	-	-
Course Code	**191CE3T03 SURVEYING**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Survey the linear and angular distances using chain, compass instruments.	3	2	2	-	-	-	-	-	-	-	-	-	2	-	-
CO2	Make use of appropriate techniques in order to estimate the level of existing ground.	3	2	1	-	-	-	-	-	-	-	-	-	2	-	-
CO3	Solve height and distances problems using Theodolite and Tachometry.	3	2	1	1	-	-	-	-	-	-	-	-	2	-	-
CO4	Utilize various advanced surveying equipment for large projects.	3	2	1	1	-	-	-	-	-	-	-	-	2	-	-
CO5	Determine regular, irregular areas and volumes of given field	3	2	2	1	-	-	-	-	-	-	-	-	2	-	-
Course Code	**191CE3L01 SURVEYING LAB**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Develop the plan and map that shows the ground features.	3	-	-	1	-	-	-	-	-	-	-	-	2	-	-
CO2	Plan a contour map to estimate the levels of existing ground.	3	-	-	1	-	-	-	-	-	-	-	-	2	-	-

-	CO Statements	POs												PSOs		
CO3	Analyze height and distances problems using appropriate surveying principles.	3	2	1	1	-	-	-	-	-	-	-	-	2	-	-
CO4	Utilize various advanced surveying equipment for large projects.	3	-	-	1	-	-	-	-	-	-	-	-	2	-	-
CO5	Determine areas and distances by total station of a given field	3	2	2	2	-	-	-	-	-	-	-	-	2	-	-
Course Code	**191CE3T04 COMPUTER AIDED CIVIL ENGINEERING DRAWING**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain basic terms plan section and elevation in drawing.	2	-	-	-	2	-	-	2	-	-	-	-	-	-	2
CO2	Identify sign conventions and symbols used in civil engineering drawing.	3	-	1	-	3	-	-	2	-	-	-	-	-	-	2
CO3	Apply building bye-laws for building planning.	3	-	1	-	2	-	-	2	-	-	-	-	-	-	2
CO4	Sketch various views of building by visualizing the details.	3	-	1	-	2	-	-	2	-	-	-	-	-	-	2
CO5	Summarize basic procedures using BIM.	2	-	-	-	2	-	-	2	-	-	-	-	-	-	2
Course Code	**191CE3L02 STRENGTH OF MATERIALS LAB**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Illustrate the stress-strain relationship for mild steel/HYSD bars.	2	1	-	-	-	-	-	-	-	-	-	-	1	-	-
CO2	Determine modulus of rigidity of spring.	3	2	-	1	-	-	-	-	-	-	-	-	2	-	-
CO3	Find the hardness of metals by Brinell hardness number, Rockwell &Vicker's apparatus.	3	2	-	1	-	-	-	-	-	-	-	-	2	-	-
CO4	Estimate the impact resistance of materials by Charpy & Izod tests.	3	2	-	1	-	-	-	-	-	-	-	-	2	-	-
CO5	Determine the young's modulus of the given beam material	2	3	-	1	-	-	-	-	-	-	-	-	3	-	-
Course Code	**191MC3A03 EMPLOYABILITY SKILLS – I**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
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**	**PSO3**
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	-	-	-	-	-	-	-	-

-	CO Statements	POs												PSOs		
IV SEM																
Course Code	**191BS4T16 NUMERICAL METHODS & STATISTICAL TECHNIQUES**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Apply numerical methods to solve equations and interpolation of polynomials.	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Apply numerical methods to solve initial value problems and problems involving integration.	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Apply discrete and continuous probability distributions.	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	Compute the components of a classical hypothesis test.	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	Apply the statistical inferential methods based on small and large sampling tests.	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191HS4T03 MANAGEMENT SCIENCE**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Apply management and motivation theories to renovate the practice of management.	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-
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	-	-	-	-	-
CO3	Appraise the functional management challenges associated with high levels of change in the organizations.	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-
CO4	Identify activities with their interdependency and use scheduling techniques of project management PERT/CPM.	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
CO5	Develop global vision and management skills both at strategic level and interpersonal level.	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Course Code	**191CE4T05 STRUCTURAL ANALYSIS**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Analyse propped cantilever beams and fixed beams under different loading and support conditions	3	2	2	-	-	-	-	-	-	-	-	-	2	-	-
CO2	Analyse continuous beams under different loading and support conditions by theorem of three moments and Slope deflection method.	3	2	2	-	-	-	-	-	-	-	-	-	2	-	-
CO3	Analyze the structures using Moment distribution method and Kani's method	33	2	2	-	-	-	-	-	-	-	-	-	2	-	-
CO4	Analyze the structures using Flexibility and Stiffness matrix methods.	3	2	1	-	-	-	-	-	-	-	-	-	2	-	-
CO5	Develop the influence line diagrams for various types of moving loads onbeams/bridges and trusses.	3	2	-	-	-	-	-	-	-	-	-	-	2	-	-
Course Code	**191CE4T06 CONSTRUCTION MATERIALS AND CONCRETE TECHNOLOGY**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain the sources, properties and applications of common building materials.	2	-	-	-	-	2	3	-	-	-	-	-	1	-	-

-	CO Statements	POs												PSOs		
CO2	Demonstrate the properties of different materials and Illustrate different constructions of brick and stone masonry.	2	-	-	-	-	2	3	-	-	-	-	-	1	-	-
CO3	Classify the fresh and the hardened concrete properties.	3	-	-	-	-	2	3	-	2	-	-	-	2	-	-
CO4	Design the concrete mix by BIS method.	3	-	-	-	-	2	3	-	-	-	-	-	2	-	-
CO5	Summarise the basic concepts of special concrete	2	-	-	-	-	2	3	-	-	-	-	-	1	-	-
Course Code	**191CE4T07 STRENGTH OF MATERIALS-II**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Calculate the principal stresses developed when subjected to stresses along different axes and design the sections.	3	2	1	-	-	-	-	-	-	-	-	-	-	2	-
CO2	Determine the effect on springs and shafts when subjected to torsion.	3	2	1	-	-	-	-	-	-	-	-	-	-	2	-
CO3	Solve the load carrying capacity of columns using different empirical formulae.	3	2	1	-	-	-	-	-	-	-	-	-	-	2	-
CO4	Determine the combined effect of direct and bending stresses of different engineering structures.	3	2	1	-	-	-	-	-	-	-	-	-	-	2	-
CO5	Analyze the trusses by using method of joints and method of sections	3	3	2	-	-	-	-	-	-	-	-	-	-	3	-
Course Code	**191CE4T08 HYDRAULICS & HYDRAULIC MACHINERY**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Illustrate different kinds of flow behavior in open channel flow	2	1	-	-	-	-	-	-	-	-	-	-	1	-	-
CO2	Determine dynamic equations and surface profiles of non-uniform flows.	3	2	-	-	-	-	-	-	-	-	-	-	2	-	-
CO3	Apply the knowledge of similitude in hydraulic model testing and hydrodynamic for cesofjets.	3	2	-	-	-	-	-	-	-	-	-	-	2	-	-
CO4	Make use of working proportion stood hydraulic design of turbines	3	2	1	-	-	-	-	-	-	-	-	-	2	-	-
CO5	Determineperformancecharacteristicsofcentrifugalandreciprocatingpumps	3	2	-	-	-	-	-	-	-	-	-	-	2	-	-
Course Code	**191CE4L03 FLUID MECHANICS & HYDRAULIC MACHINERY LAB**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Examine the calibration of different flowmeters.	3	-	-	2	-	-	-	-	-	-	-	-	3	-	-
CO2	Illustrate flow measuring devices used in pipes,channels,and tanks	2	-	-	3	-	-	-	-	-	-	-	-	1	-	-
CO3	Determine major and minor losses inpipes	3	-	-	2	-	-	-	-	-	-	-	-	3	-	-
CO4	Analyze energy equation for problems on flow through pipes	3	-	-	2	-	-	-	-	-	-	-	-	3	-	-
CO5	Identify the flow behavior in openchannels.	3	-	-	1	-	-	-	-	-	-	-	-	2	-	-
CO6	Examine the performance characteristics of turbines andpumps	3	-	-	2	-	-	-	-	-	-	-	-	3	-	-
Course Code	**191CE4L04 CONSTRUCTION MATERIALS AND CONCRETE TECHNOLOGY LAB**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain the importance of testing of cement and its properties.	3	2	-	-	-	-	-	-	-	-	-	-	2	-	-
CO2	Examine different properties of aggregates.	3	2	-	-	-	-	-	-	-	-	-	-	2	-	-
CO3	Determine the workability of concrete.	3	2	-	-	-	-	-	-	-	-	-	-	2	-	-
CO4	Experiment with the properties of hardened concrete.	3	2	-	-	-	-	-	-	-	-	-	-	2	-	-
CO5	Demonstrate the non-destructive testing procedures on concrete.	2	1	-	-	-	-	-	-	-	-	-	-	1	-	-

-	CO Statements	POs												PSOs		
Course Code	**191MC4A05 EMPLOYABILITY SKILLS– II**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Examine the symbols, notations and Venn -diagrams.	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CO2	Solve different types of number systems problems.	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CO3	Solve ratio & proportion, ages and averages by using simple logic.	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CO4	Apply negotiation skills and leadership skills in a team	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-
CO5	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**	**PSO3**
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	**191CE5T09 IRRIGATION & WATER RESOURCE ENGINEERING**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain the major hydrological components, various abstractions of precipitation and characteristics of runoff.	2	-	-	-	-	-	3	-	-	-	1	-	2	-	-
CO2	Analyze the different types of unit hydrographs, flood frequency studies and flood routing techniques.	_	-	3	-	-	-	2	-	-	-	1	-	2	-	-
CO3	Classify the various irrigation systems, sources of groundwater and diversion head works.	3	-	1	-	-	-	-	-	-	-	-	-	3	-	-
CO4	Illustrate the various design considerations of canal linings, canal structures canal regulation and cross drainage works.	3	-	2	-	-	-	-	-	-	-	-	-	2	-	-
CO5	Analyze the reservoir planning and design aspects of gravity dams, earthen dams, and spillways.	3	-	2	-	-	-	-	-	-	-	-	-	2	-	-
Course Code	**191CE5T10 ENGINEERING GEOLOGY**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Illustrate weathering process, mass movement and their importance.	2	1	-	-	-	-	-	-	3	-	-	-	1	-	-
CO2	Distinguish between different petrological formations, rock structures and mineral identification.	3	2	-	2	-	-	-	-	2	-	-	-	2	-	-
CO3	Differentiate various secondary geological formations.	3	2	-	2	-	-	-	-	2	-	-	-	2	-	-
CO4	Identify surface, subsurface formations and groundwater potential using geophysical investigation methods.	3	2	-	1	-	-	-	-	2	-	-	-	2	-	-

-	CO Statements	POs												PSOs		
CO5	Apply geological principles in natural hazards assessment and selection of sites for dams and tunnels.	3	2	-	1	-	-	-	-	2	-	-	-	2	-	-
Course Code	**191CE5T11 DESIGN AND DRAWING OF REINFORCED CONCRETE STRUCTURES**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Utilize different types of design philosophies	-	2	1	-	-	3	-	-	-	-	-	-	-	2	-
CO2	Explain the concept of limit state design and apply it to beams	-	2	2	-	-	3	-	-	-	-	-	-	-	2	-
CO3	Design flanged sections subjected to shear, torsion and bond	-	3	2	-	-	2	-	-	-	-	-	-	-	2	-
CO4	Design different type of compression members and footings	-	3	2	-	-	2	-	-	-	-	-	-	-	2	-
CO5	Design one-way slabs and two-way slabs	-	3	2	-	-	2	-	-	-	-	-	-	-	1	-
Course Code	**191CE5T12 GEOTECHNICAL ENGINEERING**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Apply physical properties of soil and grain size analysis.	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Choose equations to calculate constant head and variable head permeability's.	3	2	-	-	-	-	-	-	2	2	-	-	2	-	-
CO3	Solve stress distribution in soils.	3	2	-	-	2	-	-	-	2	2	-	-	2	-	-
CO4	Identify concepts on compaction and consolidation.	3	2	-	-	2	-	-	-	2	-	-	-	2	`	-
CO5	Solve problems on shear strength of soils.	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191CE5E02 CONSTRUCTION TECHNOLOGY & MANAGEMENT (Professional Elective-I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Apply the techniques of preliminary planning.	3	2	-	-	-	-	-	-	-	-	-	-	2	-	-
CO2	Solve the networks of project.	2	3	2	2	-	-	-	-	-	-	-	-	3	-	-
CO3	Apply the techniques of execution of works.	3	2	-	-	2	-	-	-	-	-	-	-	2	-	-
CO4	Apply the techniques of quality management.	3	2	-	-	2	-	-	-	-	-	-	-	2	-	-
CO5	Apply the techniques of quality control in construction.	3	2	-	-	-	-	-	-	-	-	-	-	2	-	-
Course Code	**191CE5E04 SUB-SURFACE INVESTIGATION AND INSRUMENTATION (Professional Elective-I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Apply various exploration methods in soil and rock.	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Choose equations to calculate boring and augering methods and their usage for various projects.	3	2	-	-	-	-	-	-	2	2	-	-	2	-	-
CO3	Prepare bore logs for different soil strata.	3	2	-	-	2	-	-	-	2	2	-	-	2	-	-
CO4	Identify methods and specifications of field testing of soils.	3	2	-	-	2	-	-	-	2	-	-	-	2	-	-
CO5	Solve field and laboratory data and prepare soil investigation report.	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191CE5E01 AIRPORT PLANNING AND DESIGN (Professional Elective-I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Apply the techniques of Airport planning.	3	2	-	-	-	-	-	-	-	-	-	-	-	1	-
CO2	Solve the Runway Design and Airport Capacity.	2	3	2	2	-	-	-	-	-	-	-	-	-	2	-
CO3	Solve the Design of Airport Pavements.	2	3	2	2	-	-	-	-	-	-	-	-	-	2	-
CO4	Apply the Air Travel Demand Analysis.	3	2	-	-	-	-	-	-	-	-	-	-	-	1	-
CO5	Apply the techniques of quality control in construction.	3	2	-	-	-	-	-	-	-	-	-	-	-	1	-

-	CO Statements	POs												PSOs		
Course Code	**191CE5E05 URBAN HYDROLOGY (Professional Elective-I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Illustrate the importance of urban hydrological cycle.	3	1	-	-	-	-	-	-	-	-	2	-	2	-	-
CO2	Apply the rational method and NRCS curve number approach for estimating runoff quality and quantity in urban drainage systems.	3	2	1	-	-	-	-	-	-	-	-	-	2	-	-
CO3	Describe the various elements of drainage systems.	2	1	-	-	-	-	-	-	-	-	-	-	2	-	-
CO4	Differentiate the different storm water drainage structures and best practices in storm water management.	3	1	2	-	-	-	-	-	-	-	-	-	2	-	-
CO5	Summarize the various concepts required in the preparation of master drainage plans.	3	2	-	-	-	-	-	-	-	-	1	-	2	-	-
Course Code	**191CE5E03 ENVIRONMENTAL POLLUTION AND CONTROL(Professional Elective-I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Choose the specific air pollutant controldevices.	3	2	-	-	-	-	-	-	-	-	-	-	-	1	-
CO2	Explain the NAAQ standards and Noise pollution control strategies.	2	1	-	-	-	-	-	-	3	-	-	-	-	1	-
CO3	Classify the treatment techniques used for sewage and industrial wastewater treatmentmethods.	2	1	-	-	2	-	-	-	2	-	-	-	-	1	-
CO4	Determine the various characteristics of the municipal solid and hazardous waste.	1	1	-	-	3	-	-	-	1	-	-	-	-	2	-
CO5	Illustrate the methods of environmental sanitation and the management of community facilities.	2	2	-	-	-	-	-	-	-	-	-	-	-	1	-
Course Code	**191CE5O01 BASIC CONCRETE TECHNOLOGY (OPEN ELECTIVE – I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain the basic concepts of concrete and admixtures	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	Explain the properties of ingredients of concrete.	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	Select the suitability of different types of aggregate for their use	2	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO4	Explain the destructive and non-destructive tests on Hardened Concrete	2	1	-	-	-	-	-	-	-	-	-	-	-	3	-
CO5	Illustrate the concept of special concrete and their use.	2	1	-	-	-	-	-	-	-	-	-	-	-	1	-
Course Code	**191EE5O01 ELECTRICAL SAFETY (OPEN ELECTIVE – I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Describe electrical hazards and safety equipment	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	Apply various grounding and bonding techniques	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	Select appropriate safety method for low, medium and high voltage equipment	2	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO4	Discuss safety managmenet and organizing structure	2	1	-	-	-	-	-	-	-	-	-	-	-	3	-
CO5	Demonstrate proper maintenance of electrical equipment by understanding various standards	2	1	-	-	-	-	-	-	-	-	-	-	-	1	-

-	CO Statements	POs												PSOs		
Course Code	**191EE5O02 ELECTRICAL MATERIALS (OPEN ELECTIVE – I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Identify various types of dielectric materials, their properties in various conditions	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	Analyze magnetic materials and their behaviour.	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	Evaluate semiconductor materials and technologies	2	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO4	Explain the application of Materials in electrical engineering	2	1	-	-	-	-	-	-	-	-	-	-	-	3	-
CO5	Explain the application of Special Purpose Materials in electrical engineering	2	1	-	-	-	-	-	-	-	-	-	-	-	1	-
Course Code	**191EE5O03 BASIC ELECTRICAL MEASUREMENTS (OPEN ELECTIVE – I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Analyze the behaviour of different types of torques in instruments.	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	Select the right type of instrument for measurement of voltage, current, power &energy	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	Develop the suitable bridge for the measurement of electrical parameters	2	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO4	Develop the suitable bridge for the measurement of electrical parameters	2	1	-	-	-	-	-	-	-	-	-	-	-	3	-
CO5	Explain frequency and phase difference between signals using CRO.	2	1	-	-	-	-	-	-	-	-	-	-	-	1	-
Course Code	**191ME5O01 RENEWABLE ENERGY SOURCES (OPEN ELECTIVE – I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Analyze solar radiation data, extraterrestrial radiation, and radiation on earth's surface.	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	Examine the solar photo voltaic systems.	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	Develop maximum power point techniques in solar PV and wind energy systems.	2	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO4	Illustrate the wind energy conversion systems, wind generators and power generation	2	1	-	-	-	-	-	-	-	-	-	-	-	3	-
CO5	Explain basic principle and working of tidal, biomass, fuel cell and geothermal systems	2	1	-	-	-	-	-	-	-	-	-	-	-	1	-
Course Code	**191ME5O02 FUNDAMENTALS OF MECHANICAL ENGINEERING (OPEN ELECTIVE – I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Compare the different types of boilers, mountings and accessories	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	Interpret different manufacturing methods.	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	Explain the working of air compressors and refrigeration.	2	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO4	Explain the working principle of Internal Combustion Engines and their performance	2	1	-	-	-	-	-	-	-	-	-	-	-	3	-

-	CO Statements	POs												PSOs		
CO5	Compute the parameters of mechanical components for power transmission	2	1	-	-	-	-	-	-	-	-	-	-	-	1	-
Course Code	**191ME5O03 SUPPLY CHAIN MANAGEMENT (OPEN ELECTIVE – I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain the framework and scope of supply chain network and functions.	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	Appraise the importance of the design and redesign of a supply chain as key components of an organization's strategic plan	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	Explain the strategic importance of logistic elements and describe how they affect supply chain management	2	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO4	Analyze the creation of new value in the supply chain for customers, society and the environment	2	1	-	-	-	-	-	-	-	-	-	-	-	3	-
CO5	Develop coordinated and collaborative processes and activities among the business partners in a supply chain, leveraging current and emerging technologies.	2	1	-	-	-	-	-	-	-	-	-	-	-	1	-
Course Code	**191ME5O04 3D PRINTING (OPEN ELECTIVE – I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Summarize the basics of Additive manufacturing (AM) technologies	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	Explain about vat photo polymerization, material jetting and binder jetting AM technologies.	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	Explain material extrusion and sheet lamination AM technologies.	2	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO4	Illustrate Powder Bed Fusion and Directed Energy Deposition AM technologies	2	1	-	-	-	-	-	-	-	-	-	-	-	3	-
CO5	Apply the AM techniques in different industries	2	1	-	-	-	-	-	-	-	-	-	-	-	1	-
CO6	Select AM technologies using decision methods															
Course Code	**191ME5O04 ENTREPRENEURSHIP DEVELOPMENT AND INCUBATION (OPEN ELECTIVE – I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Describe the meaning and concepts of entrepreneurship development	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	Apply the business plan for preparation and evaluation of project.	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	Explain about Institutional Support to Entrepreneur and MSMEs	2	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO4	Explain about the Opportunities of Entrepreneurship Internationally.	2	1	-	-	-	-	-	-	-	-	-	-	-	3	-
CO5	Explain about Informaal Risk Capital, Venture capital and Social responsibility for entrepreneurship	2	1	-	-	-	-	-	-	-	-	-	-	-	1	-
Course Code	**191EC5O01 SIGNALS AND SYSTEMS (OPEN ELECTIVE – I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Categorize signals and systems based on their characteristics.	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	Demonstrate the spectral characteristics of signals using Fourier series	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	Demonstrate the spectral characteristics of signals using Fourier Transform	2	1	-	-	-	-	-	-	-	-	-	-	-	2	-

-	CO Statements	POs												PSOs		
CO4	Identify system characteristics in time domain and frequency domain	2	1	-	-	-	-	-	-	-	-	-	-	-	3	-
CO5	Apply Laplace transform techniques for the analysis of continuous time signals and Systems	2	1	-	-	-	-	-	-	-	-	-	-	-	1	-
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**	**PSO3**
CO1	Interpret numeric information in different code formats.	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	Develop optimized logic by using various optimization algorithms.	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	Construct various combinational logic circuits for required specifications	2	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO4	Build different Programmable Logic Device for required specifications.	2	1	-	-	-	-	-	-	-	-	-	-	-	3	-
CO5	Build different sequential logic circuits for required specifications.	2	1	-	-	-	-	-	-	-	-	-	-	-	1	-
Course Code	**191EC5O03 SEMICONDUCTOR DEVICES (OPEN ELECTIVE – I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Interpret the characteristics of semiconductor diodes	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	Apply the knowledge of semiconductors in the functioning of BJT	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	Demonstrate the switching and amplification application of FET	2	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO4	Classify the semiconductor devices for special Applications	2	1	-	-	-	-	-	-	-	-	-	-	-	3	-
CO5	Identify the sensor types used in various applications and explain their principle of operation.	2	1	-	-	-	-	-	-	-	-	-	-	-	1	-
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**	**PSO3**
CO1	Compare and contrast object oriented programming and procedural oriented programming.	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	Summarize the OOPS concepts	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	Make use of constructor and destructor to initialize and destroy class objects	2	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO4	Develop programs using virtual functions and Polymorphism.	2	1	-	-	-	-	-	-	-	-	-	-	-	3	-
CO5	Apply inheritance to build real time applications, Exception handling mechanism to handle runtime errors.	2	1	-	-	-	-	-	-	-	-	-	-	-	1	-
CO6	Develop C++ classes with templates and STL															
Course Code	**191CS5O03 JAVA PROGRAMMING (OPEN ELECTIVE – I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Apply object oriented programming features and concepts for solving given problem	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	Solve real time problems using the concepts of class, inheritance, interface and packages	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	Test for runtime exceptions arise in java applications	2	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO4	Develop real time applications using multithreading and I/O streams.	2	1	-	-	-	-	-	-	-	-	-	-	-	3	-

-	CO Statements	POs												PSOs		
CO5	Develop GUI applications using event handlers, adapter classes, AWT and Swing components.	2	1	-	-	-	-	-	-	-	-	-	-	-	1	-
Course Code	**191CS5O04 R PROGRAMMING (OPEN ELECTIVE – I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Illustrate the basic concepts and advanced data structures of R programming.	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	Explain the control statements and operators in R	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	Implement simulation, Probability and linear algebra operations.	2	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO4	Make use of graph functions for better visualization of results	2	1	-	-	-	-	-	-	-	-	-	-	-	3	-
CO5	Develop programs for distribution functions and regression models.	2	1	-	-	-	-	-	-	-	-	-	-	-	1	-
Course Code	**191IT5O01 DATABASE MANAGEMENT SYSTEMS (OPEN ELECTIVE – I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Identify the database characteristics and various database architectures.	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	Interpret relational database using SQL.	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	Examine issues in data storage and query processing for appropriate solutions	2	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO4	Make use of normalization techniques to build database system for real world problems	2	1	-	-	-	-	-	-	-	-	-	-	-	3	-
CO5	Illustrate the mechanisms of transaction management	2	1	-	-	-	-	-	-	-	-	-	-	-	1	-
Course Code	**191IT5O02 COMPUTER GRAPHICS (OPEN ELECTIVE – I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Identify the applications of computer graphics and Video Display devices for implementing Graphical user interface	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	Analyze output primitives and filled area primitives in implementing various algorithms	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	Make use of Geometric Transformations, Viewing and Clipping in 2D & 3D Graphics	2	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO4	Illustrate various Visual Surface detection Methods in 3D Graphics.	2	1	-	-	-	-	-	-	-	-	-	-	-	3	-
CO5	Apply OpenGL for General Computer Animations	2	1	-	-	-	-	-	-	-	-	-	-	-	1	-
CO6	Explain different object color modeling techniques, Fractals and Ray tracing concepts															
Course Code	**191MI5O01 OVERVIEW OF MINING (OPEN ELECTIVE – I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Analyze different stages in the life of a mine.	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	Choose a suitable location for opening to a deposit	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	Organize for building appropriate permanent lining, drift with proper ventilation and lighting arrangements.	2	1	-	-	-	-	-	-	-	-	-	-	-	2	-

-	CO Statements	POs												PSOs		
CO4	Select the special methods need to be adopted for a particular situation	2	1	-	-	-	-	-	-	-	-	-	-	-	3	-
CO5	Explain the impact of mining activities on environment	2	1	-	-	-	-	-	-	-	-	-	-	-	1	-
Course Code	**191PT5O02 FUNDAMENTALS OF PETROLEUM INDUSTRY (OPEN ELECTIVE – I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
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	-
CO3	Explain the hydro carbon activity in reservoir, logging, testing and completion.	2	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO4	Analyze various case studies available in petrochemical, chemical, bioprocesses for treatment of wastage	2	1	-	-	-	-	-	-	-	-	-	-	-	3	-
CO5	Analyze various modifications to well for better production rate	2	1	-	-	-	-	-	-	-	-	-	-	-	1	-
Course Code	**191AG5O01 BASIC CROP PRODUCTION PRACTICES (OPEN ELECTIVE – I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain factors affecting on crop growth and production.	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	Explain crop selection and establishment of an adequate crop stand and ground cover	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	Explain crop water management using integrated water management methods.	2	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO4	Apply agricultural crops production practices in field	2	1	-	-	-	-	-	-	-	-	-	-	-	3	-
CO5	Apply the horticulture crops production practices in field.	2	1	-	-	-	-	-	-	-	-	-	-	-	1	-
Course Code	**191CE5L05 ENGINEERING GEOLOGY LAB**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Apply the knowledge of geology in the field of civil engineering.	3	2	-	-	-	-	-	-	-	-	-	-	3	-	-
CO2	Explain physical properties of various minerals androcks.	2	1	-	-	-	-	-	-	-	-	-	-	2	-	-
CO3	Interpret geological maps, topographical maps, and satellite imagery.	2	1	-	-	-	-	-	-	-	-	-	3	2	-	-
CO4	Identify various geologicalformations.	3	2	-	1	-	-	-	-	-	-	-	-	3	-	-
CO5	Distinguish various landforms and rock formations in constructional areas through fieldexaminations.	3	2	-	2	-	-	-	-	-	-	-	-	3	-	-
Course Code	**191CE5L06 GEOTECHNICAL ENGINEERING LAB**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Apply the knowledge of soil mechanics in the field of civil engineering	3	2	1	-	-	-	-	-	-	-	-	-	2	-	-
CO2	Determine the identification of physical properties of various soils.	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
CO3	Interpret with permeability characteristics of soils	2	1	-	-	-	-	-	-	-	-	-	-	1	-	-
CO4	Determine the identification of consolidation properties of clayey soils.	3	2	1	-	-	-	-	-	-	-	-	-	2	-	-
CO5	Distinguish various types of shear parameters by using UCS test	3	2	2	-	-	-	-	-	-	-	-	-	3	-	-

-	CO Statements	POs												PSOs		
Course Code	**191HS5T06 EMPLOYABILITY SKILLS – III**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
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	**191MC5A07 SURVEYING CAMP**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Determine areas of regular and irregular fields.	3	-	-	1	-	-	-	-	-	-	-	-	2	-	-
CO2	Estimating the levels of existing groundlevels.	3	-	-	2	-	-	-	-	-	-	-	-	3	-	-
CO3	Develop contour plans from the existing groundlevels.	3	-	-	1	-	-	-	-	-	-	-	-	3	-	-
CO4	Summarize the plan or map showing the ground features from dataobtained bysurveying.	2	-	-	-	-	-	-	-	-	-	-	-	1	-	-
CO5	Prepare to work on-site works outside the institution to gain the real time exposure.	3	-	-	1	-	-	-	-	-	-	-	-	2	-	-
Course Code	**191MC5A08 INTELLECTUAL PROPERTY RIGHTS AND PATENTS**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
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	**191CE6T13 DESIGN AND DRAWING OF STEEL STRUCTURES**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Describe the basic requirements of the IS design specifications.	-	-	-	-	-	-	-	-	-	3	-	-	-	1	-
CO2	Choose the suitable I.S Rolled Steel Sections for design.	-	-	-	-	-	-	-	-	-	2	-	-	-	1	-
CO3	Design of Bolted & Welded connections between the steel members.	-	-	2	-	-	-	-	-	-	3	-	-	-	2	-
CO4	Design of Steel members subjected to Flexure, Tension and Compression.	-	-	2	-	-	-	-	-	-	3	-	-	-	2	-
CO5	Design of Columns and Base plates subjected to gravity loads.	-	-	2	-	-	-	-	-	-	3	-	-	-	2	-
Course Code	**191CE6T14 HIGHWAY ENGINEERING**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Develop geometric design of transport systems	3	2	-	-	-	-	-	-	-	-	-	-	-	1	-
CO2	Design the traffic signaling system	3	3	2	2	-	-	-	-	-	-	-	-	-	2	-

-	CO Statements	POs												PSOs		
CO3	Design highway Intersections	3	3	2	2	-	-	-	-	-	-	-	-	-	2	-
CO4	Design of rigid and flexible pavements	3	2	-	-	-	-	-	-	-	-	-	-	-	2	-
CO5	Explain the basic concepts of railway and airport engineering	3	2	-	-	-	-	-	-	-	-	-	-	-	1	-
Course Code	**191CE6T15 FOUNDATION ENGINEERING**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Illustrate the phenomenon of soilexploration	3	2	-	-	-	2	-	-	-	-	2	-	-	2	-
CO2	Understand the various types of shallow foundation and determine their allowable bearing pressure	3	2	-	-	-	2	-	-	-	-	2	-	-	2	-
CO3	Determine the magnitude of foundation settlement and design the footing accordingly	3	2	-	-	-	2	-	-	-	-	2	-	-	2	-
CO4	Explain the load -carrying capacityof piles and design principles of well foundations	3	2	-	-	-	2	-	-	-	-	2	-	-	2	-
CO5	Solve the problems related to the concept of earth-retaining structures and slope stability	2	1	-	-	-	2	-	-	-	-	2	-	-	1	-
Course Code	**191CE6E10 REPAIR AND REHABILITATION OF STRUCTURES (Professional Elective-II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Recognize the mechanisms of degradation of concrete structures and to design durable concrete structures.	3	1	-	-	-	-	2	-	-	-	-	1	3	-	-
CO2	Conduct field monitoring and non-destructive evaluation of concrete structures.	2	-	-	-	1	3	2	-	-	-	-	-	3	-	-
CO3	Design and suggest repair strategies for deteriorated concrete structures including repairing with composites.	-	1	-	2	3	2	-	-	-	-	-	-	3	-	-
CO4	Understand the methods of strengthening methods for concrete structures	1	2	-	-	3	2	-	-	-	-	-	-	3	-	-
CO5	Assessment of the service ability and residual life span of concrete structures by Visual inspection and in situ tests	3	2	-	-	2	-	1	-	-	-	-	-	2	-	-
CO6	Evaluation of causes and mechanism of damage	3	2	-	-	-	-	1	-	-	-	-	-	2	-	-
CO7	Evaluation of actual capacity of the concrete structure Maintenance strategies															
Course Code	**191CE6E07 GROUND IMPROVEMENT TECHNIQUES (Professional Elective-II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Interpret the concepts behind a range of ground improvement and soil remediation techniques	2	1	-	-	2	2	-	-	-	-	-	-	2	-	-
CO2	Illustrate the appropriate techniques for a range of ground and site conditions	2	1	-	-	-	-	-	-	3	-	-	-	2	-	-
CO3	Identify the stabilization of soils with different materials	2	1	1	-	3	-	-	-	-	-	-	-	2	-	-
CO4	Classify different types of grouts, their properties and application	2	1	2	-	3	-	-	-	-	-	-	-	2	-	-
CO5	Make use of different geosynthetics and understand their field applications	3	2	1	1	-	-	-	-	-	-	-	-	3	-	-

-	CO Statements	POs												PSOs		
Course Code	**191CE6E09 RAILWAY ENGINEERING (Professional Elective-II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain different components of railway track.	2	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	Design track gradients as per given requirements.	3	2	1	-	-	-	-	-	-	-	-	-	-	2	-
CO3	Discuss various types of tracks turnouts and crossings.	-	1	-	-	-	3	-	-	2	-	-	-	-	2	-
CO4	Explain interlocking and signalling systems.	-	1	-	-	-	2	-	-	-	-	-	-	-	3	-
CO5	Describe purposes and facilities at Railway Stations and explain track maintenance.	2	-	-	-	-	2	3	-	-	-	-	-	-	1	-
Course Code	**191CE6E08 HYDROPOWER DEVELOPMENT (Professional Elective-II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Understand basics of Hydropower development	-	3	-	-	1	-	-	2	-	-	-	-	-	2	-
CO2	Understand hydropower plant and its components	-	3	-	-	2	-	-	1	-	-	-	-	-	2	-
CO3	Flow of water through penstock	-	3	-	1	2	-	-	-	-	-	-	-	-	2	-
CO4	Design of surge tank	-	3	-	-	1	-	-	2	-	-	-	-	-	1	-
CO5	Hydraulic analysis of turbine and draft tube	-	3	-	-	2	-	-	1	-	-	-	-	-	1	-
Course Code	**191CE6E06 AIR POLLUTION ENGINEERING (Professional Elective-II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Interpret the various ambient air quality parameters.	2	1	-	-	-	2	3	-	-	-	-	-	-	1	-
CO2	Examine the plume behavior in prevailing atmospheric conditions.	3	2	-	-	-	2	2	-	-	-	-	-	-	2	-
CO3	Explain the various methods related to sampling and analysis.	2	1	-	-	-	2	1	-	-	-	-	-	-	1	-
CO4	Choose the appropriate air pollution control devices.	3	3	-	-	-	2	2	-	-	-	-	-	-	2	-
CO5	Apply suitable particulate and gaseous control measures for an industry.	1	2	-	-	-	3	1	-	-	-	-	-	-	2	-
Course Code	**191CE6E13 FINITE ELEMENT METHODS (Professional Elective-III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Understanding the basic procedure of Finite Elements Methods	2	1	-	-	-	2	-	-	-	-	-	-	-	**2**	-
CO2	Understanding the Shape functions in Finite Element Method	3	2	1	-	-	3	-	-	-	-	-	-	-	**2**	-
CO3	Understanding the development of element stiffness matrix	2	1	-	-	-	2	-	-	-	-	-	-	-	**1**	-
CO4	Able to carry out 2 Dimensional Structural Analysis	3	2	1	-	-	3	-	-	-	-	-	-	-	**1**	-
CO5	Understanding the 3D shape functions and Pre and Post Process using software.	3	2	1	-	-	3	-	-	-	-	-	-	-	**1**	-
Course Code	**191CE6E12 EXPANSIVE SOILS(Professional Elective-III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Identify the expansive soils in the field and laboratory	2	3	-	2	2	-	-	-	-	-	-	-	-	2	-
CO2	Illustrate the methods for the identification of soil structure and clay mineralogy	2	1	-	2	-	-	3	-	-	-	-	-	-	1	-
CO3	Design a suitable foundation for expansive soils	2	2	3	1	-	-	-	-	-	-	-	-	-	1	-

-	CO Statements	POs												PSOs		
CO4	Suggest a suitable method for stabilizing the expansive soils	3	2	-	1	-	-	-	-	-	-	-	-	-	1	-
CO5	Assess and control the liquefaction problems related to expansive soils	2	3	-	-	2	-	2	-	-	-	-	-	-	1	-
Course Code	**191CE6E11 DOCK AND HARBOUR ENGINEERING (Professional Elective-III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain the fundamentals of Harbour planning	2	1	-	-	-	2	-	-	-	-	-	-	-	2	-
CO2	Explain the natural forces affecting ports and general design aspects of marine structures	2	1	-	-	-	2	-	-	-	-	-	-	-	1	-
CO3	Describe various navigational aids and dock & repair facilities	3	1	-	-	-	-	-	-	-	3	-	-	-	1	-
CO4	Explain and plan port facilities	2	1	-	-	-	2	-	-	-	-	-	-	-	1	-
CO5	Describe maintenance and protection of port facilities	2	1	-	-	-	2	-	-	-	3	-	-	-	1	-
Course Code	**191CE6E15 WATER RESOURCES SYSTEMS ANALYSIS (Professional Elective-III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Distinguish between quality of domestic and industrial water requirements and Waste water quantity generation	2	-	1	-	-	2	3	-	-	-	-	-	-	1	-
CO2	Illustrate various treatment methods based on characteristics of waste water	2	-	1	-	-	3	2	-	-	-	-	-	-	2	-
CO3	Suggest treatment methods for any industrial waste water	3	-	1	-	-	1	1	-	-	-	-	-	-	1	-
CO4	Decide the need of common effluent treatment plant for the industrial area in their vicinity.	1	-	2	-	-	1	2	-	-	-	-	-	-	2	-
CO5	Learn the manufacturing process of various industries.	3	-	1	-	-	2	-	-	-	-	-	-	-	1	-
Course Code	**191CE6E14 INDUSTRIAL WASTE & WASTE-WATER ENGINEERING(Professional Elective-III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain various types of signals.	3	2	2	1	-	-	-	-	-	-	-	-	-	-	-
CO2	Explain various types of Transducers principles.	2	3	2	2	-	-	-	-	-	-	-	-	-	-	-
CO3	Measure various parameters such as strain, velocity, temperature, pressure etc.	2	1	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.	2	3	1	1	-	-	-	-	-	-	-	-	-	-	-
CO5	Analyze the different signals using various types of signal analyzers.	1	3	2	1	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191CE6O02 DISASTER MANAGEMENT (OPEN ELECTIVE – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain the aspects of disaster management and adopt remedial measures	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	Explain the disaster vulnerability profile of India	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	Explain the hazard assessment and mitigation measures	1	1	-	-	-	-	-	-	-	-	-	-	-	1	-

-	CO Statements	POs												PSOs		
CO4	Explain landslides and earthquake disasters and management	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO5	Explain about cyclone, fire disasters and rehabilitation programmes	1	-	-	-	-	-	-	-	-	-	-	-	-	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**	**PSO3**
CO1	Explain energy efficiency, conservation, and various technologies.	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	Design energy efficient lighting systems.	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	Calculate power factor of systems and propose suitable compensation techniques.	1	1	-	-	-	-	-	-	-	-	-	-	-	1	-
CO4	Explain energy conservation in HVAC systems.	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO5	Calculate power factor of systems and propose suitable compensation techniques.	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Course Code	**191EE6O05 NON-CONVENTIONAL ENERGY SOURCES (OPEN ELECTIVE – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain the prospects of renewable energy and solar energy	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
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	-	-	-	-	-	-	-	-	-	-	-	-
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	**191EE6O06 INSTRUMENTATION (OPEN ELECTIVE – II)**	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
CO1	Explain various types of signals	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	Explain various types of Transducers principles	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	Measure various parameters such as strain, velocity, temperature, pressure etc	1	1	-	-	-	-	-	-	-	-	-	-	-	1	-
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	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO5	Analyze the different signals using various types of signal analyzers	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Course Code	**191ME6O06 SOLAR ENERGY UTILISATION (OPEN ELECTIVE – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain the concept of solar radiation and its measurement.	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	Describe the working principle of different types of collectors and its types	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	Explain the various solar thermal energy technologies and their applications	1	1	-	-	-	-	-	-	-	-	-	-	-	1	-
CO4	Analyze the various solar PV cell materials and conversion techniques.	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-

-	CO Statements	POs												PSOs		
CO5	Apply solar passive building techniques for cooling and heating applications	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-
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**	**PSO3**
CO1	Explain basic thermodynamic concepts and laws of thermodynamics	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	Explain basic thermodynamic concepts and laws of thermodynamics	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	Find the efficiency of a thermodynamic cycle	1	1	-	-	-	-	-	-	-	-	-	-	-	1	-
CO4	Explain basic heat transfer mechanisms	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO5	Evaluate the performance of heat exchangers	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Course Code	**191ME6O09 3D PRINTING (OPEN ELECTIVE – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Summarize the basics of AM technologies.	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	Explain about vat photo polymerization, material jetting and binder jetting AM technologies.	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
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	-	-	-	-	-	-	-	-	-	-	-	2	-
CO5	Apply the AM techniques in different industries	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-
CO6	Select AM technologies using decision methods															
Course Code	**191ME6O10 ROBOTICS(OPEN ELECTIVE – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain the basic concepts, parts of robots and types of robots	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	Identify various robot configuration and components,	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	Analyze the transformations and manitulator kinematics of robot using DH Notation	1	1	-	-	-	-	-	-	-	-	-	-	-	1	-
CO4	Analyze the differential transformations and dynamics of robots	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO5	Analyze the trajectory planning for a manipulator by avoiding Obstacles	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Course Code	**191ME6O11 MANAGEMENT SCIENCE (OPEN ELECTIVE – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Apply management and motivation theories to renovate the practice of management.	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
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	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	Appraise the functional management challenges associated with high levels of change in the organizations.	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	-	-	-	-	-	-	-	-	-	-	-	2	-

-	CO Statements	POs												PSOs		
CO5	Develop global vision and management skills both at strategic level and interpersonal level.	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Course Code	**1191ME6O12 ENTREPRENEURSHIP DEVELOPMENT AND INCUBATION (OPEN ELECTIVE – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Describe the meaning and concepts of entrepreneurship development	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	Apply the business plan for preparation and evaluation of project.	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	Explain about Institutional Support to Entrepreneur and MSMEs	1	1	-	-	-	-	-	-	-	-	-	-	-	1	-
CO4	Utilize the Opportunities of Entrepreneurship Internationally	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO5	Utilize the Opportunities of Entrepreneurship Internationally	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Course Code	**191EC6O04 BIOMEDICAL INSTRUMENTATION (OPEN ELECTIVE – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Summarize the physiological relation of the human body with the environment	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	Make use of different electrodes and transducers for biomedical applications.	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	Demonstrate the working principle of different biomedical instruments for heart and respiratory system monitoring	1	1	-	-	-	-	-	-	-	-	-	-	-	1	-
CO4	Illustrate Intensive-Care Monitoring system for patient management	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO5	Outline different diagnostic techniques for telemedicine.	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Course Code	**191EC6O05 ECAD TOOLS (OPEN ELECTIVE – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Illustrate the basic concepts on ECAD tools and PSPICE.	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	Summarize the fundamental concepts of passive circuits using PSPICE	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	Demonstrate the performance active circuits using PSPICE.	1	1	-	-	-	-	-	-	-	-	-	-	-	1	-
CO4	Develop the various functionality of MATLAB	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO5	Apply the fundamentals and applications of MATLAB Simulink.	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Course Code	**191CS6O05 PYTHON PROGRAMMING (OPEN ELECTIVE – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Illustrate the basic concepts on ECAD tools and PSPICE.	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	Summarize the fundamental concepts of passive circuits using PSPICE	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	Demonstrate the performance active circuits using PSPICE.	1	1	-	-	-	-	-	-	-	-	-	-	-	1	-
CO4	Develop the various functionality of MATLAB	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO5	Apply the fundamentals and applications of MATLAB Simulink.	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Course Code	**191CS6O06 OPERATING SYSTEMS (OPEN ELECTIVE – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Illustrate the basic structure, services, system calls and architectural components of Operating System	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-

-	CO Statements	POs												PSOs		
CO2	Solve problems related to process scheduling, synchronization in unit and multi processing systems.	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	Explain the deadlock handling Mechanism in the processing System	1	1	-	-	-	-	-	-	-	-	-	-	-	1	-
CO4	Explain the deadlock handling Mechanism in the processing System	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO5	Describe the concepts of file system and mass storage structure.	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Course Code	**191CS6O07 WEB TECHNOLOGIES (OPEN ELECTIVE – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Develop static web pages using HTML and CSS.	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	Apply JavaScript for Client-side validations and Node.JS to learn server-side applications using JavaScript.	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	Make use of Angular JS for developing dynamic and responsive web pages.	1	1	-	-	-	-	-	-	-	-	-	-	-	1	-
CO4	Utilize React JS for developing dynamic and responsive web pages	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO5	Create and deploy secure, usable database driven web applications using PHP and MySQL/Mongo DB.	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Course Code	**191CS6O07 WEB TECHNOLOGIES (OPEN ELECTIVE – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Develop static web pages using HTML and CSS.	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	Apply JavaScript for Client-side validations and Node.JS to learn server-side applications using JavaScript.	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	Make use of Angular JS for developing dynamic and responsive web pages.	1	1	-	-	-	-	-	-	-	-	-	-	-	1	-
CO4	Utilize React JS for developing dynamic and responsive web pages	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO5	Create and deploy secure, usable database driven web applications using PHP and MySQL/Mongo DB.	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Course Code	**191CS6O08CYBER SECURITY (OPEN ELECTIVE – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain the cyber security and security management methods to maintain security protection	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	Illustrate the nature of secure software development and operating systems	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	Summarize the Network management and cloud computing security issues	1	1	-	-	-	-	-	-	-	-	-	-	-	1	-
CO4	Analyze the data privacy techniques for data management.	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO5	Demonstrate the role security management plays in cyber security defense and legal and social issues at play in developing solutions	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Course Code	**191CS6O09 AR/VR (OPEN ELECTIVE – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain VR, its environments and hardware technologies for 3D interfaces	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	Summarize 3D user interface input hardware in VR environment.	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-

-	CO Statements	POs												PSOs		
CO3	Make use of software technologies to build VR applications.	1	1	-	-	-	-	-	-	-	-	-	-	-	1	-
CO4	Develop 3D user interfaces using 3D interaction techniques.	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO5	Describe the fundamental concepts of AR	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Course Code	**191IT6O03 COMPUTER ORGANIZATION (OPEN ELECTIVE – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Describe the basic structure of a computer system, various number systems and arithmetic operations	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	Explain the Operation of CPUs including RTL, ALU, Instruction Cycle and Buses	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	Demonstrate the architecture and functionality of central processing unit	1	1	-	-	-	-	-	-	-	-	-	-	-	1	-
CO4	Illustrate the I/O and memory organization in an efficient way.	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO5	Make use of multi processors and pipelining to improve the efficiency of computer system	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Course Code	**191IT6O04 AI TOOLS & TECHNIQUES (OPEN ELECTIVE – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain the fundamentals of Artificial Intelligence and its applications.	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	Describe various problems solving techniques and searching techniques.	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	Apply various logical systems to inference the different logical problems	1	1	-	-	-	-	-	-	-	-	-	-	-	1	-
CO4	Demonstrate the concept of Knowledge Representation Techniques.	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO5	Explain the phases in Expert System and its applications.	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-
CO6	Identify various interpretations of probability theory, basic knowledge of fuzzy sets and fuzzy logic															
Course Code	**191IT6O05 ROBOTIC PROCESS AUTOMATION (OPEN ELECTIVE – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Describe the fundamentals of Robotic Process Automation Technology.	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	Summarize the UiPath programming techniques to deploy robot configurations	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	Explore various data extraction techniques and learn about integrations with various popular applications like SAP and MS Office	1	1	-	-	-	-	-	-	-	-	-	-	-	1	-
CO4	Develop a programmed robot including logging and exception handling	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO5	Create and Deploy the Bots and control it with UiPath Orchestrator.	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-

-	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**	**PSO3**
CO1	Explain the different hazards and its prevention in mining industries.	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	Distinguish the mine accidents occurring in surface and underground mining area.	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	Explain the safety concepts, emergency preparation and response in disaster	1	1	-	-	-	-	-	-	-	-	-	-	-	1	-
CO4	Assess and minimize the risk using safety analysis techniques	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO5	Explain Safety standards, safety information system and safety audit	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Course Code	**191MI6O03 ELECTRICAL EQUIPMENT IN MINES (OPEN ELECTIVE – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain about power systems used in mines	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	Analyze various earthing methods used in mines	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	Summarize various electrical equipment used in mines.	1	1	-	-	-	-	-	-	-	-	-	-	-	1	-
CO4	Explain the instrumentation and control systems used in mines	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO5	Analyze about mine telephone system and intrinsic safety.	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Course Code	**191MI6O03 UNCONVENTIONAL HYDROCARBON RESOURCES (OPEN ELECTIVE – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Outline the fundamentals of Coal Bed Methane	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	Estimate the shale gas reserves for Indian Scenario	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	Estimate the shale gas reserves for Indian Scenario	1	1	-	-	-	-	-	-	-	-	-	-	-	1	-
CO4	Illustrate the Origin and Characterize Shale Gas.	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO5	Explain the Heavy oil reservoirs and their Challenges	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Course Code	**191PT6O04 ASSET MANAGEMENT(OPEN ELECTIVE – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain the Asset Management in corporate approach	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	Estimate the running cost and value for Asset Management	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	Determine value using Asset Management Interpretation	1	1	-	-	-	-	-	-	-	-	-	-	-	1	-
CO4	Illustrate Asset Management Decision making framework	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO5	Explain the Capital Planning System	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Course Code	**191AG6O02 WEATHER FORECAST IN AGRICULTURE (OPEN ELECTIVE – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain the weather elements and their impact on crop production.	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	Identify the type of crop production risk and their management.	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	Explain crop weather relationships and their responses.	1	1	-	-	-	-	-	-	-	-	-	-	-	1	-
CO4	Classify the types of weather forecast and their characteristics	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO5	Apply weather thumb rules and verification of weather forecast with real events	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-

-	CO Statements	POs												PSOs		
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**	**PSO3**
CO1	Explain the importance of Bioenergy.	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	Compare and contrast Biomass and Agrochemical Conversion techniques.	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	Categorize different ways of biomass production	1	1	-	-	-	-	-	-	-	-	-	-	-	1	-
CO4	Classify Gasification and Liquefaction	1	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO5	Analyze advanced Bio-diesel production from Oils and Seeds	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Course Code	**191CE6L07 TRANSPORTATION ENGINEERING LAB**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Characterize the highway aggregates	2	1	-	-	-	-	-	2	3	-	-	-	-	2	-
CO2	Conduct tests on suitabilityofbitumen	2	1	-	-	-	-	-	3	2	-	-	-	-	2	-
CO3	Identifythe parkingcapacityand useof parking facilities	2	3	-	-	-	-	-	3	3	-	-	-	-	2	-
CO4	Design the marshal stabilitymix	2	2	-	-	-	-	-	3	2	-	-	-	-	3	-
CO5	Conduct CBR test of soils.	2	1	-	-	-	-	-	2	3	-	-	-	-	1	-
Course Code	**191CE6L08 COMPUTER AIDED DESIGN LAB**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Able to learn structural software and practice different elements and frames	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
CO2	Able to analyze different types of elements using structural software	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
CO3	Able to analyze pinned and rigid frames using software	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
CO4	Able to draw shear force and bending moments for various structures with different boundary conditions and loading conditions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
CO5	Able to analyze framed structures, influence line diagrams and moment envelopes using software.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Course Code	**191CE6L09 IRRIGATION DESIGN AND DRAWING**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Design and draw diversion head work surplus weir and Tank sluice with tower head	-	-	2	-	-	1	-	3	-	-	-	-	-	2	-
CO2	Design and draw canal drop with notch type	-	-	2	-	-	1	-	3	-	-	-	-	-	1	-
CO3	Design and draw canal regulator	-	-	2	-	-	1	-	3	-	-	-	-	-	1	-
CO4	Design and draw under tunnel	-	-	2	-	-	1	-	3	-	-	-	-	-	1	-
CO5	Design and draw syphon aqueduct type-III	-	-	2	-	-	1	-	3	-	-	-	-	-	1	-
Course Code	**191HS6T07 EMPLOYABILITY SKILLS– IV**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
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	-	-	-

-	CO Statements	POs												PSOs		
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**	**PSO3**
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	-	-	-	-	-	-	-
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	**191CE7T16 ENVIRONMENTAL ENGINEERING**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Apply basic principles of water supply in designing of protected water for a city.	3	-	1	-	-	-	-	-	-	-	2	-	-	2	-
CO2	Illustrate various treatment methods based on the characteristics of raw water.	2	-	2	-	-	-	-	-	-	-	2	-	-	1	-
CO3	Interpret different treatment technologies of wastewater base on characteristics of sewage.	1	-	1	-	-	-	-	-	-	-	1	-	-	1	-
CO4	Select an appropriate secondary and tertiary treatment method of sewage.	-	-	2	-	-	-	-	-	-	-	-	-	-	2	-
CO5	Demonstrate the concepts of sludge management and its disposal methods.	-	-	3	-	-	-	-	-	-	-	2	-	-	1	-
CO6	Choose the method of recycling of treated water	3		1								2			1	
Course Code	**191CE7T17 PRE-STRESSED CONCRETE**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain methods of prestressed concrete	2	1	-	-	-	-	-	2	-	-	-	-	-	1	-
CO2	Calculate various losses in prestressed concrete sections	3	2	-	-	-	-	-	2	-	-	-	-	-	2	-
CO3	Analyze the members for flexure, shear and torsion	3	2	-	-	-	-	-	2	-	-	-	-	-	1	-
CO4	Design prestressed concrete members for deflection and crack control	3	2	2	-	-	-	-	2	-	-	-	-	-	1	-
CO5	Design of end blocks for post tensioned members	3	2	2	-	-	-	-	2	-	-	-	-	-	2	-
Course Code	**191CE7T18 ESTIMATION, SPECIFICATIONS AND CONTRACTS**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Describe the importance of specifications and abstract estimate for different civil engineering works	2	1	-	-	-	2	-	-	2	-	-	-	-	1	-
CO2	Prepare rate analysis for different civil work items	3	2	-	-	-	2	-	-	2	-	-	-	-	1	-
CO3	Estimate the earth work quantities for roads and canals	3	2	-	-	-	2	-	-	2	-	-	-	-	2	-

-	CO Statements	POs												PSOs		
CO4	Prepare bar bending schedule for different RCC components Classify different types of Contracts and Tenders	3	2	-	-	-	2	-	-	2	-	-	-	-	2	-
CO5	Prepare valuation reports for roads and buildings & Estimate the quantities for different building components	2	1	-	-	-	2	-	-	2	-	-	-	-	1	-
Course Code	**191CE7E17 DESIGN OF TALL BUILDINGS (Professional Elective-IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain different types of concrete used in construction of tall buildings	-	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	Calculate various loads acting onbuildings	1	2	1	-	-	-	-	-	-	-	-	-	-	1	-
CO3	Summarize the behaviour of various structural systems.	-	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO4	Design various structural systems for tallbuildings	2	3	2	-	-	-	-	-	-	-	-	-	-	1	-
CO5	Analyze stability of structural members in tall buildings	2	3	2	-	-	-	-	-	-	-	-	-	-	1	-
Course Code	**191CE7E16 ADVANCED FOUNDATION ENGINEERING (Professional Elective-IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Compute the safe bearing capacity of footings subjected to vertical and inclined loads	2	3	-	-	1	-	-	2	-	-	-	-	-	2	-
CO2	Understand the difference between isolated footings and combined footings and mat foundations.	1	3	-	-	2	-	-	2	-	-	-	-	-	2	-
CO3	Design the earth retaining structures	-	2	-	3	2	-	2	-	-	-	-	-	-	1	-
CO4	Appreciate the methods of computing the pull-out capacity and negative skin friction of piles and compute the settlements of pile groups in clays	-	-	2	3	1	-	-	2	-	-	-	-	-	2	-
CO5	Solve the problems posed by expansive soils and the different foundation practices devised	-	3	-	-	2	2	-	1	-	-	-	-	-	1	-
Course Code	**191CE7E20 TRAFFIC ENGINEERING (Professional Elective-IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Identify traffic stream characteristics and studies	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**-**	**-**	**-**	**-**	**1**	**-**
CO2	Explain traffic capacity and level of service.	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**3**	**2**	**-**	**-**	**-**	**-**	**2**	**-**
CO3	Solve various parking problems and manage traffic regulations	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**-**	**-**	**-**	**-**	**2**	**-**
CO4	Illustrate measures for Road safety	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**3**	**2**	**-**	**-**	**-**	**-**	**1**	**-**
CO5	Design traffic signal cycle and Rotary Island capacity	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**-**	**-**	**-**	**-**	**1**	**-**
Course Code	**191CE7E19 SUSTAINABLE WATER RESOURCES DEVELOPMENT (Professional Elective-IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Understand the importance of various water resources	2	1	-	-	-	-	-	-	3	-	-	-	-	1	-
CO2	Understand the development strategies for water resources	2	1	-	-	-	-	-	-	3	-	-	-	-	2	-
CO3	Understand how to integrate the technologies with natural resources	2	1	-	-	-	-	-	-	3	-	-	-	-	2	-
CO4	Understand Overall socio-economic & community development with reference to sustainability	2	-	-	1	-	-	-	-	3	-	-	-	-	1	-

-	CO Statements	POs												PSOs		
CO5	Illustrate the various approaches towards the sustainable water resource development	2	-	-	1	-	-	-	-	3	-	-	-	-	1	-
Course Code	**191CE7E18 ENVIRONMENTAL IMPACT ASSESSMENT (Professional Elective-IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain the basic concepts of EIA.	-	-	-	-	-	-	1	-	-	-	-	-	-	1	-
CO2	Classify the various EIA methodologies.	2	-	-	-	-	-	2	-	-	-	-	-	-	2	-
CO3	Illustrate the systematic procedure of assessment of impacts of developmental activities on various sectors of environment.	3	-	-	-	-	-	-	2	-	-	-	1	-	3	-
CO4	Describe the concept of risk assessment and management in EIA.	-	-	-	-	-	-	-	2	-	-	-	3	-	-	-
CO5	Apply the knowledge of EIA to day to day activities.	-	-	-	-	-	-	3	2	-	-	-	2	-	-	-
Course Code	**191CE7E21 ADVANCED STRUCTURAL ANALYSIS (Professional Elective-V)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Summarizethe importanceof matrix methods of analysis	2	1	-	-	2	-	-	-	-	-	-	1	-	2	-
CO2	Assemblage the identical structural elements by stiffness matrix method	3	2	-	1	2	-	-	-	-	-	-	3	-	1	-
CO3	Analyse the beams, frames and trusses by flexibility matrix method	3	2	-	2	2	-	-	-	-	-	-	3	-	1	-
CO4	Analyse the beams, frames and trusses by stiffness matrix method.	3	2	-	2	2	-	-	-	-	-	-	3	-	1	-
CO5	Develop the analysis procedure for structures due to shear and stresses.	3	2	-	1	2	-	-	-	-	-	-	3	-	1	-
Course Code	**191CE7E22 GEO-TECHNIQUES FOR DESIGN OF UNDERGROUND STRUCTURES (Professional Elective-V)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Compute the pre-requisites of arching and features and its applications	-	3	-	-	1	-	-	2	-	-	-	-	-	2	-
CO2	Understand the soil pressure on conduits and loads on ditch, and theory for soil pressure	-	3	-	-	2	-	-	3	-	-	-	-	-	2	-
CO3	Solve the stresses in shaft and Tunnels, lateral earth pressures, design concepts of Tie Backs.	-	3	-	2	2	-	-	-	-	-	-	-	-	1	-
CO4	Understand the soil nailing and components of nailing and design of nailing	-	-	-	3	1	-	-	2	-	-	-	-	-	1	-
CO5	Understanding the anchorage systems for anchored sheet pile walls and design of anchorages	-	3	-	-	2	-	-	1	-	-	-	-	-	1	-
Course Code	**191CE7E25 TRAFFIC ANALYSIS(Professional Elective-V)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Estimate basic characteristics of traffic stream	3	2	-	1	-	-	-	-	-	-	-	-	-	2	-
CO2	Explain traffic stream models and estimate relation between traffic flow parameters	2	1	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	Analyze performance of a system using Queueing analysis	3	2	-	1	-	-	-	-	-	-	-	-	-	1	-
CO4	Estimate pedestrian gaps and delays.	3	2	-	1	-	-	-	-	-	-	-	-	-	1	-

-	CO Statements	POs												PSOs		
CO5	Explain concept of simulation and simulation techniques	2	1	-	-	2	-	-	-	-	-	-	-	-	1	-
Course Code	**191CE7E24 RIVER BASIN MANAGEMENT(Professional Elective-V)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Understand the different river basin systems and catchments and their associated quality and quantity problems	2	-	1	-	-	-	-	-	-	-	-	3	-	2	-
CO2	Apply the River basin management techniques to various water resource assessments	2	-	1	-	-	-	-	-	-	-	-	3	-	1	-
CO3	Illustrate various integrated river basin management methods and decision-making tools	3	-	1	-	-	-	-	-	-	-	-	2	-	1	-
CO4	Develop the river basin modeling approaches	2	-	1	-	-	-	-	-	-	-	-	3	-	1	-
CO5	Understand the role of various organizations in river basin management	3	-	1	-	-	-	-	-	-	-	-	2	-	1	-
Course Code	**191CE7E23 REMOTE SENSING AND GIS APPLICATIONS(Professional Elective-V)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Classify the information content of remotely sensed data	2	1	-	-	-	-	-	-	3	-	-	-	2	-	-
CO2	Explain the energy interactions in the atmosphere and earth surface features.	2	1	-	-	-	-	-	-	3	-	-	-	2	-	-
CO3	Interpret the images for preparation of thematic maps	2	1	-	-	-	-	-	-	3	-	-	-	1	-	-
CO4	Analyze spatial and attribute data for solving spatial problems	3	2	-	1	-	-	-	-	2	-	-	-	1	-	-
CO5	Apply problem specific remote sensing data for engineering applications	3	2	-	1	-	-	-	-	2	-	-	-	1	-	-
Course Code	**191CE7O03 WASTE WATER MANAGEMENT (Open Elective-III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Summarize the importance of sanitation and waste water management.	2	1	-	-	-	2	3	-	-	-	-	-	-	2	-
CO2	Estimate the rate of sewage flow and storm water drainage	1	1	-	-	-	1	2	-	-	-	-	-	-	2	-
CO3	Identify the various characteristics of sewage and plan the treatment system	3	2	-	-	-	2	2	-	-	-	-	-	-	2	-
CO4	Outline various waste water treatment technologies	2	1	-	-	-	2	3	-	-	-	-	-	-	3	-
CO5	Explain the different treated effluent disposal methods.	2	1	-	-	-	2	3	-	-	-	-	-	-	1	-
Course Code	**191EE7O07 ELECTRICAL AND HYBRID VEHICLES (Open Elective-III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain the characteristics of electrical and hybrid vehicles.	2	1	-	-	-	2	3	-	-	-	-	-	-	2	-
CO2	Explain the characteristics of electrical and hybrid vehicles.	1	1	-	-	-	1	2	-	-	-	-	-	-	2	-
CO3	Compare and evaluate the different possible ways of energy storage	3	2	-	-	-	2	2	-	-	-	-	-	-	2	-
CO4	Demonstrate the sizing of the drive system.	2	1	-	-	-	2	3	-	-	-	-	-	-	3	-
CO5	Apply the different strategies related to energy management.	2	1	-	-	-	2	3	-	-	-	-	-	-	1	-

-	CO Statements	POs												PSOs		
Course Code	**191EE7O08 SPECIAL ELECTRICAL MACHINE (Open Elective-III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Distinguish between brush dc motor and brush less dc motor.	2	1	-	-	-	2	3	-	-	-	-	-	-	2	-
CO2	Explain the performance and control of stepper motors and their applications	1	1	-	-	-	1	2	-	-	-	-	-	-	2	-
CO3	Describe theory of operation and control of switched reluctance motor	3	2	-	-	-	2	2	-	-	-	-	-	-	2	-
CO4	Explicate the theory of travelling magnetic field and applications of linear motors.	2	1	-	-	-	2	3	-	-	-	-	-	-	3	-
CO5	Explain the significance of electrical motors for traction drives.	2	1	-	-	-	2	3	-	-	-	-	-	-	1	-
Course Code	**191EE7O09 INDUSTRIAL ELECTRICAL SYSTEMS (Open Elective-III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain the electrical wiring systems for residential, commercial, and industrial consumers, representing the systems with standard symbols and drawings, SLD.	2	1	-	-	-	2	3	-	-	-	-	-	-	2	-
CO2	Illustrate the residential and commercial electrical systems.	1	1	-	-	-	1	2	-	-	-	-	-	-	2	-
CO3	Design the residential and commercial lightning systems.	3	2	-	-	-	2	2	-	-	-	-	-	-	2	-
CO4	Explain various components of industrial electrical systems	2	1	-	-	-	2	3	-	-	-	-	-	-	3	-
CO5	Analyze and select the proper size of various electrical system components.	2	1	-	-	-	2	3	-	-	-	-	-	-	1	-
Course Code	**191ME7O13 IOPTIMIZATION TECHNIQUES (Open Elective-III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Use advanced optimization techniques to solve real-life problems	2	1	-	-	-	2	3	-	-	-	-	-	-	2	-
CO2	Formulate and solve various practical optimization problems in manufacturing and service organizations	1	1	-	-	-	1	2	-	-	-	-	-	-	2	-
CO3	Use non-linear optimization techniques such as classical optimization methods, integer programming	3	2	-	-	-	2	2	-	-	-	-	-	-	2	-
CO4	Apply Genetic algorithm and Particle Swarm Optimization algorithms to solve problems	2	1	-	-	-	2	3	-	-	-	-	-	-	3	-
CO5	Use Advance techniques to formulate and solve the optimization problems	2	1	-	-	-	2	3	-	-	-	-	-	-	1	-
Course Code	**191ME7O14 ENERGY CONSERVATION (Open Elective-III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain the concepts of National Energy consumption, Energy Auditing, and its types	2	1	-	-	-	2	3	-	-	-	-	-	-	2	-
CO2	Explain the improvement in efficiency of various electrical equipment’s like capacitors and electric motors etc.	1	1	-	-	-	1	2	-	-	-	-	-	-	2	-

-	CO Statements	POs												PSOs		
CO3	Explain the improvement in efficiency of various mechanical equipment like boilers, condensers, and steam lines etc.	3	2	-	-	-	2	2	-	-	-	-	-	-	2	-
CO4	Explain the energy efficiency of components like pumps, blowers, fans, and various refrigeration equipment.	2	1	-	-	-	2	3	-	-	-	-	-	-	3	-
CO5	Apply the concepts of energy economics like payback period, internal rate of returns life cycle costing etc.	2	1	-	-	-	2	3	-	-	-	-	-	-	1	-
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**	**PSO3**
CO1	Explain principal groups and applications of material handling equipment	2	1	-	-	-	2	3	-	-	-	-	-	-	2	-
CO2	Explain the working and applications of Flexible hoisting applicances	1	1	-	-	-	1	2	-	-	-	-	-	-	2	-
CO3	Explain the working of Load handling and Special Material handling equipment	3	2	-	-	-	2	2	-	-	-	-	-	-	2	-
CO4	Explain the brake systems used in Material handling equipment	2	1	-	-	-	2	3	-	-	-	-	-	-	3	-
CO5	Calculate the operating characteristics in material handling mechanisms	2	1	-	-	-	2	3	-	-	-	-	-	-	1	-
Course Code	**191ME7O16 ROBOTICS (Open Elective-III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain the basic concepts, parts of robots and types of robots.	2	1	-	-	-	2	3	-	-	-	-	-	-	2	-
CO2	Identify various robot configuration and components	1	1	-	-	-	1	2	-	-	-	-	-	-	2	-
CO3	Select appropriate actuators and sensors for a robot based on specific application	3	2	-	-	-	2	2	-	-	-	-	-	-	2	-
CO4	Apply DH Notation for Joint coordinates and world coordinators in Manipulator kinematics problems	2	1	-	-	-	2	3	-	-	-	-	-	-	3	-
CO5	Analyze the trajectory planning for a manipulator by avoiding Obstacles	2	1	-	-	-	2	3	-	-	-	-	-	-	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**	**PSO3**
CO1	Describe the meaning and concepts of entrepreneurship development	2	1	-	-	-	2	3	-	-	-	-	-	-	2	-
CO2	Apply the business plan for preparation and evaluation of project	1	1	-	-	-	1	2	-	-	-	-	-	-	2	-
CO3	Explain about Institutional Support to Entrepreneur and MSMEs	3	2	-	-	-	2	2	-	-	-	-	-	-	2	-
CO4	Explain about the Opportunities of Entrepreneurship Internationally.	2	1	-	-	-	2	3	-	-	-	-	-	-	3	-
CO5	Explain about Informaal Risk Capital, Venture capital and Social responsibility for entrepreneurship	2	1	-	-	-	2	3	-	-	-	-	-	-	1	-
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**	**PSO3**
CO1	Analyze Discrete Time Signals and Systems	2	1	-	-	-	2	3	-	-	-	-	-	-	2	-

-	CO Statements	POs												PSOs		
CO2	Apply various DFT properties to evaluate the given sequence	1	1	-	-	-	1	2	-	-	-	-	-	-	2	-
CO3	Make use of FFT Algorithms for the computation of DFT	3	2	-	-	-	2	2	-	-	-	-	-	-	2	-
CO4	Design digital filters and implement with different structures	2	1	-	-	-	2	3	-	-	-	-	-	-	3	-
CO5	Apply the knowledge of Multirate signal processing in the real time applications.	2	1	-	-	-	2	3	-	-	-	-	-	-	1	-
Course Code	**191EC7O07 BASICS OF VLSI DESIGN (Open Elective-III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Demonstrate the fundamental concepts of basic MOS theory of fabrication process and the electrical properties of MOS and Bi-CMOS Circuit	2	1	-	-	-	2	3	-	-	-	-	-	-	2	-
CO2	Develop the stick and layout models of MOS circuits using design rules.	1	1	-	-	-	1	2	-	-	-	-	-	-	2	-
CO3	Develop various CMOS logic structures using different MOS logic technologies.	3	2	-	-	-	2	2	-	-	-	-	-	-	2	-
CO4	Demonstrate the scaling factors in determining the characteristics and performance of MOS circuits in silicon	2	1	-	-	-	2	3	-	-	-	-	-	-	3	-
CO5	Demonstrate the scaling factors in determining the characteristics and performance of MOS circuits in silicon	2	1	-	-	-	2	3	-	-	-	-	-	-	1	-
Course Code	**191EC7O08 MICRO ELECTROMECHANICAL SYSTEMS (Open Elective-III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Summarize the operation of micro systems, and their applications	2	1	-	-	-	2	3	-	-	-	-	-	-	2	-
CO2	Classify the materials for micro system applications	1	1	-	-	-	1	2	-	-	-	-	-	-	2	-
CO3	Explain the state-of-the-art for lithography and packaging techniques	3	2	-	-	-	2	2	-	-	-	-	-	-	2	-
CO4	Extend the knowledge of basic approaches for various sensors and actuators design	2	1	-	-	-	2	3	-	-	-	-	-	-	3	-
CO5	Apply the expertise on micro systems for interdisciplinary applications	2	1	-	-	-	2	3	-	-	-	-	-	-	1	-
Course Code	**191EC7O08 IMAGE PROCESSING (Open Elective-III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain the concepts of digital image processing	2	1	-	-	-	2	3	-	-	-	-	-	-	2	-
CO2	Identify various image enhancement and image restoration techniques.	1	1	-	-	-	1	2	-	-	-	-	-	-	2	-
CO3	Outline the color fundamentals and different color image processing methods.	3	2	-	-	-	2	2	-	-	-	-	-	-	2	-
CO4	Utilize different morphological operators for image processing.	2	1	-	-	-	2	3	-	-	-	-	-	-	3	-
CO5	Analyze different image segmentation techniques for image processing	2	1	-	-	-	2	3	-	-	-	-	-	-	1	-
Course Code	**191CS7O10 BIG DATA ANALYTICS (Open Elective-III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Illustrate big data challenges in different domains including social media, transportation, finance, and medicine	2	1	-	-	-	2	3	-	-	-	-	-	-	2	-
CO2	Use various techniques for mining data stream	1	1	-	-	-	1	2	-	-	-	-	-	-	2	-
CO3	Demonstrate building blocks of Hadoop	3	2	-	-	-	2	2	-	-	-	-	-	-	2	-
CO4	Apply map reduce procedure to solve big data problems	2	1	-	-	-	2	3	-	-	-	-	-	-	3	-

-	CO Statements	POs												PSOs		
CO5	Make use of Pig & Hive Frameworks to work with big data.	2	1	-	-	-	2	3	-	-	-	-	-	-	1	-
CO6	Explore various visualization techniques															
Course Code	**191CS7O11 MOBILE APPLICATION DEVELOPMENT (Open Elective-III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Make use of Android Studio to develop Android application	2	1	-	-	-	2	3	-	-	-	-	-	-	2	-
CO2	Develop user Interfaces using Android platformv	1	1	-	-	-	1	2	-	-	-	-	-	-	2	-
CO3	Make Use of state information across important operating system events	3	2	-	-	-	2	2	-	-	-	-	-	-	2	-
CO4	Apply Java programming concepts to Android application development	2	1	-	-	-	2	3	-	-	-	-	-	-	3	-
CO5	Explain the concepts of GPS and mobile security	2	1	-	-	-	2	3	-	-	-	-	-	-	1	-
Course Code	**191CS7O12 DATA SCIENCE (Open Elective-III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Describe Data Science and the skill sets needed to be a data scientist.	2	1	-	-	-	2	3	-	-	-	-	-	-	2	-
CO2	Apply basic tools for visualizing Data& optimization	1	1	-	-	-	1	2	-	-	-	-	-	-	2	-
CO3	Describe the process of reading and exploring data	3	2	-	-	-	2	2	-	-	-	-	-	-	2	-
CO4	Implement various machine learning algorithms for analyzing various datasets.	2	1	-	-	-	2	3	-	-	-	-	-	-	3	-
CO5	Analyze datasets using clustering and recommender systems	2	1	-	-	-	2	3	-	-	-	-	-	-	1	-
Course Code	**191IT7O06 MACHINE LEARNING (Open Elective-III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Identify machine learning techniques suitable for a given problem	2	1	-	-	-	2	3	-	-	-	-	-	-	2	-
CO2	Evaluate the performance of an algorithm used in an ML model	1	1	-	-	-	1	2	-	-	-	-	-	-	2	-
CO3	Apply probability approximations and frame ordered and unordered rules for given machine learning problem	3	2	-	-	-	2	2	-	-	-	-	-	-	2	-
CO4	Design multilayer model using techniques like back propagation, quadratic programming solution.	2	1	-	-	-	2	3	-	-	-	-	-	-	3	-
CO5	Design models using conditional probability, logistic regression, and distance based techniques.	2	1	-	-	-	2	3	-	-	-	-	-	-	1	-
Course Code	**191IT7O07 QUANTUM COMPUTING (Open Elective-III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Illustrate fundamentals of quantum information processing	2	1	-	-	-	2	3	-	-	-	-	-	-	2	-
CO2	Explain quantum basics and principles	1	1	-	-	-	1	2	-	-	-	-	-	-	2	-
CO3	Apply various quantum algorithms for solving problem	3	2	-	-	-	2	2	-	-	-	-	-	-	2	-
CO4	Apply simple quantum algorithms and information channels in the quantum circuit model	2	1	-	-	-	2	3	-	-	-	-	-	-	3	-
CO5	Demonstrate Performance, Security and Scalability of quantum computing	2	1	-	-	-	2	3	-	-	-	-	-	-	1	-
CO6	Analyze various quantum computing models and approaches															

-	CO Statements	POs												PSOs		
Course Code	**191IT7O08 BLOCK CHAIN TECHNOLOGIES (Open Elective-III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Demonstrate the foundation of the Blockchain technology and understand the processes in payment and funding	2	1	-	-	-	2	3	-	-	-	-	-	-	2	-
CO2	Identify the risks involved in building Blockchain applications.	1	1	-	-	-	1	2	-	-	-	-	-	-	2	-
CO3	Explain the legal implications using smart contracts.	3	2	-	-	-	2	2	-	-	-	-	-	-	2	-
CO4	Choose the present landscape of Blockchain implementations and Understand Crypto currency markets	2	1	-	-	-	2	3	-	-	-	-	-	-	3	-
CO5	Examine how to profit from trading crypto currencies.	2	1	-	-	-	2	3	-	-	-	-	-	-	1	-
Course Code	**191MI7O04 COMMUNICATION SYSTEM IN MINES Open Elective-III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Demonstrate types of signals and relation of time domain representation to frequency domain.	2	1	-	-	-	2	3	-	-	-	-	-	-	2	-
CO2	Apply signal concepts to continuous wave modulation	1	1	-	-	-	1	2	-	-	-	-	-	-	2	-
CO3	Interpret the basic concepts of pulse modulation.	3	2	-	-	-	2	2	-	-	-	-	-	-	2	-
CO4	Analyze the concepts of digital modulation techniques.	2	1	-	-	-	2	3	-	-	-	-	-	-	3	-
CO5	Summarize different advanced communication networks.	2	1	-	-	-	2	3	-	-	-	-	-	-	1	-
Course Code	**191MI7O05 DRILLING & BLASTING (Open Elective-III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Differentiate between explosives	2	1	-	-	-	2	3	-	-	-	-	-	-	2	-
CO2	Use blasting accessories along with monitoring and assessment.	1	1	-	-	-	1	2	-	-	-	-	-	-	2	-
CO3	Analyze problems associated with open cast blasting and mitigation	3	2	-	-	-	2	2	-	-	-	-	-	-	2	-
CO4	Analyze problems associated with underground blasting and mitigation.	2	1	-	-	-	2	3	-	-	-	-	-	-	3	-
CO5	Assess blasting in metal mines	2	1	-	-	-	2	3	-	-	-	-	-	-	1	-
Course Code	**191PT7O05 INTRODUCTION TO EARTH SCIENCES (Open Elective-III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain various branches of earth sciences and universe	2	1	-	-	-	2	3	-	-	-	-	-	-	2	-
CO2	Explain the origin of the universe and solar systems	1	1	-	-	-	1	2	-	-	-	-	-	-	2	-
CO3	Explain the concepts of earth's magnetic field	3	2	-	-	-	2	2	-	-	-	-	-	-	2	-
CO4	Illustrate the concepts of the plate tectonics	2	1	-	-	-	2	3	-	-	-	-	-	-	3	-
CO5	Explain the origin of the oceans, continents, mountains, and valleys	2	1	-	-	-	2	3	-	-	-	-	-	-	1	-
Course Code	**191PT7006 BASIC CONCEPTS IN PETROLEUM DRILLING AND COMPLETIONS (Open Elective-III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain the types of drilling equipment and drilling hydraulics.	2	1	-	-	-	2	3	-	-	-	-	-	-	2	-
CO2	Explain about Casings, cement slurry design, directional drilling, and fishing, well control concepts.	1	1	-	-	-	1	2	-	-	-	-	-	-	2	-
CO3	Explain different types of wells, well testing, surface, and subsurface equipment.	3	2	-	-	-	2	2	-	-	-	-	-	-	2	-

-	CO Statements	POs												PSOs		
CO4	Explain well completion equipment and different perforation techniques.	2	1	-	-	-	2	3	-	-	-	-	-	-	3	-
CO5	Illustrate different Subsurface circulating equipment and different types of packers	2	1	-	-	-	2	3	-	-	-	-	-	-	1	-
Course Code	**191AG7O04 GREENHOUSE TECHNOLOGY (Open Elective-III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Design small scale polyhouse for drying purpose.	2	1	-	-	-	2	3	-	-	-	-	-	-	2	-
CO2	Classify greenhouses based on construction materials.	1	1	-	-	-	1	2	-	-	-	-	-	-	2	-
CO3	Explain the scenario of protective cultivation around the globe and in India.	3	2	-	-	-	2	2	-	-	-	-	-	-	2	-
CO4	Make use of non-chemical and chemical pesticides and growth regulators effectively in an environmentally responsible way.	2	1	-	-	-	2	3	-	-	-	-	-	-	3	-
CO5	Assess the basic production requirements and the knowledge of horticulture crop cultivation in greenhouse.	2	1	-	-	-	2	3	-	-	-	-	-	-	1	-
Course Code	**191AG7O05 FLOODS AND CONTROL MEASURES (Open Elective-III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
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	1	-	-	-	2	3	-	-	-	-	-	-	2	-
CO2	Explain importance of various flood routing techniques and flood control measures	1	1	-	-	-	1	2	-	-	-	-	-	-	2	-
CO3	Design of flood control projects and their cost economics estimation	3	2	-	-	-	2	2	-	-	-	-	-	-	2	-
CO4	Estimate seepage through earth embankments and understand causes of failures.	2	1	-	-	-	2	3	-	-	-	-	-	-	3	-
CO5	Design of earthen dam and its stability analysis by different methods	2	1	-	-	-	2	3	-	-	-	-	-	-	1	-
Course Code	**191CE7P03 INTERNSHIP**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Conduct a technical survey to identify a real world engineering problem	1	1	-	-	-	-	-	-	-	1	-	1	-	1	-
CO2	Analyze the industrial plant layout using technical expertise	2	-	-	-	-	1	1		-	-	-	1	-	1	-
CO3	Compare theoretical and real work environments in technical perspective	2	-	-	-	-	-	-	-	-	1	1	1	-	2	-
CO4	Identify the challenges in the execution of operations	1	1	1	1	-	-	-	-	-	-	-	-	-	2	-
CO5	Execute the operations and report the results of assigned tasks using modern tools adhering to professional ethics	-	-	-	-	2	-	-	2	1	1	-	-	-	2	-
Course Code	**191CE7L06 ENVIRONMENTAL ENGINEERING LAB**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Determine the chemical quality parameters of water.	3	-	-	-	-	-	2	-	-	-	-	2	-	2	-
CO2	Estimate the extent of pollution in the given waste water by comparing with the IS – 10500 - 2012 drinking water standards.	2	-	-	-	-	-	-	-	-	-	-	3	-	2	-

-	CO Statements	POs												PSOs		
CO3	Determine the treatment methods to be followed in order to supply the water for public consumption.	-	-	-	-	-	-	-	-	-	-	-	3	-	1	-
CO4	Estimate the level of treatment methods to be followed for the given waste water sample.	-	-	-	-	-	-	2	-	-	-	-	3	-	2	-
CO5	Judge whether the given waste water sample can be disposed into the environment.	1	-	-	-	-	-	1	-	-	-	-	3	-	2	-
VIII SEM																
Course Code	**191CE8E30 SUSTAINABLE MATERIALS AND GREEN BUILDINGS (Professional Elective-VI)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Describe the concepts of sustainability in conventional engineered building materials.	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-
CO2	Familiarize the concept of sustainability through lower carbon cements	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-
CO3	Design the thermal conductive models.	-	-	2	-	-	-	-	-	-	3	-	-	-	-	-
CO4	Design the energy efficient buildings.	-	-	2	-	-	-	-	-	-	3	-	-	-	-	-
CO5	Illustrate the concept of solar energy and solar cells.	-	-	2	-	-	-	-	-	-	3	-	-	-	-	-
Course Code	**191CE8E27 GEO-SYNTHETICS AND REINFORCED SOIL STRUCTURES (Professional Elective-VI)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Understand the effect of reinforcement in soils	3	2	-	1	-	2	-	-	-	-	-	-	-	2	-
CO2	Describe about geo-synthetics and design of earth retaining walls	3	2	-	2	-	2	-	-	-	-	-	-	-	3	-
CO3	Design reinforced embankments and foundation mattress	3	2	-	2	-	2	-	-	-	-	-	-	-	2	-
CO4	Analysis and design of reinforced soil beds	3	2	-	2	-	2	-	-	-	-	-	-	-	2	-
CO5	Explain the basic concepts of reinforced pavements	2	1	-	2	-	2	-	-	-	-	-	-	-	1	-
Course Code	**191CE8E28 INFRASTRUCTURE PLANNING AND MANAGEMENT (Professional Elective-VI)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain the basic concepts related to Infrastructure Projects	3	2	-	-	-	2	-	-	-	-	2	-	-	2	-
CO2	Explain the role of private sector in infrastructure growth	3	2	-	-	-	2	-	-	-	-	2	-	-	2	-
CO3	Describe the strategies for successful Infrastructure Project implementation.	3	2	-	-	-	2	-	-	-	-	2	-	-	1	-
CO4	Develop Infrastructure modeling and Life Cycle Analysis Techniques	3	2	-	-	-	2	-	-	-	-	2	-	-	1	-
CO5	Explain Sustainable development of Infrastructure	2	1	-	-	-	2	-	-	-	-	2	-	-	1	-
Course Code	**191CE8E29 SUBSURFACE EXPLORATION - IMPORTANCE AND TECHNIQUES INVOLVED (Professional Elective-VI)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO 1	Interpret the concepts behind a range of sub-surface exploration	2	1	-	-	-	-	3	-	-	-	-	-	-	2	-
CO 2	Illustrate the appropriate techniques for a range of geotechnical investigations	2	1	-	-	-	-	3	-	-	-	-	-	-	1	-
CO 3	Identify the geo physical investigation techniques	2	1	-	3	-	-	-	-	-	-	-	-	-	1	-
CO 4	Classify different types offshore investigations	2	1	-	-	-	-	3	-	-	-	-	-	-	2	-

-	CO Statements	POs												PSOs		
CO 5	Make use of different dynamic testing of piles	3	2	1	-	-	-	-	-	-	-	-	-	-	2	-
Course Code	**191CE8E26 ENVIRONMENTAL REMEDIATION OF CONTAMINATED SITES (Professional Elective-VI)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Interpret the concepts to hazardous waste laws and risk assessment	2	-	-	-	-	-	2	-	-	-	-	-	2	-	-
CO2	Illustrate the appropriate techniques for remediation of contaminated	2	-	-	-	-	-	2	-	-	-	-	-	1	-	-
CO3	Identify the permeable reactive barriers	-	-	-	1	-	-	2	3	-	-	-	-	-	-	-
CO4	Classify different types solidification and stabilization	-	-	-	2	-	-	2	3	-	-	-	-	2	-	-
CO5	Illustrate the concept of chemical treatment	3	-	-	1	-	-	-	2	-	-	-	-	3	-	-
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**	**PSO3**
CO1	Describe generation rates, composition, and issues of Solid waste	2	1	-	-	-	2	3	-	-	-	-	-	-	2	-
CO2	Explain the issues, collection, recovery, reuse, processing of Municipal solid waste	2	1	-	-	-	2	3	-	-	-	-	-	-	1	-
CO3	Explain the issues, collection, recovery, reuse, processing of Municipal solid waste	1	2	-	-	-	2	3	-	-	-	-	-	-	1	-
CO4	Interpret Construction and demolition waste management	2	1	-	-	-	2	3	-	-	-	-	-	-	1	-
CO5	Assess the issues related to E-waste generation and current management practices	1	2	-	-	-	2	3	-	-	-	-	-	-	1	-
Course Code	**191EE8O10 IFUNDAMENTALS OF ELECTRICAL ENGINEERING (OPEN ELECTIVE – IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain the concepts of basic circuits and basic laws for electrical networks	2	1	-	-	-	2	3	-	-	-	-	-	-	2	-
CO2	Summarize the behaviour of RLC networks	2	1	-	-	-	2	3	-	-	-	-	-	-	1	-
CO3	Analyse the network by obtaining solution through mesh and nodal analysis	1	2	-	-	-	2	3	-	-	-	-	-	-	1	-
CO4	Determine resonance frequency and Q factor of an AC Circuit	2	1	-	-	-	2	3	-	-	-	-	-	-	1	-
CO5	Explain the operation of the Transformer	1	2	-	-	-	2	3	-	-	-	-	-	-	1	-
CO6	Explain the operation of the Induction motors and DC Machines															
Course Code	**191EE8O11 BASIC ELECTRIC CIRCUITS (OPEN ELECTIVE – IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain various theories of electrical networks	2	1	-	-	-	2	3	-	-	-	-	-	-	2	-
CO2	Explain the importance of three phase circuits with Star& Delta connected balanced and unbalanced loads	2	1	-	-	-	2	3	-	-	-	-	-	-	1	-
CO3	Illustrate various electrical networks by using principles of network theorems	1	2	-	-	-	2	3	-	-	-	-	-	-	1	-
CO4	Obtain the various network parameters for the given two port networks	2	1	-	-	-	2	3	-	-	-	-	-	-	1	-

-	CO Statements	POs												PSOs		
CO5	Analyse the transient behaviour of electrical networks for DC excitations	1	2	-	-	-	2	3	-	-	-	-	-	-	1	-
Course Code	**191EE8O12 ELECTRICAL MACHINES (OPEN ELECTIVE – IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Evaluate the effects of armature reaction in dc machines	2	1	-	-	-	2	3	-	-	-	-	-	-	2	-
CO2	Determine the torque production mechanism and control the speed of dc motors.	2	1	-	-	-	2	3	-	-	-	-	-	-	1	-
CO3	Determine the voltage regulation and efficiency of single-phase transformers.	1	2	-	-	-	2	3	-	-	-	-	-	-	1	-
CO4	Explain the operation and performance of three phase induction motor.	2	1	-	-	-	2	3	-	-	-	-	-	-	1	-
CO5	Apply methods of staring and correction of power factor with synchronous motor	1	2	-	-	-	2	3	-	-	-	-	-	-	1	-
Course Code	**191EE8O13 Power Electronics (OPEN ELECTIVE – IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
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**	**PSO3**
CO1	Explain the prospects of renewable energy and solar energy.	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	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**	**PSO3**
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	-	-	-

-	CO Statements	POs												PSOs		
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**	**PSO3**
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**	**PSO3**
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**	**PSO3**
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	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191EC8O12 Principles of Communications (OPEN ELECTIVE – IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
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	-	-	-

-	CO Statements	POs												PSOs		
Course Code	**191EC8O13 Electronic Instrumentation (OPEN ELECTIVE – IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
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**	**PSO3**
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**	**PSO3**
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 Crimes and 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**	**PSO3**
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	-	-	-
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**	**PSO3**
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	-	-	-	-	-	-	-	-	-	-

-	CO Statements	POs												PSOs		
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**	**PSO3**
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**	**PSO3**
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**	**PSO3**
CO1	Demonstrate the mathematical foundation of neural network	3	2	-	2	2	-	-	-	-	-	-	-	-	-	-
CO2	Explain various machine learning algorithms and their importance for data analysis.	3	2	-	2	2	-	-	-	-	-	-	-	-	-	-
CO3	Illustrate the challenges and optimization strategies of deep neural network.	2	2	-	3	1	-	-	-	-	-	-	-	-	-	-
CO4	Build a convolutional neural network using different activation functions.	2	3	-	2	1	-	-	-	-	-	-	-	-	-	-
CO5	Build and train RNN and LSTMs using sequence modelling.	2	3	-	2	1	-	-	-	-	-	-	-	-	-	-
Course Code	**191IT8O10 Block Chain Technologies (OPEN ELECTIVE – IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
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	-	-	-

-	CO Statements	POs												PSOs		
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**	**PSO3**
CO1	Explain the Process Safety, Accidents and Loss statistics, Toxicological Studies	2	-	-	-	-	1	-	-	-	-	-	1	-	-	-
CO2	Explain the fire and explosion and its prevention	2	-	-	-	-	1	-	-	-	-	-	1	-	-	-
CO3	Explain the Source model and dispersion, Relief sizing	2	-	-	-	-	1	-	-	-	-	-	1	-	-	-
CO4	Illustrate Hazard Identification, HAZOP analysis, Risk Assessment	2	-	-	-	-	1	-	-	-	-	-	1	-	-	-
CO5	Explain the Process of Accident Investigation, Reliability Engineering, Economics of loss prevention	2	-	-	-	-	1	-	-	-	-	-	1	-	-	-
Course Code	**191PT8O08 Mechanical Unit Operations(OPEN ELECTIVE – IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain the fundamentals of Mechanical unit operations	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Explain storage of bulk solids and flow measurements.	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Explain the Flow past immersed solid objects and motion of particles through fluids, beds of solids	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	Apply Filtration, flow through packed and fluidized beds, cross flow filtration	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	Explain the Gravity sedimentation, centrifugal separations, floatation	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**	**PSO3**
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	-	-	-	-	-	-	-	-	-	-
Course Code	**191AG8O07 Plastic Applications in Agriculture (OPEN ELECTIVE – IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
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	-	-	-	-	-	-	-	-	-

-	CO Statements	POs												PSOs		
CO5	Outline plastic usage due to hands on experience through visit to a greenhouse and farmer's field.	3	1	-	2	-	2	-	-	-	-	-	-	-	-	-
Course Code	**191AG8P05 PROJECT PART-2**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Demonstrate technical skills of data collection and data analysis adhering to professional ethics.	1	1	-	-	-	-	-	2	-	-	-	1	-	2	-
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	-	-	-	-	-	-	1	-
CO3	Build a team of people to work together and communicate well in the critical stages of project progress.	-	-	-	-	-	-	-	-	1	2	1	1	-	-	1
CO4	Use modern tools to derive conclusions of the project work effectively.	-	-	-	-	3	-	-	-	-	2	1	1	2	-	-
CO5	Demonstrate the results of the project work as a functional product prototype/application/analytical solution for a specified operation.	-	-	-	-	1	-	-	-	-	1	1	1	3	-	-