ADITYA ENGINEERING COLLEGE

An Autonomous Institutuion

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

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Department of Petroleum Technology

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

	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**
CO1	Illustrate the fundamental concepts of computers and basics of computer programming	1	-	-	-	-	-	-	-	-	-	-	1	-	-
CO2	Make use of control structures and arrays in solving complex problems.	3	-	-	-	-	-	-	-	-	-	-	1	-	-
CO3	Develop modular program aspects and strings fundamentals.	3	-	-	-	-	-	-	-	-	-	-	1	-	-
CO4	Demonstrate the ideas of pointers usage.	2	-	-	-	-	-	-	-	-	-	-	1	-	-
CO5	Solve real world problems using the concept of structures, unions and File operations.	3	2	1	-	2	-	-	-	-	-	-	1	-	-
Course Code	**191HS1L01 - Communicative English Lab-I**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Make use of the concepts to communicate confidently and competently in English Language in all spheres.	-	-	-	-	1	-	-	-	-	3	-	1	-	-
CO2	Express Creative skills to construct Dialogues / Conversations in Spoken and Written forms.	-	-	-	-	1	-	-	-	-	3	-	2	-	-
CO3	Identify Accent for intelligibility.	-	-	-	-	1	-	-	-	-	3	-	2	-	-
CO4	Demonstrate communicative ability in everyday Conversation, JAM Sessions and Public Speaking.	-	-	-	-	1	-	-	-	-	3	-	1	-	-
CO5	Demonstrate nuances of Language through Audio – Visual Experience and group activities.	-	-	-	-	1	-	-	-	-	3	-	1	-	-
Course Code	**191BS1L01 - Engineering Physics Lab**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Determine the rigidity and young's modulus to understand material properties.	3	2	-	-	-	-	-	-	2	-	-	1	-	-
CO2	Determine Acceleration due to Gravity and Radius of Gyration and spring constant by oscillatory mechanics.	3	2	-	-	-	-	-	-	2	-	-	1	-	-
CO3	Find the strength of the magnetic field.	2	1	-	-	-	-	-	-	2	-	-	1	-	-
CO4	Determine wave length of unknown source, particle size using lasers.	3	2	-	-	-	-	-	-	2	-	-	1	-	-
CO5	Determination of velocity of sound, moment of inertia.	3	2	-	-	-	-	-	-	2	-	-	1	-	-
Course Code	**191ES1L01 - Programming for Problem Solving Using C Lab**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Develop the basic programs in C and draw the flowcharts using Raptor.	2	-	-	-	1	-	-	-	-	-	-	3	-	-

	CO Statements	POs												PSOs	
CO2	Make use of conditional and iterative statements to solve real time scenarios in C.	3	-	-	-	1	-	-	-	-	-	-	3	-	-
CO3	Apply the concept of arrays, modularity and strings to handle complex problems.	3	-	-	-	1	-	-	-	-	-	-	3	-	-
CO4	Apply the dynamic memory allocation functions using pointers.	2	-	-	-	1	-	-	-	-	-	-	3	-	-
CO5	Develop programs using structures, and Files.	3	-	-	-	1	-	-	-	-	-	-	3	-	-
Course Code	**191ES1L02 - Basic Engineering Workshop**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Construct the various wooden joints.	3	2	1	-	3	-	-	-	-	-	-	-	3	-
CO2	Develop various fitting joints.	3	2	1	-	3	-	-	-	-	-	-	-	3	-
CO3	Develop components for making the various sheet metal models.	3	2	1	-	3	-	-	-	-	-	-	-	3	-
CO4	Experiment with the various house wiring connections.	3	2	1	-	3	-	-	-	-	-	-	-	-	-
Course Code	**191MC1A01 - Environmental Science**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Outline the natural resources and their importance for the sustenance of the life	-	-	-	-	-	1	2	-	-	-	-	-	-	-
CO2	Explain about the biodiversity of India, threats and its conservation methods	-	-	-	-	-	1	2	-	-	-	-	-	-	-
CO3	Illustrate various attributes of the pollution, impacts and measures to control the pollution along with waste management practices	-	-	-	-	-	1	2	-	-	-	-	-	-	-
CO4	Describe social issues of both rural and urban environment to combat the challenges and the legislations of India in environmental protection	-	-	-	-	-	1	2	-	-	-	-	-	-	-
CO5	Explain the population growth and its implications	-	-	-	-	-	1	2	-	-	-	-	-	-	-
Course Code	**191MC1A02 - Constitution of India**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain historical background ofthe constitution making and its importance for building a democratic India.	-	-	-	-	-	1	-	-	-	-	-	-	-	-
CO2	Compare the functioning of three wings of the government i.e. executive, legislative and judiciary.	-	-	-	-	-	1	-	-	-	-	-	-	-	-
CO3	Interpret the value of the fundamental rights and duties for becoming good citizen of India.	-	-	-	-	-	1	-	-	-	-	-	-	-	-
CO4	Compare the decentralization of power between central, state and local self-government.	-	-	-	-	-	1	-	-	-	-	-	-	-	-
CO5	Extend the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.	-	-	-	-	-	1	-	-	-	-	-	-	-	-
	II SEM														
Course Code	**191BS2T05 - Partial Differential Equations and Vector Calculus**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Solve improper integrals using beta and gamma functions.	3	2	-	-	-	-	-	-	-	-	-	-	-	-

	CO Statements	POs												PSOs	
CO2	Solve partial differential equations of first order.	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Compute the double integral over a region and triple integral over a volume.	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO4	Calculate the gradient of a scalar function, divergence and curl of a vector function.	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO5	Apply line, surface and volume integrals.	3	2	-	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191BS2T06 - Chemistry of Materials**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Compare the quality of drinking water and problems associated with hardwater.	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Explain the fundamentals and applications of Electrochemical energy systems.	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Explain fundamentals and applications of polymers and building materials.	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	Explain the fundamentals and controlling methods of corrosion.	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	Explain the properties and applications of nano materials, conductors, Semiconductors and Super conductors.	3	-	-	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191ES2T02 - Engineering Graphics and Design**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Make use of fundamentals of Engineering Drawing to sketch basic curves, conic sections, cycloid, epicycloid, hypocycloid and involute.	3	-	-	-	-	-	-	-	-	2	-	-	-	-
CO2	Apply the principles of orthographic projections for points, lines and planes.	3	-	-	-	-	-	-	-	-	2	-	-	-	-
CO3	Apply the principles of orthographic projections for solids.	3	-	-	-	-	-	-	-	-	2	-	-	-	-
CO4	Apply the AutoCAD software for the orthographic projection of the machine parts.	3	-	-	-	2	-	-	-	-	2	-	2	-	-
CO5	Apply the AutoCAD software for the isometric projection of the machine parts.	3	-	-	-	2	-	-	-	-	2	-	2	-	-
Course Code	**191ES2T03 - Essential Electrical and Electronics Engineering**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Construct simple electrical circuits using basic laws.	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Explain the constructional features of DC Machines and working.	3	2	2	-	-	-	-	-	-	-	-	-	-	-
CO3	Examine the performance of single phase transformer.	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO4	Illustrate the principle of AC rotating machines.	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO5	Analyze the device structure, operation and application of diode and BJT.	3	-	-	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191ES2T04 - Engineering Mechanics**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Determine the resultant force and moment for a given force system.	2	2	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Solve the member forces in trusses.	1	2	-	-	-	-	-	-	-	-	-	-	-	-

	CO Statements	POs												PSOs	
CO3	Apply concept of Virtual work to find the work done by force and couple.	1	2	-	-	-	-	-	-	-	-	-	-	-	-
CO4	Solve the centre of gravity and moment of inertia for various geometric shapes.	2	2	-	-	-	-	-	-	-	-	-	-	-	-
CO5	Determine the displacement, velocity and acceleration relations in dynamic systems.	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO6	Apply the concepts of kinematics, kinetics, work - energy and impulse - momentum methods to particle motion.	3	2	-	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191HS2L02 - Communicative English Lab-II**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Make effective use of Body language in all situations and contexts to enhance effective communication in all aspects.	-	-	-	-	-	-	-	-	-	3	-	2	-	-
CO2	Identify communicative competency to respond to others in different situations.	-	-	-	-	-	-	-	-	-	3	-	2	-	-
CO3	Make use of effective delivery strategies to select, compile and synthesize information for oral presentation.	-	-	-	-	-	-	-	-	-	3	-	2	-	-
CO4	Demonstratein mock interviews, group discussion and public speaking.	-	-	-	-	-	-	-	-	-	3	-	2	-	-
CO5	Illustrate interpersonal skills using English language confidently and effectively for personal and professional growth.	-	-	-	-	-	-	-	-	-	3	-	2	-	-
Course Code	**191BS2L04 - Engineering Chemistry Lab**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Analyze and generate experimental skills.	3	-	-	-	3	-	-	-	3	3	-	1	-	-
CO2	Calculate the hardness of water.	3	-	-	-	3	-	-	-	3	3	-	1	-	-
CO3	Calculate the strength of acids & bases by instrumental analysis.	3	-	-	-	3	-	-	-	3	3	-	1	-	-
CO4	Prepare advanced polymer materials.	3	-	-	-	3	-	-	-	3	3	-	1	-	-
CO5	Prepare alternative fuel like Bio-Diesel.	3	-	-	-	3	-	-	-	3	3	-	1	-	-
Course Code	**191ES2L03 - Essential Electrical and Electronics Engineering Lab**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Analyze the electrical networks using network theorems.	3	2	1	1	-	-	-	-	-	-	-	-	-	-
CO2	Analyze the performance of AC and DC Machines.	3	3	2	-	-	-	-	-	-	-	-	-	-	-
CO3	Estimate the performance of 1-phase transformer.	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO4	Explain diode characteristics and its applications	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO5	Explain the simulation of diode and transistor.	2	1	-	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191ES2L13 - Petroleum Technology Workshop**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Understand the importance of unit operations such as fluid dynamics, heat transfer and mass transfer.	3	2	-	-	-	-	-	-	-	-	-	-	3	-
CO2	Understand the factors that influence reservoir fluid flow.	3	2	-	-	-	-	-	-	-	-	-	-	2	-
CO3	Determine the properties of drilling fluid.	2	2	-	-	-	-	-	-	-	-	-	-	2	-

	CO Statements	POs												PSOs	
CO4	Characterize the distillation of fuel samples.	3	2	-	-	-	-	-	-	-	-	-	-	3	-
CO5	Understand the properties of rocks and depositional environment.	3	2	-	-	-	-	-	-	-	-	-	-	3	-
Course Code	**191PR2P01 - Engineering Exploration Project**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Analyze the surrounding environment and identifyadesignchallenge	1	1	1	-	-	-	-	-	-	-	-	1	-	-
CO2	Foster team collaboration,find inspiration from the environmentandlearn how to identifyproblems	-	1	1	-	-	-	-	-	1	1	-	-	-	-
CO3	Encourage exploration to process the DesignChallenge,empathize &brainstorm the users effectively	-	-	1	1	-	1	1	-	-	-	-	-	-	-
CO4	Build effective prototypes as tangiblemodels to use ascommunicationtools	-	-	-	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	**191BS3T15 - Numerical Methods and Integral Transforms**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
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	Compute Fourier series of a function	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO4	Compute the Fourier transform ofa function.	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO5	Apply Laplace transform to solve initial value problems.	3	2	-	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191PT3T01 - Petroleum Exploration**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Apply the different geological approaches for exploration of oil and gas deposits	3	-	-	-	-	-	-	-	-	-	-	1	2	-
CO2	Utilize the principles of gravity prospecting to explore the subsurface rocks favorable for hydrocarbon deposits	3	-	-	-	-	-	-	-	-	-	-	1	2	-
CO3	Make use of principles of magnetic method to explore sedimentary basins	3	-	-	-	-	-	-	-	-	-	-	1	2	-
CO4	Apply the method of seismic refraction to estimate the velocity and thickness of different subsurface geological layers	3	-	-	-	-	-	-	-	-	-	-	1	2	-
CO5	Apply different seismic reflection techniques in selected areas of structural interest revealed by the gravity and magnetic methods to locate oil bearing structures	3	-	-	-	-	-	-	-	-	-	-	1	2	-
Course Code	**191HS3T02 - Managerial Economics and Financial Analysis**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the Managerial Economic concepts for decision making and forward	1	-	-	-	-	-	-	-	-	-	-	-	-	-

	CO Statements	POs												PSOs	
CO2	Illustrate the law of demand and its exceptions by using different forecasting methods.	-	-	-	-	-	-	-	-	-	2	-	-	-	-
CO3	Apply the production and cost concepts to determine Break Even Point in managerial	1	-	-	-	-	-	-	-	-	-	3	-	-	-
CO4	Classify the different types of Market structures and business organizations.	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CO5	Prepare final accounts by using process and principles of accounting.	1	-	-	-	-	-	-	-	-	3	-	-	-	-
CO6	Utilize various techniques on investment project proposals with the help of capital.	1	-	-	-	-	-	-	-	-	-	2	-	-	-
Course Code	**191PT3T02 - Geology and Sedimentology**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the general facts of the earth.	2	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	Analyze the different processes for the formation of land forms.	2	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	Analyze the different erosion cycles and their products.	2	-	-	-	-	-	-	-	-	-	-	-	2	-
CO4	Compare and classify various kinds of rocks.	2	-	-	-	-	-	-	-	-	-	-	-	2	-
CO5	Explain how basins and micro fossils are formed	2	-	-	-	-	-	-	-	-	-	-	-	2	-
Course Code	**191PT3T03 - Chemical Process Calculations**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Solve basic calculations of stoichiometric and ideal gaseous mixtures	3	2	-	-	-	-	-	-	-	-	-	1	3	-
CO2	Apply vapor pressure, humidity and saturation for engineering calculations	2	2	-	-	-	-	-	-	-	-	-	1	2	-
CO3	Calculate the material balances with and without chemical reactions	3	2	-	-	-	-	-	-	-	-	-	1	2	-
CO4	Calculate the energy balances with reactive and non-reactive process systems	3	2	-	-	-	-	-	-	-	-	-	1	2	-
CO5	Solve combustion calculations and thermal efficiency calculations	2	2	-	-	-	-	-	-	-	-	-	1	3	-
Course Code	**191PT3T04 - Mechanical and Materials Science and Engineering**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Calculate the design parameters stress, strain, elastic constants and strain energy of different materials under different loading conditions.	2	1	3	-	-	-	3	-	-	-	-	-	2	2
CO2	Calculate Shear force and bending moment for beams under various loading conditions and interpret as Shear force diagram & Bending moment diagram.	3	3	2	-	-	-	1	-	-	-	-	-	3	3
CO3	Compare the behavior of materials by means of phase diagrams.	2	1	-	-	-	-	3	2	-	2	-	-	2	-
CO4	Explain the mechanical behavior of materials by dislocation theory.	2	1	-	-	-	-	3	2	-	2	-	-	2	3
CO5	Select the suitable material for petroleum engineering applications.	3	2	1	1	-	-	3	3	-	2	-	-	-	3
Course Code	**191PT3L01 - Mechanical and Material Science Lab**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Demonstrate the material mechanical behavior under various direct loads.	2	1	-	-	-	-	3	-	-	3	2	-	-	-
CO2	Calculate the mechanical strength of cube.	3	2	-	-	-	-	3	-	-	3	3	-	3	-

	CO Statements	POs												PSOs	
CO3	Demonstrate the materials mechanical behavior under various indirect loads.	2	1	-	-	-	-	3	-	-	3	2	-	-	-
CO4	Analyze the Structure of pure metals and alloys.	-	3	-	-	-	-	3	-	-	-	-	-	-	-
CO5	Estimate the hardness of various treated and untreated steels.	2	1	-	-	-	-	3	-	-	3	2	-	2	-
Course Code	**191PT3L02 - Geology Lab**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Make use of maps to estimate reservour area, thickness, and draw litho stratigrathy coloums.	**3**	-	-	-	-	-	-	-	2	2	-	1	-	1
CO2	Construct Geological map, strike, dip at any chosen location/ different geological locations and do sampling for paleontological studies at any locaton.	**3**	-	-	-	-	-	-	-	2	2	-	1	-	1
CO3	Estimate the levels of existing ground with the help of auto level.	**3**	-	-	-	-	-	-	-	2	2	-	1	-	1
CO4	Find out the oil-water contact.	**3**	-	-	-	-	-	-	-	2	2	-	1	-	1
CO5	Identify different types of rocks	**3**	-	-	-	-	-	-	-	2	2	-	1	-	1
Course Code	**191MC3A03 - Employability Skills – I**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Solve problems of Series & Analogy for Numbers and Letters	1	-	-	-	-	-	-	-	-	-	-	1	-	-
CO2	Solve problems on Coding & Decoding and Divisibility rules	1	-	-	-	-	-	-	-	-	-	-	1	-	-
CO3	Solve problems on LCM & HCF and Simple Equations	1	-	-	-	-	-	-	-	-	-	-	1	-	-
CO4	Demonstrate Attitude, self-confidence and decision making in different situations	-	-	-	-	-	-	-	-	-	1	-	1	-	-
CO5	Develop out of box and lateral thinking, better goal setting and time management	-	-	-	-	-	-	-	-	-	1	-	1	-	-
Course Code	**191MC3A04 - Essence of Indian Traditional Knowledge**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Identify the concept of Traditional knowledge and its importance.	-	-	-	-	-	1	1	-	-	-	-	-	-	-
CO2	Explain the need and importance of protecting traditional knowledge.	-	-	-	-	-	1	1	-	-	-	-	-	-	-
CO3	Illustrate the various enactments related to the protection of traditional knowledge	-	-	-	-	-	1	1	-	-	-	-	-	-	-
CO4	Interpret the concepts of Intellectual property to protect the traditional knowledge.	-	-	-	-	-	1	1	-	-	-	-	-	-	-
CO5	Explain the importance of Traditional knowledge in Agriculture and Medicine.	-	-	-	-	-	1	1	-	-	-	-	-	-	-
IV SEM															
Course Code	**191BS4T19 - Complex Variables and Statistical Methods**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Apply Cauchy-Riemann equations to complex functions in order to determine whether a given continuous function is analytic and find the differentiation and integration of complex functions used in engineering problems.	3	2	-	-	-	-	-	-	-	-	-	-	-	-

	CO Statements	POs												PSOs	
CO2	Make use of the Cauchy residue theorem to evaluate certain integrals.	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Apply discrete and continuous probability distributions.	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO4	Design the components of a classical hypothesis test.	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO5	Infer 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**
CO1	Apply management and motivation theories to renovate the practice of management.	-	-	-	-	-	-	-	-	-	-	2	-	1	-
CO2	Explain concepts of quality management and use process control charts, concepts and tools of quality engineering in the design of products and process controls	-	-	-	-	-	-	-	-	-	1	-	-	-	1
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	-	-	-	-	2	-
CO5	Develop global vision and management skills both at strategic level and interpersonal level.	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Course Code	**191ES4T15 - Internet of Things**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Describe the application areas of IoT.	1	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Illustrate revolution of Internet in Mobile Devices, Cloud & Sensor Networks.	2	2	3	-	-	-	-	-	-	-	-	-	-	-
CO3	Explain communication protocols used in IoT.	3	2	2	-	-	-	-	-	-	-	-	-	-	-
CO4	Make use of python programming to implement Internet of Things.	1	2	1	-	3	-	-	-	-	-	-	-	-	-
CO5	Design IoT applications using Raspberry Pi.	1	1	3	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191PT4T05 - Process Heat Transfer**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the various modes of heat transfer and the principles involved in them.	3	2	-	-	-	-	-	-	-	-	-	2	**2**	-
CO2	Make use of individual heat transfer coefficients to determine over all heat transfer rate.	3	2	-	-	-	-	-	-	-	-	-	2	**2**	-
CO3	Explain the concepts of heat transfer without phase change.	3	2	-	-	-	-	-	-	-	-	-	2	**2**	-
CO4	Explain the concepts of heat transfer with phase change and demonstrate the radiation heat transfer.	1	2	-	-	-	-	-	-	-	-	-	2	**2**	-
CO5	Identify the types of heat exchanger equipment and know their intended purpose.	3	2	-	-	-	-	-	-	-	-	-	2	**2**	-

	CO Statements	POs												PSOs	
Course Code	**191PT4T06 - Momentum Transfer**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the basic concepts of dimensional analysis and fluid flow phenomena.	2	3	-	3	1	-	-	-	-	-	-	1	-	1
CO2	Solve mass balance in a flowing fluid, continuity, differential momentum balance and mechanical energy equations.	2	3	-	3	-	-	-	-	-	-	-	1	-	3
CO3	Classify compressible and incompressible fluids flow in pipes and channels.	2	3	-	3	-	-	-	-	-	-	-	1	-	1
CO4	Calculate the drag and drag coefficient, flow through beds of solids, motion of particles through fluids.	2	3	-	3	-	-	-	-	-	-	-	1	-	1
CO5	Explain about transportation, metering of fluids and measurement of flowing fluids.	2	3	-	3	-	-	-	-	-	-	-	1	-	2
Course Code	**191PT4T07 - Petroleum Geology**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Identify different source rocks and choose better one for oil formation.	2	-	-	-	-	-	-	-	-	-	-	3	2	-
CO2	Analyze the different factors for the mechanism of oil migration.	3	-	-	-	-	-	-	-	-	-	-	3	2	-
CO3	Apply the petrophysical properties of reservoir and cap rocks for oil retention.	3	-	-	-	-	-	-	-	-	-	-	3	2	-
CO4	Build a geological model for ideal petroleum system.	2	-	-	-	-	-	-	-	-	-	-	3	2	-
CO5	Explain the types of sedimentary basins.	3	-	-	-	-	-	-	-	-	-	-	3	2	-
Course Code	**191PT4L03 - Process Heat Transfer Lab**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Utilize the basics of experimental techniques for heat transfer measurements.	-	-	-	-	-	-	-	-	3	2	-	2	-	2
CO2	Demonstrate the heat transfer equipment like heat exchangers	-	-	-	-	-	-	-	-	3	2	-	2	-	2
CO3	Analyze process experimental data and obtain correlations to predict heat transfer coefficients for design of heat transfer systems.	-	-	-	-	-	-	-	-	3	2	-	2	-	2
CO4	Interpret the experiments at R & D level in the industry	-	-	-	-	-	-	-	-	3	2	-	2	-	2
CO5	Relate the professional and ethical responsibilities in the field of heat transfer.	-	-	-	-	-	-	-	-	3	2	-	2	-	2
Course Code	**191PT4L04 - Momentum Transfer Lab**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Identify laminar and turbulent flows in major equipment like Reynolds apparatus and operate fluid flow equipment and instrumentation.	-	-	-	-	-	-	-	-	3	2	-	2	-	2
CO2	Calculate momentum transfer principles and experimentation methods.	-	-	-	-	-	-	-	-	3	2	-	2	-	2
CO3	Classify involving Bernoulli's equation for the transport of acidic, alkaline, hydrocarbon and miscellaneous incompressible fluids in pipelines.	-	-	-	-	-	-	-	-	3	2	-	2	-	2

	CO Statements	POs												PSOs	
CO4	Solve pressure drop calculations and energy requirements associated to compressible fluid flow in circular and rectangular ducts.	-	-	-	-	-	-	-	-	3	2	-	2	-	2
CO5	Apply pressure drop in packed and fluidized beds and prepare reports following accepted writing and graphical techniques.	-	-	-	-	-	-	-	-	3	2	-	2	-	2
Course Code	**191MC4A05 - Employability Skills – II**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
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**
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 bio-chemical 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	**191PT5T08 - Instrumentation and Process Control**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Choose the instrument based on static and dynamic characteristic.	-	3	-	-	-	-	-	-	-	-	-	2	-	2
CO2	Categorize the various types of thermometers & pressure gauges.	-	3	-	-	-	-	-	-	-	-	-	2	-	2
CO3	Explain the processes with appropriate block diagrams.	-	3	-	-	-	-	-	-	-	-	-	2	-	2
CO4	Interpret the responses of first order systems with examples.	-	3	-	-	-	-	-	-	-	-	-	2	-	2
CO5	Explain tuning a control loop and characteristics of control valves.	-	3	-	-	-	-	-	-	-	-	-	2	-	2
Course Code	**191PT5T09 - Well Logging and Mud Logging**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Apply the principles of open hole logs for subsurface interpretation.	3	-	-	-	-	-	-	-	-	-	-	2	-	2
CO2	Make use of principles of different cased hole and production logging techniques to decipher subsurface properties.	3	-	-	-	-	-	-	-	-	-	-	2	-	2
CO3	Interpret the different log data using different quick look interpretation techniques.	3	-	-	-	-	-	-	-	-	-	-	2	-	2
CO4	Explain the basics of mud logging in evaluate formation.	3	-	-	-	-	-	-	-	-	-	-	2	-	2
CO5	Apply principles of mud logging techniques in drilling control.	3	-	-	-	-	-	-	-	-	-	-	2	-	2

	CO Statements	POs												PSOs	
Course Code	**191PT5T10 - Drilling Technology**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the basics of drill string and rotary drilling technology.	3	2	-	-	-	-	-	-	-	-	-	2	-	3
CO2	Apply the concept of pore pressure and its measurement in for safe drilling.	3	2	-	-	-	-	-	-	-	-	-	2	-	3
CO3	Apply concepts of drilling fluid properties and drilling hydraulics in practice.	3	2	-	-	-	-	-	-	-	-	-	2	-	3
CO4	Design proper casing and cementing jobs for sustainable drilling practice.	3	2	-	-	-	-	-	-	-	-	-	2	-	3
CO5	Apply the concept of directional drilling to solve problems in different geological environments.	3	2	-	-	-	-	-	-	-	-	-	2	-	3
CO6	Describe the causes and proper remedial techniques for different hole problems.	3	2	-	-	-	-	-	-	-	-	-	2	-	3
Course Code	**191PT5T11 - Thermodynamics for Petroleum Engineers**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the basic concepts of thermodynamics and first law of thermodynamics.	3	2	-	-	-	-	-	-	-	-	-	2	3	-
CO2	Explain PVT behavior of pure substances and second law of thermodynamics.	3	2	-	-	-	-	-	-	-	-	-	2	3	-
CO3	Make use of thermodynamic tables and diagrams for the estimation of thermodynamic properties of fluids.	3	2	-	-	-	-	-	-	-	-	-	2	3	-
CO4	Apply residual and excess gibbs free energy models for design of oil and natural gas processing systems	3	2	-	-	-	-	-	-	-	-	-	2	3	-
CO5	Explain the concepts and calculations of VLE, VLLE, SVE and SLE	3	2	-	-	-	-	-	-	-	-	-	2	3	-
Course Code	**191PT5E03 - Well Engineering and Design (Professional Elective - I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain Pore pressure and Fracture pressure.	3	2	-	-	-	-	-	-	-	-	-	2	-	2
CO2	Solve the Kick tolerance for Kick identification.	3	2	-	-	-	-	-	-	-	-	-	2	-	2
CO3	Design the Casing for effective well construction.	3	2	-	-	-	-	-	-	-	-	-	2	-	2
CO4	Solve the Wellbore instability problems.	3	3	-	-	-	-	-	-	-	-	-	2	-	2
CO5	Calculate the Torque and Drag forces based on Horizontal, Extended, Multilateral and HPHT Wells.	3	2	-	-	-	-	-	-	-	-	-	2	-	2
Course Code	**191PT5E02 - Pipeline Engineering (Professional Elective - I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Illustrate pipeline route selection and survey operations.	3	2	-	-	-	-	-	-	-	-	-	2	-	2
CO2	Apply the pipeline mechanical design and pipeline protection.	3	2	-	-	-	-	-	-	-	-	-	2	-	2
CO3	Summarize the natural gas transmission in pipelines.	3	2	-	-	-	-	-	-	-	-	-	2	-	2
CO4	Explain the performance of compressors and coolers.	3	2	-	-	-	-	-	-	-	-	-	2	-	2
CO5	Facilitate the fundamentals of transient analysis.	3	2	-	-	-	-	-	-	-	-	-	2	-	2

	CO Statements	POs												PSOs	
Course Code	**191PT5E01 - Natural Gas Engineering and Processing (Professional Elective - I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Estimate Natural gas properties and application of suitable techniques.	3	2	-	-	-	-	-	-	-	-	-	2	3	-
CO2	Apply various liquid loading on gas wells during production.	3	2	-	-	-	-	-	-	-	-	-	2	2	-
CO3	Design gas liquid separation, dehydration & Sweetening systems.	3	2	-	-	-	-	-	-	-	-	-	2	2	-
CO4	Design Natural gas transportation systems, pipelines and compression system.	3	2	-	-	-	-	-	-	-	-	-	2	2	-
CO5	Apply GTL process technology for selection and their economics.	3	2	-	-	-	-	-	-	-	-	-	2	3	-
Course Code	**191CE5O01 - Basic Concrete Technology (Open Elective - I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the basic concepts of concrete and admixtures	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Explain the properties of ingredients of concrete.	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Select the suitability of different types of aggregate for their use	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO4	Explain the destructive and non-destructive tests on Hardened Concrete	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO5	Illustrate the concept of special concrete and their use.	2	1	-	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191EE5O01 - Electrical Safety (Open Elective - I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Describe electrical hazards and safety equipment	-	-	1	-	-	-	-	-	-	-	-	-	-	-
CO2	Apply various grounding and bonding techniques	1	-	-	-	1	-	-	-	-	-	-	-	-	-
CO3	Select appropriate safety method for low, medium and high voltage equipment	-	-	1	-	-	-	-	-	-	-	-	-	-	-
CO4	Discuss safety managmenet and organizing structure	-	-	1	-	-	-	-	-	-	-	-	-	-	-
CO5	Demonstrate proper maintenance of electrical equipment by understanding various standards	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191EE5O02 - Electrical Materials (Open Elective - I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Identify various types of dielectric materials, their properties in various conditions.	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Analyze magnetic materials and their behaviour.	3	1	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Evaluate semiconductor materials and technologies.	3	1	-	-	-	-	-	-	-	-	-	-	-	-
CO4	Explain the application of Materials in electrical engineering	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO5	Explain the application of Special Purpose Materials in electrical engineering.	3	2	-	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191EE5O03 - Basic Electrical Measurements (Open Elective - I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Analyze the behaviour of different types of torques in instruments.	1	1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Select the right type of instrument for measurement of voltage, current, power &energy.	1	1	-	-	-	-	-	-	-	-	-	-	-	-

	CO Statements	POs												PSOs	
CO3	Develop the suitable bridge for the measurement of electrical parameters.	1	1	-	-	-	-	-	-	-	-	-	-	-	-
CO4	Analyze the behaviour of different types of Transducers and Sensors.	1	1	-	-	-	-	-	-	-	-	-	-	-	-
CO5	Explain frequency and phase difference between signals using CRO.	1	1	-	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191ME5O01 - Renewable Energy Sources (Open Elective - I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Analyze solar radiation data, extraterrestrial radiation, and radiation on earth's surface.	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Examine the solar photo voltaic systems.	3	2	1	1	-	-	-	-	-	-	-	-	-	-
CO3	Develop maximum power point techniques in solar PV and wind energy systems.	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO4	Illustrate the wind energy conversion systems, wind generators and power generation.	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	Explain basic principle and working of tidal, biomass, fuel cell and geothermal systems.	2	3	2	2	-	-	-	-	-	-	-	-	-	-
Course Code	**191ME5O02 - Fundamentals of Mechanical Engineering (Open Elective - I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Compare the different types of boilers, mountings and accessories.	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Interpret different manufacturing methods.	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Explain the working of air compressors and refrigeration.	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	Explain the working principle of Internal Combustion Engines and their performance.	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	Compute the parameters of mechanical components for power transmission.	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191ME5O03 - Supply Chain Management (Open Elective - I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the framework and scope of supply chain network and functions.	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Appraise the importance of the design and redesign of a supply chain as key components of an organization's strategic plan.	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Explain the strategic importance of logistic elements and describe how they affect supply chain management.	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	Analyze the creation of new value in the supply chain for customers, society and the environment.	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	Develop coordinated and collaborative processes and activities among the business partners in a supply chain, leveraging current and emerging technologies.	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191ME5O04 - 3D Printing (Open Elective - I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Summarize the basics of Additive manufacturing (AM) technologies.	1	-	-	-	-	2	-	-	-	-	-	1	-	-

	CO Statements	POs												PSOs	
CO2	Explain about vat photo polymerization, material jetting and binder jetting AM technologies.	1	-	-	-	-	-	-	-	-	-	-	1	-	-
CO3	Explain material extrusion and sheet lamination AM technologies.	1	-	-	-	-	-	-	-	-	-	-	1	-	-
CO4	Illustrate Powder Bed Fusion and Directed Energy Deposition AM technologies.	1	-	-	-	-	-	-	-	-	-	-	1	-	-
CO5	Apply the AM techniques in different industries	1	-	-	-	-	-	-	-	-	-	-	1	-	-
CO6	Select AM technologies using decision methods	1	-	-	-	-	-	-	-	-	-	-	1	-	-
Course Code	**191ME5O05 - Entrepreneurship Development and Incubation (Open Elective - I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Describe the meaning and concepts of entrepreneurship development	-	-	-	-	-	1	2	-	-	2	-	-	-	-
CO2	Apply the business plan for preparation and evaluation of project.	-	-	-	-	-	1	2	-	-	2	-	-	-	-
CO3	Explain about Institutional Support to Entrepreneur and MSMEs	-	-	-	-	-	2	3	-	-	2	2	-	-	-
CO4	Explain about the Opportunities of Entrepreneurship Internationally.	-	-	-	-	-	2	3	-	-	2	2	-	-	-
CO5	Explain about Informaal Risk Capital, Venture capital and Social responsibility for entrepreneurship	-	-	-	-	-	1	2	-	-	2	-	-	-	-
Course Code	**191EC5O01 - Signals & Systems (Open Elective - I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Categorize signals and systems based on their characteristics.	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Demonstrate the spectral characteristics of signals using Fourier series	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Demonstrate the spectral characteristics of signals using Fourier Transform	2	2	1	1	-	-	-	-	-	-	-	-	-	-
CO4	Identify system characteristics in time domain and frequency domain.	2	2	1	1	-	-	-	-	-	-	-	-	-	-
CO5	Apply Laplace transform techniques for the analysis of continuous time signals and Systems...	2	2	2	2	-	-	-	-	-	-	-	-	-	-
Course Code	**191EC5O02 - Digital Electronics and Logic Design (Open Elective - I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Interpret numeric information in different code formats.	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Develop optimized logic by using various optimization algorithms.	2	2	1	-	-	-	-	-	-	-	-	-	-	-
CO3	Construct various combinational logic circuits for required specifications.	2	2	2	-	-	-	-	-	-	-	-	-	-	-
CO4	Build different Programmable Logic Device for required specifications.	2	2	2	1	-	-	-	-	-	-	-	-	-	-
CO5	Build different sequential logic circuits for required specifications.	2	2	2	1	-	-	-	-	-	-	-	-	-	-
Course Code	**191EC5O03 - Semi conductor devices (Open Elective - I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Interpret the characteristics of semiconductor diodes.	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Apply the knowledge of semiconductors in the functioning of BJT.	2	2	1	-	-	-	-	-	-	-	-	-	-	-
CO3	Demonstrate the switching and amplification application of FET.	2	1	-	-	-	-	-	-	-	-	-	-	-	-

	CO Statements	POs												PSOs	
CO4	Classify the semiconductor devices for special Applications.	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO5	Identify the sensor types used in various applications and explain their principle of operation.	2	2	1	1	-	-	-	-	-	-	-	-	-	-
Course Code	**191CS5O01 - Data Structures (Open Elective - I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Illustrate time and space complexities of an algorithm	2	3	2	1	-	-	-	-	-	-	-	-	-	-
CO2	Apply various searching and sorting techniques to solve computing problems.	3	2	2	1	-	-	-	-	-	-	-	-	-	-
CO3	Make use of linear data structures to solve real time problems.	3	1	2	-	-	-	-	-	-	-	-	-	-	-
CO4	Develop applications using Tree Data Structures.	2	1	3	-	-	-	-	-	-	-	-	-	-	-
CO5	Solve problems using Graph Algorithms.	1	2	3	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191CS5O02 - Object Oriented Programming through C++ (Open Elective - I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Compare and contrast object oriented programming and procedural oriented programming.	2	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Summarize the OOPS concepts.	2	1	3	-	-	-	-	-	-	-	-	-	-	-
CO3	Make use of constructor and destructor to initialize and destroy class objects.	2	1	3	-	-	-	-	-	-	-	-	-	-	-
CO4	Develop programs using virtual functions and Polymorphism.	3	1	2	-	-	-	-	-	-	-	-	-	-	-
CO5	Apply inheritance to build real time applications, Exception handling mechanism to handle runtime errors.	2	3	2	-	-	-	-	-	-	-	-	-	-	-
CO6	Develop C++ classes with templates and STL.	1	2	3	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191CS5O03 - Java Programming (Open Elective - I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Apply object oriented programming features and concepts for solving given problem.	3	2	2	-	-	-	-	-	-	-	-	-	-	-
CO2	Solve real time problems using the concepts of class, inheritance, interface and packages.	2	3	2	-	-	-	-	-	-	-	-	-	-	-
CO3	Test for runtime exceptions arise in java applications.	3	2	1	-	-	-	-	-	-	-	-	-	-	-
CO4	Develop real time applications using multithreading and I/O streams.	2	2	3	-	-	-	-	-	-	-	-	-	-	-
CO5	Develop GUI applications using event handlers, adapter classes, AWT and Swing components.	2	1	2	-	3	-	-	-	-	-	-	-	-	-
Course Code	**191CS5O04 - R Programming (Open Elective - I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Illustrate the basic concepts and advanced data structures of R programming.	3	1	-	-	1	-	-	-	-	-	-	-	-	-
CO2	Explain the control statements and operators in R.	2	3	1	-	-	-	-	-	-	-	-	-	-	-
CO3	Implement simulation, Probability and linear algebra operations.	3	2	1	-	2	-	-	-	-	-	-	-	-	-
CO4	Make use of graph functions for better visualization of results.l	2	1	3	-	2	-	-	-	-	-	-	-	-	-
CO5	Develop programs for distribution functions and regression models.	2	2	3	-	2	-	-	-	-	-	-	-	-	-

	CO Statements	POs												PSOs	
Course Code	**191IT5O01 - Data Base Management Systems (Open Elective - I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Identify the database characteristics and various database architectures.	3	-	-	-	1	-	-	-	-	-	-	-	-	-
CO2	Interpret relational database using SQL.	3	-	1	-	1	-	-	-	-	-	-	-	-	-
CO3	Examine issues in data storage and query processing for appropriate solutions.	1	-	1	-	3	-	-	-	-	-	-	-	-	-
CO4	Make use of normalization techniques to build database system for real world problems.	1	2	1	-	3	-	-	-	-	-	-	-	-	-
CO5	Illustrate the mechanisms of transaction management.	2	2	1	-	3	-	-	-	-	-	-	-	-	-
Course Code	**191IT5O02 - Computer Graphics (Open Elective - I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Identify the applications of computer graphics and Video Display devices for implementing Graphical user interface.	3	1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Analyze output primitives and filled area primitives in implementing various algorithms.	1	3	1	-	-	-	-	-	-	-	-	-	-	-
CO3	Make use of Geometric Transformations, Viewing and Clipping in 2D & 3D Graphics.	2	3	-	-	-	-	-	-	-	-	-	-	-	-
CO4	Illustrate various Visual Surface detection Methods in 3D Graphics.	2	2	3	-	-	-	-	-	-	-	-	-	-	-
CO5	Apply OpenGL for General Computer Animations.	2	1	2	-	3	-	-	-	-	-	-	-	-	-
CO6	Explain different object color modeling techniques, Fractals and Ray tracing concepts.	3	2	-	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191MI5O01 - Overview of Mining (Open Elective - I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Analyze different stages in the life of a mine.	1	-	-	-	-	1	1	-	-	-	-	-	-	-
CO2	Choose a suitable location for opening to a deposit.	1	-	-	-	-	1	1	-	-	-	-	-	-	-
CO3	Organize for building appropriate permanent lining, drift with proper ventilation and lighting arrangements.	1	-	-	-	-	1	1	-	-	-	-	-	-	-
CO4	Select the special methods need to be adopted for a particular situation.	1	3	-	-	-	1	1	-	-	-	-	-	-	-
CO5	Explain the impact of mining activities on environment	1	3	-	-	-	1	1	-	-	-	-	-	-	-
Course Code	**191PT5O01 - Process Intensification in Petroleum Industry (Open Elective - I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the basic principles and mechanisms that are responsible for process intensification.	2	1	-	-	-	-	-	-	-	-	-	-	-	2
CO2	Analyze various modifications to process equipment and designs with which process intensification becomes a reality in unit operations and unit processes.	2	1	-	-	-	-	-	-	-	-	-	-	-	2

	CO Statements	POs												PSOs	
CO3	Analyze various case studies available in petrochemical, fine chemical, bioprocesses for Downhole separation	2	1	-	-	-	-	-	-	-	-	-	-	-	2
CO4	Explain the role of photo voltaic cells, solar power in offshore oil and gas operations.	2	1	-	-	-	-	-	-	-	-	-	-	-	2
CO5	Apply the working principles of Divided wall distillation for separation of natural gas -liquid	2	-	-	-	-	-	-	-	-	-	-	-	-	2
Course Code	**191PT5O02 - Fundamentals of Petroleum Industry (Open Elective - I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Apply the basic principles and mechanisms that are responsible for petroleum industry.	2	-	-	-	-	-	-	-	-	-	-	-	-	2
CO2	Analyze various modifications to equipment and designs with which evaluate the lithological characteristics and behavior of reservoir.	2	-	-	-	-	-	-	-	-	-	-	-	-	2
CO3	Explain the hydro carbon activity in reservoir, logging, testing and completion.	2	-	-	-	-	-	-	-	-	-	-	-	-	2
CO4	Analyze various case studies available in petrochemical, chemical, bioprocesses for treatment of wastage.	2	-	-	-	-	-	-	-	-	-	-	-	-	2
CO5	Analyze various modifications to well for better production rate.	2	-	-	-	-	-	-	-	-	-	-	-	-	2
Course Code	**191AG5O01 - Basic Crop Production Practices (Open Elective - I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain factors affecting on crop growth and production.	1	1	-	-	1	-	-	-	-	-	-	2	-	-
CO2	Explain crop selection and establishment of an adequate crop stand and ground cover.	1	-	-	-	2	-	-	-	-	-	-	-	-	-
CO3	Explain crop water management using integrated water management methods.	1	1	-	-	2	-	-	-	-	-	-	-	-	-
CO4	Apply agricultural crops production practices in field.	1	-	1	1	3	-	-	-	-	-	-	-	-	-
CO5	Apply the horticulture crops production practices in field.	1	-	1	1	3	-	-	-	-	-	-	2	-	-
Course Code	**191PT5L04 - Drilling Fluids Lab**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Evaluate the suitability of drilling fluid by performing different laboratory tests.	2	-	-	-	-	-	-	-	2	2	-	2	-	2
CO2	Analyse the effect of adding different proportions of bentonite on different essential properties of drilling fluid.	2	-	-	-	-	-	-	-	2	2	-	2	-	2
CO3	Estimate the compressive strength of cement and its suitability for cementing jobs.	2	-	-	-	-	-	-	-	2	2	-	2	-	2
CO4	Function effectively as an individual, and as a member or leader while performing lab experiments.	2	-	-	-	-	-	-	-	2	2	-	2	-	2
CO5	Communicate effectively the drilling lab results by documenting experimental results.	2	-	-	-	-	-	-	-	2	2	-	2	-	2

	CO Statements	POs												PSOs	
Course Code	**191PT5L05 - Instrumentation, Process Dynamics and Control Lab**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Experiment with the dynamic characteristics of first and second order systems.	2	2	-	-	-	-	-	-	2	2	-	2	-	2
CO2	Apply the advanced control methods used for complex processes in the industries.	2	2	-	-	-	-	-	-	2	2	-	2	-	2
CO3	Apply controllers like ON/OFF, P, PI, PD and PID for process systems.	2	2	-	-	-	-	-	-	2	2	-	2	-	2
CO4	Identify the stability of the system with advanced control methods.	2	2	-	-	-	-	-	-	2	2	-	2	-	2
CO5	Experiment with the types of control valves and the response of U-tube manometer.	2	2	-	-	-	-	-	-	2	2	-	2	-	2
Course Code	**191ES5T16 - Employability Skills – III**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain different types of puzzles,group reasoning,clock and calender problems	1	-	-	-	-	-	-	-	-	-	-	1	-	-
CO2	Solve problems on cubes & dice, partnership, percentages.	1	-	-	-	-	-	-	-	-	-	-	1	-	-
CO3	Solve problems on profit and loss, simple interest and compound interest	1	-	-	-	-	-	-	-	-	-	-	1	-	-
CO4	Apply interviewing skills, Group discussion skills and personal priorities	-	-	-	-	-	-	-	-	-	1	-	1	-	-
CO5	Apply resume writing skills, e-mail writing & business etiquette	-	-	-	-	-	-	-	-	-	1	-	1	-	-
Course Code	**191PR5P01 - Socially Relevant Project**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Conduct a literature survey in the selected area	1	-	-	-	-	-	-	-	1	1	1	-	-	-
CO2	Use scientific reasoning to gather, evaluate and interpret the survey data to identify the problem	-	2	-	-	-	2	2	-	-	-	-	2	-	-
CO3	Design and develop many solutions in the light of societal, cultural, legal and environmental issues	-	-	2	2	-	-	-	1	-	-	-	-	-	-
CO4	Select a final solution to the social problem and submit as a working prototype	-	-	-	2	-	-	-	-	-	-	-	-	-	-
CO5	Use modern tools to prepare the results of the project as a report adhering to professional ethics	-	-	-	-	2	-	-	2	-	-	1	1	-	-
Course Code	**191MC5A08 - Intellectual Property Rights and Patents**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Compare various types of Intellectual Property rights.	-	-	-	-	-	-	-	3	-	-	-	2	-	-
CO2	Discuss Intellectual Property and infer rights on such Intellectual Property owners	-	-	-	-	-	-	-	3	-	-	-	2	-	-
CO3	Explain the process of patenting	-	-	-	-	-	-	-	3	-	-	-	2	-	-
CO4	Apply for trade marks and trade secrets.	-	-	-	-	-	-	-	3	-	-	-	2	-	-

	CO Statements	POs												PSOs	
CO5	Interpret the legal issues on Intellectual Property Rights and cyber laws	-	-	-	-	-	-	-	3	-	-	-	2	-	-
VI SEM															
Course Code	**191PT6T12 - Petroleum Refinery and Petrochemical Engineering**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Identify the types of petroleum feed stocks and products by their properties.	2	-	-	-	-	-	-	-	-	-	-	1	-	**2**
CO2	Make use of process knowledge to solve operational problems and increase the efficiency.	2	-	-	-	-	-	-	-	-	-	-	1	-	**2**
CO3	Apply the knowledge of crucial processes to meet the end product demands.	2	-	-	-	-	-	-	-	-	-	-	1	-	**2**
CO4	Prioritize the demand of various Petrochemicals to optimize the processes.	2	-	-	-	-	-	-	-	-	-	-	1	-	**2**
CO5	Distinguish various petrochemical products and their uses	2	-	-	-	-	-	-	-	-	-	-	1	-	**2**
Course Code	**191PT6T13 - Petroleum Production Engineering**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Apply Oil and gas properties concept to get production from different types of reservoir based on drive mechanism.	2	3	-	-	-	-	-	-	-	-	-	2	-	2
CO2	Apply the concept of different types of flow to start the production.	2	3	-	-	-	-	-	-	-	-	-	2	-	2
CO3	Design and operate artificial lift on reservoir pressure Depletion.	2	3	-	-	-	-	-	-	-	-	-	2	-	2
CO4	Select appropriate gas lift valve to fulfill the potential compression requirements.	2	3	-	-	-	-	-	-	-	-	-	2	-	2
CO5	Identify different types of well problems during production and solve them to stimulate the productions	2	3	-	-	-	-	-	-	-	-	-	2	-	2
Course Code	**191PT6T14 - Petroleum Reservoir Engineering-I**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Apply basic Concepts of Reservoir Engineering	3	2	-	-	-	-	-	-	-	-	-	2	-	2
CO2	Estimate the PVT analysis parameters such as formation volume factor for oil and gas, solution gas ratio	3	2	-	-	-	-	-	-	-	-	-	2	-	2
CO3	Apply and estimate the reserves based on General Material Balance Equation.	3	2	-	-	-	-	-	-	-	-	-	2	-	2
CO4	Evaluate the Permeability and Potential, mobility from Darcy's law	3	2	-	-	-	-	-	-	-	-	-	2	-	2
CO5	Apply Basic radial Flow differential equation and Well inflow Estimation for Different system of equations	3	2	-	-	-	-	-	-	-	-	-	2	-	2
Course Code	**191PT6E06 - Well Completions, Testing and Services (Professional Elective - II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Recognize specified equipment for well head installations	3	-	-	-	-	-	-	-	-	-	-	2	-	2
CO2	Apply DST/RFT tools to know the initial potential of the wells.	2	-	-	-	-	-	-	-	-	-	-	2	-	3
CO3	Illustrate the equipment for setting in the well for testing& production	3	-	-	-	-	-	-	-	-	-	-	2	-	3

	CO Statements	POs												PSOs	
CO4	Identify the logging tool for testing the zone	3	-	-	-	-	-	-	-	-	-	-	2	-	2
CO5	choose good work over operation whenever rigs less operation are required	2	-	-	-	-	-	-	-	-	-	-	2	-	3
Course Code	**191PT6E05 - Operational and Maintenance of Pipelines (Professional Elective - II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the Elements of Pipeline operation and maintenance	3	3	-	-	-	-	-	-	-	-	-	2	-	2
CO2	Explain the Operation and maintenance organization in pipeline	3	3	-	-	-	-	-	-	-	-	-	2	-	2
CO3	Explain overview of pipeline system operation	3	3	-	-	-	-	-	-	-	-	-	2	-	2
CO4	Apply pipeline system maintenance	3	3	-	-	-	-	-	-	-	-	-	2	-	2
CO5	Explain the Valves and operations in pipeline	3	3	-	-	-	-	-	-	-	-	-	2	-	2
Course Code	**191PT6E04 - Fundamentals of Liquefied Natural gas (Professional Elective - II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the LNG value chain	**3**	**2**	-	-	-	-	-	-	-	-	-	**2**	-	2
CO2	Classify the different liquefaction technologies of LNG.	**3**	**2**	-	-	-	-	-	-	-	-	-	**2**	-	2
CO3	Explain the components of LNG receiving terminals.	**3**	**2**	-	-	-	-	-	-	-	-	-	**2**	-	2
CO4	Summarize LNG storage and transportation facilities.	**3**	**2**	-	-	-	-	-	-	-	-	-	**2**	-	2
CO5	Identify major equipment and safety aspects of LNG industry.	**3**	**2**	-	-	-	-	-	-	-	-	-	**2**	-	2
Course Code	**191PT7E09 - Unconventional Hydrocarbon Resources (Professional Elective - III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Understand the fundamentals of Coal Bed Methane	3	2	-	-	-	-	-	-	-	-	-	2	**2**	-
CO2	Estimate the shale gas reserves for Indian Scenario	2	2	-	-	-	-	-	-	-	-	-	2	**2**	-
CO3	Determine the extent of gas hydrates resource estimation	3	2	-	-	-	-	-	-	-	-	-	2	**2**	-
CO4	Illustrate the Origin and Characterize Shale Gas.	3	2	-	-	-	-	-	-	-	-	-	2	**2**	-
CO5	Explain the Heavy oil reservoirs and their Challenges	2	2	-	-	-	-	-	-	-	-	-	2	**2**	-
Course Code	**191PT7E08 - Storage and Transportation of Crude oil and Natural gas (Professional Elective - III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Recognize specified equipment for testing various samples	2	-	-	-	-	-	-	-	-	-	-	2	-	2
CO2	Apply various apparatus/equipment in determining analyze the various products of petroleum components	2	-	-	-	-	-	-	-	-	-	-	2	-	2
CO3	Illustrate the equipment's for different petroleum products	2	-	-	-	-	-	-	-	-	-	-	2	-	2
CO4	Identify the physical properties of different petroleum products	2	-	-	-	-	-	-	-	-	-	-	2	-	2
CO5	Choose transport properties of different petroleum products	2	-	-	-	-	-	-	-	-	-	-	2	-	2
Course Code	**191PT7E07 - Advanced Separation Techniques (Professional Elective - III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Apply recent advances in separation techniques	3	-	-	-	-	-	-	-	-	-	-	1	-	2
CO2	Make use of process knowledge on membrane separation.	3	-	-	-	-	-	-	-	-	-	-	1	-	2
CO3	Apply the knowledge of separation by adsorption techniques.	3	-	-	-	-	-	-	-	-	-	-	1	-	2

	CO Statements	POs												PSOs	
CO4	Prioritize the concepts on ionic separations.	3	-	-	-	-	-	-	-	-	-	-	1	-	2
CO5	Distinguish various modern techniques	3	-	-	-	-	-	-	-	-	-	-	1	-	2
Course Code	**191CE6O02 - Disaster Management (Open Elective - II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the aspects of disaster management and adopt remedial measures	1	1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Explain the disaster vulnerability profile of India	1	1	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Explain the hazard assessment and mitigation measures	1	1	-	-	-	-	-	-	-	-	-	-	-	-
CO4	Explain landslides and earthquake disasters and management	1	1	-	-	-	-	-	-	-	-	-	-	-	-
CO5	Explain about cyclone, fire disasters and rehabilitation programmes	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191EE6O04 - Energy Audit and Conservation Management (Open Elective - II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain energy efficiency, conservation and various technologies.	2	3	2	1	-	-	-	-	-	-	-	-	-	-
CO2	Design energy efficient lighting systems.	3	1	2	2	-	-	-	-	-	-	-	-	-	-
CO3	Calculate power factor of systems and propose suitable compensation techniques.	2	3	1	1	-	-	-	-	-	-	-	-	-	-
CO4	Explain energy conservation in HVAC systems.	2	3	1	1	-	-	-	-	-	-	-	-	-	-
CO5	Calculate life cycle costing analysis and return on investment on energy efficient technologies.	1	2	1	3	-	-	-	-	-	-	-	-	-	-
Course Code	**191EE6O05 - Non Conventional Energy resources (Open Elective - II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Interpret renewable energy sources and solar radiation.	1	-	-	-	-	-	1	-	-	-	-	-	-	-
CO2	Apply the knowledge of solar principles for its applications.	1	-	-	-	-	-	1	-	-	-	-	-	-	-
CO3	Discuss the working principles of wind and Bio-mass energy resources.	1	-	-	-	-	-	1	-	-	-	-	-	-	-
CO4	Illustrate the techniques and conversion principles of Geothermal and tidal energy resources.	1	-	-	-	-	-	1	-	-	-	-	-	-	-
CO5	Make use of working principles in energy conversion	1	-	-	-	-	-	1	-	-	-	-	-	-	-
Course Code	**191EE6O06 - Instrumentation (Open Elective - II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain various types of signals	1	2	3	1	-	-	-	-	-	-	-	-	-	-
CO2	Explain various types of Transducers principles	1	2	1	3	-	-	-	-	-	-	-	-	-	-
CO3	Measure various parameters such as strain, velocity, temperature, pressure etc.	1	2	1	3	-	-	-	-	-	-	-	-	-	-
CO4	Explain the working principle of various types of digital Voltmeters and measure various parameter like phase and frequency of a signal with the help of CRO.	1	2	1	3	-	-	-	-	-	-	-	-	-	-
CO5	Analyze the different signals using various types of signal analyzers	1	2	1	3	-	-	-	-	-	-	-	-	-	-

	CO Statements	POs												PSOs	
Course Code	**191ME6O06 - Solar Energy Utilisation (Open Elective - II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the concept of solar radiation and its measurement.	1	-	-	-	-	-	1	-	-	-	-	1	-	-
CO2	Describe the working principle of different types of collectors and its types	2	-	-	-	-	2	1	-	-	-	-	2	-	-
CO3	Explain the various solar thermal energy technologies and their applications	2	-	-	-	-	2	1	-	-	-	-	2	-	-
CO4	Analyze the various solar PV cell materials and conversion techniques.	2	-	-	-	-	1	1	-	-	-	-	2	-	-
CO5	Apply solar passive building techniques for cooling and heating applications.	2	-	-	-	-	1	1	-	-	-	-	2	-	-
Course Code	**191ME6O07 - Basic Thermodynamics and Heat Transfer (Open Elective - II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain basic thermodynamic concepts and laws of thermodynamics	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Make use of steam tables to solve problems on properties of pure substance and gas mixture	2	2	1	-	-	-	-	-	-	-	-	-	-	-
CO3	Find the efficiency of a thermodynamic cycle	1	2	1	-	-	-	-	-	-	-	-	-	-	-
CO4	Explain basic heat transfer mechanisms	1	2	1	-	-	-	-	-	-	-	-	-	-	-
CO5	Evaluate the performance of heat exchangers	1	2	-	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191ME6O08 - Introduction to Hydraulics and Pneumatics (Open Elective - II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Describe the fundamentals of fluid power systems.	1	1	1	-	-	-	3	-	-	-	-	-	-	-
CO2	Illustrate the working of fluid power actuators, hydraulic motors, and Hydraulic Components.	1	1	1	-	-	-	3	-	-	-	-	-	-	-
CO3	Analyze the design and drawings of hydraulic circuits.	1	1	1	-	-	-	-	-	-	-	-	-	-	-
CO4	Explain the working of pneumatic systems.	1	1	2	-	-	-	-	-	-	-	-	-	-	-
CO5	Examine the concepts of pneumatic circuits.	1	1	2	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191ME6O09 - 3D Printing (Open Elective - II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Summarize the basics of AM technologies.	1	-	-	-	-	1	-	-	-	-	-	1	-	-
CO2	Explain about vat photo polymerization, material jetting and binder jetting AM technologies.	1	-	-	-	-	1	-	-	-	-	-	1	-	-
CO3	Explain material extrusion and sheet lamination AM technologies.	1	-	-	-	-	-	1	-	-	-	-	1	-	-
CO4	Illustrate powder bed fusion and directed energy deposition AM technologies.	1	-	-	-	-	-	1	-	-	-	-	1	-	-
CO5	Apply the AM techniques in different industries	1	-	-	-	-	1	-	-	-	-	-	1	-	-
CO6	Select AM technologies using decision methods	1	-	-	-	-	-	-	-	-	-	-	1	-	-

	CO Statements	POs												PSOs	
Course Code	**191ME6O10 - Robotics (Open Elective - II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the basic concepts, parts of robots and types of robots.	2	-	-	-	-	-	-	-	-	-	-	1	-	-
CO2	Identify various robot configuration and components,	2	-	-	-	-	-	-	-	-	-	-	1	-	-
CO3	Analyze the transformations and manitulator kinematics of robot using DH Notation	2	1	-	-	-	-	-	-	-	-	-	1	-	-
CO4	Analyze the differential transformations and dynamics of robots	3	2	-	-	-	-	-	-	-	-	-	1	-	-
CO5	Analyze the trajectory planning for a manipulator by avoiding Obstacles	1	2	1	-	-	-	-	-	-	-	-	1	-	-
Course Code	**191ME6O11 - Management Science (Open Elective - II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Apply management and motivation theories to renovate the practice of management.	1	1	-	-	-	1	-	-	-	-	-	1	-	-
CO2	Explain concepts of quality management and use process control charts, concepts, and tools of quality engineering in the design of products and process controls.	1	1	-	-	-	1	-	-	-	-	-	1	-	-
CO3	Appraise the functional management challenges associated with high levels of change in the organizations.	1	1	-	-	-	1	-	-	-	-	-	1	-	-
CO4	Use scheduling techniques of project management PERT/CPM to calculate Critical path and Probabiltiy of completion of the project.	1	1	-	-	-	-	1	-	-	-	-	1	-	-
CO5	Develop global vision and management skills both at strategic level and interpersonal level.	1	1	-	-	-	-	1	-	-	-	-	1	-	-
Course Code	**191ME6O12 - Entrepreneurship Development and Incubation (Open Elective - II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Describe the meaning and concepts of entrepreneurship development	-	-	-	-	-	1	2	-	-	2	-	-	-	-
CO2	Apply the business plan for preparation and evaluation of project.	-	-	-	-	-	1	2	-	-	2	-	-	-	-
CO3	Explain about Institutional Support to Entrepreneur and MSMEs	-	-	-	-	-	2	3	-	-	2	2	-	-	-
CO4	Utilize the Opportunities of Entrepreneurship Internationally.	-	-	-	-	-	2	3	-	-	2	2	-	-	-
CO5	Explain Informal Risk capital, Venture capital , Social & Rural entrepreneurship	-	-	-	-	-	1	2	-	-	2	-	-	-	-
Course Code	**191EC6O04 - Biomedical Instrumentation (Open Elective - II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Summarize the physiological relation of the human body with the environment.	2	2	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Make use of different electrodes and transducers for biomedical applications.	2	2	2	1	-	-	-	-	-	-	-	-	-	-
CO3	Demonstrate the working principle of different biomedical instruments for heart and respiratory system monitoring.	2	3	2	1	-	-	-	-	-	-	-	-	-	-
CO4	Illustrate Intensive-Care Monitoring system for patient management.	2	2	3	-	-	-	-	-	-	-	-	-	-	-
CO5	Outline different diagnostic techniques for telemedicine.	2	2	3	-	-	-	-	-	-	-	-	-	-	-

	CO Statements	POs												PSOs	
Course Code	**191EC6O05 - ECAD Tools (Open Elective - II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Illustrate the basic concepts on ECAD tools and PSPICE.	2	1	-	-	-	-	-	-	-	-	-	2	-	-
CO2	Summarize the fundamental concepts of passive circuits using PSPICE.	2	2	-	-	-	-	-	-	-	-	-	2	-	-
CO3	Demonstrate the performance active circuits using PSPICE.	2	2	1	-	-	-	-	-	-	-	-	2	-	-
CO4	Develop the various functionality of MATLAB.	2	2	1	-	-	-	-	-	-	-	-	2	-	-
CO5	Apply the fundamentals and applications of MATLAB Simulink.	2	2	1	-	-	-	-	-	-	-	-	2	-	-
Course Code	**191CS6O05 - Python Programming (Open Elective - II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Develop programs using fundamental concepts and control statements in python.	2	2	3	-	2	-	-	-	-	-	-	-	-	-
CO2	Utilize data structures in Python to solve various problems.	2	3	2	-	-	-	-	-	-	-	-	-	-	-
CO3	Develop programs using functions and Standard libraries like math, datetime, random etc. in building real time applications.	2	2	3	-	2	-	-	-	-	-	-	-	-	-
CO4	Apply Object Oriented Programming concepts.	3	-	2	-	2	-	-	-	-	-	-	-	-	-
CO5	Apply concept of exception handling in solving runtime issues.	3	-	2	-	2	-	-	-	-	-	-	-	-	-
CO6	Build various applications using files.	2	3	2	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191CS6O06 - Operating Systems (Open Elective - II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Illustrate the basic structure, services, system calls and architectural components of Operating Systems.	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Solve problems related to process scheduling, synchronization in unit and multi-processing systems.	2	2	2	3	-	-	-	-	-	-	-	-	-	-
CO3	Explain the deadlock handling Mechanism in the processing System	2	3	1	2	-	-	-	-	-	-	-	-	-	-
CO4	Summarize the concepts of Memory Management, Virtual Memory Management and Thrashing	2	2	3	2	-	-	-	-	-	-	-	-	-	-
CO5	Describe the concepts of file system and mass storage structure.	2	3	2	2	-	-	-	-	-	-	-	-	-	-
Course Code	**191CS6O07 - Web Technologies (Open Elective - II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Develop static web pages using HTML and CSS.	2	-	3	-	-	-	-	-	-	-	-	-	-	-
CO2	Apply JavaScript for Client-side validations and Node.JS to learn server-side applications using JavaScript.	3	2	2	-	2	-	-	-	-	-	-	-	-	-
CO3	Make use of Angular JS for developing dynamic and responsive web pages.	2	2	3	-	2	-	-	-	-	-	-	-	-	-
CO4	Utilize React JS for developing dynamic and responsive web pages.	2	3	2	-	-	-	-	-	-	-	-	-	-	-
CO5	Create and deploy secure, usable database driven web applications using PHP and MySQL/Mongo DB.	2	-	2	-	3	-	-	-	-	-	-	-	-	-
Course Code	**191CS6O08 - Cyber Security (Open Elective - II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the cyber security and security management methods to maintain security protection.	3	1	-	-	2	-	-	2	-	-	-	-	-	-

	CO Statements	POs												PSOs	
CO2	Illustrate the nature of secure software development and operating systems.	2	3	-	-	2	-	-	-	-	-	-	-	-	-
CO3	Summarize the Network management and cloud computing security issues.	1	2	-	-	3	-	-	-	-	-	-	-	-	-
CO4	Analyze the data privacy techniques for data management.	1	3	-	-	2	-	-	-	-	-	-	-	-	-
CO5	Demonstrate the role security management plays in cyber security defense and legal and social issues at play in developing solutions.	3	1	-	-	2	-	-	2	-	-	-	-	-	-
Course Code	**191CS6O09 - AR / VR (Open Elective - II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain VR, its environments and hardware technologies for 3D interfaces.	3	-	-	1	1	-	-	-	-	-	-	-	-	-
CO2	Summarize 3D user interface input hardware in VR environment.	3	1	-	2	1	-	-	-	-	-	-	-	-	-
CO3	Make use of software technologies to build VR applications.	2	2	3	-	2	-	-	-	-	-	-	-	-	-
CO4	Develop 3D user interfaces using 3D interaction techniques.	2	2	3	-	2	-	-	-	-	-	-	-	-	-
CO5	Describe the fundamental concepts of AR	2	3	2	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191IT6O03 - Computer Organization (Open Elective - II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Describe the basic structure of a computer system, various number systems and arithmetic operations.	3	2	1	1	-	-	-	-	-	-	-	-	-	-
CO2	Explain the Operation of CPUs including RTL, ALU, Instruction Cycle and Buses	2	2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	Demonstrate the architecture and functionality of central processing unit	2	2	3	1	-	-	-	-	-	-	-	-	-	-
CO4	Illustrate the I/O and memory organization in an efficient way.	1	2	2	3	-	-	-	-	-	-	-	-	-	-
CO5	Make use of multi processors and pipelining to improve the efficiency of computer system.	1	2	2	3	-	-	-	-	-	-	-	-	-	-
Course Code	**191IT6O04 - AI Tools & Techniques (Open Elective - II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the fundamentals of Artificial Intelligence and its applications.	-	3	-	2	-	-	-	-	-	-	-	-	-	-
CO2	Describe various problems solving techniques and searching techniques.	-	2	-	-	3	-	-	-	-	-	-	-	-	-
CO3	Apply various logical systems to inference the different logical problems.	-	2	3	1	2	-	-	-	-	-	-	-	-	-
CO4	Demonstrate the concept of Knowledge Representation Techniques.	-	2	2	1	2	-	-	-	-	-	-	-	-	-
CO5	Explain the phases in Expert System and its applications.	-	2	1	-	-	-	-	-	-	-	-	-	-	-
CO6	Identify various interpretations of probability theory, basic knowledge of fuzzy sets and fuzzy logic.	-	2	-	2	-	-	-	-	-	-	-	-	-	-
Course Code	**191IT6O05 - Robotic Process Automation (Open Elective - II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Describe the fundamentals of Robotic Process Automation Technology.	-	3	1	2	-	-	-	-	-	-	-	-	-	-

	CO Statements	POs												PSOs	
CO2	Summarize the UiPath programming techniques to deploy robot configurations.	-	1	3	1	-	-	-	-	-	-	-	-	-	-
CO3	Explore various data extraction techniques and learn about integrations with various popular applications like SAP and MS Office	-	2	-	3	2	-	-	-	-	-	-	-	-	-
CO4	Develop a programmed robot including logging and exception handling	-	2	2	2	3	-	-	-	-	-	-	-	-	-
CO5	Create and Deploy the Bots and control it with UiPath Orchestrator.	-	2	1	3	2	-	-	-	-	-	-	-	-	-
Course Code	**191MI6O02 - Industrial Safety Practices (Open Elective - II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the different hazards and its prevention in mining industries.	1	-	-	-	-	1	-	-	-	-	-	-	-	-
CO2	Distinguish the mine accidents occurring in surface and underground mining area.	1	-	-	-	-	1	-	-	-	-	-	-	-	-
CO3	Explain the safety concepts, emergency preparation and response in disaster	1	-	-	-	-	1	-	-	-	-	-	-	-	-
CO4	Assess and minimize the risk using safety analysis techniques	1	-	-	-	-	1	-	-	-	-	-	-	-	-
CO5	Explain Safety standards, safety information system and safety audit	1	-	-	-	-	1	-	-	-	-	-	-	-	-
Course Code	**191MI6O03 - Electrical Equipment's in Mines (Open Elective - II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain about power systems used in mines.	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Analyze various earthing methods used in mines.	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Summarize various electrical equipment used in mines.	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO4	Explain the instrumentation and control systems used in mines	2	2	-	-	-	-	-	-	-	-	-	-	-	-
CO5	Analyze about mine telephone system and intrinsic safety.	3	2	-	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191PT6O03 - Unconventional Hydrocarbon Resources (Open Elective - II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Outline the fundamentals of Coal Bed Methane	2	-	-	-	-	-	-	-	-	-	-	-	-	2
CO2	Estimate the shale gas reserves for Indian Scenario	2	-	-	-	-	-	-	-	-	-	-	-	-	2
CO3	Determine the extent of gas hydrates resource estimation	2	-	-	-	-	-	-	-	-	-	-	-	-	2
CO4	Illustrate the Origin and Characterize Shale Gas.	2	-	-	-	-	-	-	-	-	-	-	-	-	2
CO5	Explain the Heavy oil reservoirs and their Challenges	2	-	-	-	-	-	-	-	-	-	-	-	-	2
Course Code	**191PT6O04 - Asset Management (Open Elective - II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the Asset Management in corporate approach	2	-	-	-	-	-	-	-	-	-	1	-	-	2
CO2	Estimate the running cost and value for Asset Management	2	-	-	-	-	-	-	-	-	-	1	-	-	2
CO3	Determine value using Asset Management Interpretation	2	-	-	-	-	-	-	-	-	-	1	-	-	2
CO4	Illustrate Asset Management Decision making framework	2	-	-	-	-	-	-	-	-	-	1	-	-	2
CO5	Explain the Capital Planning System	2	-	-	-	-	-	-	-	-	-	1	-	-	2

	CO Statements	POs												PSOs	
Course Code	**191AG6O02 - Weather forecast in Agriculture (Open Elective - II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the weather elements and their impact on crop production.	1	-	-	-	1	-	-	-	-	-	-	-	-	-
CO2	Identify the type of crop production risk and their management.	-	1	-	-	-	-	1	1	-	-	-	-	-	-
CO3	Explain crop weather relationships and their responses.	-	2	-	1	1	-	1	-	-	-	-	-	-	-
CO4	Classify the types of weather forecast and their characteristics.	1	-	-	-	-	-	1	-	-	-	-	-	-	-
CO5	Apply weather thumb rules and verification of weather forecast with real events.	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Course Code	**191AG6O03 - Bio-energy systems design and applications (Open Elective - II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the importance of Bioenergy.	2	-	-	-	-	2	3	-	-	-	-	-	-	-
CO2	Compare and contrast Biomass and Agrochemical Conversion techniques.	3	2	-	1	-	2	-	-	-	-	-	-	-	-
CO3	Categorize different ways of biomass production.	2	1	-	-	-	2	3	-	-	-	-	-	-	-
CO4	Classify Gasification and Liquefaction.	2	1	-	-	-	3	1	-	-	-	-	-	-	-
CO5	Analyze advanced Bio-diesel production from Oils and Seeds.	2	1	-	-	-	3	1	-	-	-	-	-	-	-
Course Code	**191PT6L06 - Petroleum Reservoir Engineering Lab**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Identify kind of flow (steady-state, unsteady-state or transient)	-	-	-	-	-	-	-	-	2	2	-	2	2	-
CO2	Calculate and analyze porosity, permeability and pore distribution of a reservoir rock sample.	-	-	-	-	-	-	-	-	2	2	-	2	2	-
CO3	Classify involving Darcy fluid flow equation for in a reservoir.	-	-	-	-	-	-	-	-	2	2	-	2	2	-
CO4	Solve the type of permeability when two fluid flows.	-	-	-	-	-	-	-	-	2	2	-	2	2	-
CO5	Apply the experiment value to real life to get favorable outcome in reservoir engineering problem.	-	-	-	-	-	-	-	-	2	2	-	2	2	-
Course Code	**191PT6L07 - Petroleum Analysis Lab**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Recognize specified equipment for testing various samples	-	-	-	-	-	-	-	-	2	2	-	2	3	-
CO2	Apply various apparatus/equipment in determining analyze the various products of petroleum components	-	-	-	-	-	-	-	-	2	2	-	2	2	-
CO3	Illustrate the equipment's for different petroleum products	-	-	-	-	-	-	-	-	2	2	-	2	2	-
CO4	Identify the physical properties of different petroleum products	-	-	-	-	-	-	-	-	2	2	-	2	2	-
CO5	Choose transport properties of different petroleum products	-	-	-	-	-	-	-	-	2	2	-	2	3	-
Course Code	**191ES6T17 - Employability Skills - IV**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Solve problems of seating arrangements ,syllogism	1	-	-	-	-	-	-	-	-	-	-	1	2	-
CO2	Solve problems of Time and Work, Pipes and Cisterns, Time and Distance, Races and trains	1	-	-	-	-	-	-	-	-	-	-	1	3	-
CO3	Solve Problems on Boats and Streams, Permutation and Combination, Probability and Data Interpretation	1	-	-	-	-	-	-	-	-	-	-	1	1	-

	CO Statements	POs												PSOs	
CO4	Apply processes of Group discussion ,Phonetics, Leadership skills in real world	-	-	-	-	-	-	-	-	-	2	-	1	1	-
CO5	Apply principles of Group Dynamics, Interview Skills & Evaluation criteria in organizations	-	-	-	-	-	-	-	-	-	2	-	1	2	-
Course Code	**191MC6A09 - Professional Ethics and Human Values**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Make use of values, morals and ethics in their day to day life.	-	-	-	-	-	-	-	2	-	-	-	-	-	-
CO2	Identify what is right and wrong through moral ethics.	-	-	-	-	-	-	-	2	-	-	-	-	-	-
CO3	Analyze experimental learning while developing the society with ethics.	-	-	-	-	-	-	-	2	-	-	-	-	-	-
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	**191PT7T15 - Petroleum Reservoir Engineering – II**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Apply Constant Terminal Rate solution of the radial diffusivity equation and its application to oil well testing	2	3	-	-	-	-	-	-	-	-	-	2	-	2
CO2	Apply Radial flow differential equation to Gas well Testing	2	3	-	-	-	-	-	-	-	-	-	2	-	2
CO3	Solve Radial flow differential equation to interference testing, pulse testing, injection well testing of Gas Wells	2	3	-	-	-	-	-	-	-	-	-	2	-	2
CO4	Apply Natural Water Influx Models of using Hurst and Van-Everdingen, Fetkovich Method and Immiscible Displacement for quantitative study.	2	3	-	-	-	-	-	-	-	-	-	2	-	2
CO5	Explain Unconventional Reservoirs such as Coal bed Methane, Tight Gas, UGC	2	3	-	-	-	-	-	-	-	-	-	2	-	2
Course Code	**191PT7T16 - Design of Surface Facilities**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the efficient separation of oil and gas.	3	2	-	-	-	-	-	-	-	-	-	1	-	**2**
CO2	Maintain the quality of oil, required by the refineries.	2	2	-	-	-	-	-	-	-	-	-	1	-	**2**
CO3	Identify the various control systems fitted on the separators/heater-theaters, so that Smooth operation of GGS/GCS can be maintained	3	2	-	-	-	-	-	-	-	-	-	1	-	**2**
CO4	Apply design principles and sizing of gas-oil separators	3	2	-	-	-	-	-	-	-	-	-	1	-	**2**
CO5	Design of all types of separators, pumps & compressors heat exchangers, oil	2	2	-	-	-	-	-	-	-	-	-	1	-	**2**
Course Code	**191PT7E10 - Enhanced Oil Recovery (Professional Elective - IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Understand the basic features and technical foundations of the most common EOR methods.	3	-	-	-	-	-	-	-	-	-	-	2	-	2

	CO Statements	POs												PSOs	
CO2	Understand basic reservoir and production engineering of gas reservoirs, oil reservoirs, and PVT of gas condensate reservoirs	2	-	-	-	-	-	-	-	-	-	-	2	-	2
CO3	Apply screening criteria to a given reservoir to select an optimum EOR method both technically and economically	3	-	-	-	-	-	-	-	-	-	-	2	-	2
CO4	Use rock, fluid and reservoir data to specify the process and operating parameters of an EOR method application	3	-	-	-	-	-	-	-	-	-	-	2	-	2
CO5	Distinguish different type of EOR process.	2	-	-	-	-	-	-	-	-	-	-	2	-	2
Course Code	**191PT7E12 - Petroleum Economics and Polices and Regulations (Professional Elective - IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Identify the importance of petroleum sector in the world economy	3	-	-	-	-	-	-	-	-	-	2	1	3	-
CO2	Apply various capital budgeting and capital efficiency in petroleum industry	2	-	-	-	-	-	-	-	-	-	2	2	2	-
CO3	Apply project evaluation methods in petroleum industry	3	-	-	-	-	-	-	-	-	-	2	2	2	-
CO4	Identify the Demand and Marketing of Petroleum Products	3	-	-	-	-	-	-	-	-	-	2	2	2	-
CO5	Study the laws and regulations in petroleum industries.	2	-	-	-	-	-	-	-	-	-	2	2	3	-
Course Code	**191PT7E11 - Petroleum Corrosion Technology (Professional Elective - IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Understand the basics of corrosion, factors effecting corrosion techniques.	3	-	-	-	-	-	-	-	-	-	-	2	3	-
CO2	Analyze Protective coating, type of coating, pipeline coatings.	2	-	-	-	-	-	-	-	-	-	-	2	2	-
CO3	Explain the importance of cathodic protection, principle, criteria and significance of protective coating.	3	-	-	-	-	-	-	-	-	-	-	2	2	-
CO4	Describe various principles/ involved in Chemical treatment and control of corrosion environment.	3	-	-	-	-	-	-	-	-	-	-	2	2	-
CO5	Apply concepts of Corrosion Detection & Control Monitoring, Inspection of Surface Equipment.	2	-	-	-	-	-	-	-	-	-	-	2	3	-
Course Code	**191PT7E13 - Offshore Deep water Drilling and Production (Professional Elective - V)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Summarize the concept of deep sea production systems.	3	-	-	-	-	-	-	-	-	-	-	2	-	2
CO2	Demonstrate the components of deep sea production systems.	3	-	-	-	-	-	-	-	-	-	-	2	-	2
CO3	Explain the concept of umblical and control systems of deep sea Production.	3	-	-	-	-	-	-	-	-	-	-	2	-	2
CO4	Summarize the various subsea processing facilities of reservoir fluids.	3	-	-	-	-	-	-	-	-	-	-	2	-	2
CO5	Illustrate the flow regimes in multi phase flow and aspects off low assurance in Deep sea production systems.	3	-	-	-	-	-	-	-	-	-	-	2	-	2

	CO Statements	POs												PSOs	
Course Code	**191PT7E14 - Pipeline Project Management (Professional Elective - V)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain pipeline integrity management and framework	3	-	-	-	-	-	-	-	-	-	2	1	-	2
CO2	Apply Engineering concepts for pipeline integrity	3	-	-	-	-	-	-	-	-	-	2	1	-	2
CO3	Explain Elements of a pipeline integrity management system	3	-	-	-	-	-	-	-	-	-	2	1	-	2
CO4	Apply Integrity hazard and threat susceptibility and assessment	3	-	-	-	-	-	-	-	-	-	2	1	-	2
CO5	Explain the Consequences assessment for pipelines	3	-	-	-	-	-	-	-	-	-	2	1	-	2
Course Code	**191PT7E15 - Process Optimization (Professional Elective - V)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Identify the types of optimization techniques in process industry.	3	-	-	-	-	-	-	-	-	-	-	2	**2**	-
CO2	Make use of process knowledge to solve Optimization of One Dimensional Functions.	2	-	-	-	-	-	-	-	-	-	-	2	**2**	-
CO3	Interpret the concepts of Indirect First Order and Second Order Methods.	3	-	-	-	-	-	-	-	-	-	-	2	**2**	-
CO4	Prioritize the demand of Multivariable Optimization Algorithms.	3	-	-	-	-	-	-	-	-	-	-	2	**2**	-
CO5	Explain concepts of Constrained Optimization Algorithms and Non-traditional Optimization Techniques	2	-	-	-	-	-	-	-	-	-	-	2	**2**	-
Course Code	**191CE7O03 - Waste Water Management (Open Elective - III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Summarize the importance of sanitation and waste water management.	2	1	-	-	-	2	3	-	-	-	-	-	-	-
CO2	Estimatethe rate of sewage flow and storm water drainage	1	1	-	-	-	1	2	-	-	-	-	-	-	-
CO3	Identify the various characteristics of sewage and plan the treatment system.	3	2	-	-	-	2	2	-	-	-	-	-	-	-
CO4	Outline various waste water treatment technologies.	2	1	-	-	-	2	3	-	-	-	-	-	-	-
CO5	Explain the different treated effluent disposal methods.	2	1	-	-	-	2	3	-	-	-	-	-	-	-
Course Code	**191EE7O07 - Electrical and Hybrid Vehicles (Open Elective - III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the characteristics of electrical and hybrid vehicles.	1	-	-	-	-	1	1	-	-	-	-	-	-	-
CO2	Analyze the models to describe electric trains and their performance.	1	-	-	-	-	1	1	-	-	-	-	-	-	-
CO3	Compare and evaluate the different possible ways of energy storage.	1	-	-	-	-	1	1	-	-	-	-	-	-	-
CO4	Demonstrate the sizing of the drive system.	1	-	-	-	-	1	1	-	-	-	-	-	-	-
CO5	Apply the different strategies related to energy management.	1	-	-	-	-	1	1	-	-	-	-	-	-	-
Course Code	**191EE7O08 - Special Electrical Machines (Open Elective - III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Distinguish between brush dc motor and brush less dc motor.	1	1	1	-	-	-	-	-	-	-	-	-	-	-
CO2	Explain the performance and control of stepper motors and their applications.	1	1	1	-	-	-	-	-	-	-	-	-	-	-
CO3	Describe theory of operation and control of switched reluctance motor.	1	1	1	-	-	-	-	-	-	-	-	-	-	-

	CO Statements	POs												PSOs	
CO4	Explicate the theory of travelling magnetic field and applications of linear motors.	1	1	1	-	-	-	-	-	-	-	-	-	-	-
CO5	Explain the significance of electrical motors for traction drives.	1	1	1	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191EE7O09 - Industrial Electrical Systems (Open Elective - III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the electrical wiring systems for residential, commercial, and industrial consumers, representing the systems with standard symbols and drawings, SLD.	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Illustrate the residential and commercial electrical systems.	3	1	1	1	-	-	-	-	-	-	-	-	-	-
CO3	Design the residential and commercial lightning systems.	3	1	1	-	-	-	-	-	-	-	-	-	-	-
CO4	Explain various components of industrial electrical systems.	3	2	2	1	-	-	-	-	-	-	-	-	-	-
CO5	Analyze and select the proper size of various electrical system components.	3	2	-	1	-	-	-	-	-	-	-	-	-	-
Course Code	**191ME7O13 - Optimization techniques (Open Elective - III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Use advanced optimization techniques to solve real-life problems.	3	2	1	-	-	-	-	-	-	-	-	1	-	-
CO2	Formulate and solve various practical optimization problems in manufacturing and service organizations	3	2	1	-	-	-	-	-	-	-	-	1	-	-
CO3	Use non-linear optimization techniques such as classical optimization methods, integer programming.	2	2	1	-	-	-	-	-	-	-	-	1	-	-
CO4	Apply unconstrained optimization and constrained non-linear programming and dynamic programming	1	2	1	-	-	-	-	-	-	-	-	1	-	-
CO5	Use Advance techniques to formulate and solve the optimization problems.	1	2	1	-	-	-	-	-	-	-	-	1	-	-
Course Code	**191ME7O14 - Energy Conservation (Open Elective - III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the concepts of National Energy consumption, Energy Auditing, and its types	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	-	-
CO2	Explain the improvement in efficiency of various electrical equipment's like capacitors and electric motors etc.	**1**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	-	-
CO3	Explain the improvement in efficiency of various mechanical equipment like boilers, condensers, and steam lines etc.	**1**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	-	-
CO4	Explain the energy efficiency of components like pumps, blowers, fans, and various refrigeration equipment.	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	-	-
CO5	Apply the concepts of energy economics like payback period, internal rate of returns life cycle costing etc.	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	-	-

	CO Statements	POs												PSOs	
Course Code	**191ME7O15 - Introduction to Material Handling Systems (Open Elective - III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Demonstrate ability to complete successfully Forklift Certification to safely and operate effectively in the manufacturing environment.	3	-	-	-	-	-	-	-	-	-	1	-	-	-
CO2	Discuss proficiency in supply chain operations, utilizing appropriate methods to plan and implement processes necessary for the purchase and conveyance of goods in a timely and cost-effective manner.	3	-	-	-	-	-	-	-	-	-	2	-	-	-
CO3	Summarize different types of material handling systems, advantages, and disadvantages and suggest the selection procedure for the material handling along with its specifications.	3	-	-	-	-	-	-	-	-	-	2	-	-	-
CO4	Explain different techniques of Material handling systems like Automated Material handling Design Program, and Computerized material handling planning	3	-	-	-	-	-	-	-	-	-	2	-	-	-
CO5	Analyze different models of Material handling system and selection procedure of material handling on different function-oriented systems related with plant layout by which the minimization of the handling charges.	3	-	-	-	-	-	-	-	-	-	2	-	-	-
Course Code	**191ME7O16 - Robotics (Open Elective - III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the basic concepts, parts of robots and types of robots.	2	-	-	-	-	-	-	-	-	-	-	1	-	-
CO2	Identify various robot configuration and components,	-	2	-	-	-	-	-	-	-	-	-	1	-	-
CO3	Select appropriate actuators and sensors for a robot based on specific application	1	-	1	1	-	-	-	-	-	-	-	1	-	-
CO4	Apply DH Notation for Joint coordinates and world coordinators in Manipulator kinematics problems	-	2	-	2	-	-	-	-	-	-	-	1	-	-
CO5	Analyze the trajectory planning for a manipulator by avoiding Obstacles	-	2	2	2	-	-	-	-	-	-	-	1	-	-
Course Code	**191ME7O17 - Entrepreneurship Development and Incubation (Open Elective - III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Describe the meaning and concepts of entrepreneurship development	-	-	-	-	-	1	2	-	-	2	-	-	-	-
CO2	Apply the business plan for preparation and evaluation of project.	-	-	-	-	-	1	2	-	-	2	-	-	-	-
CO3	Explain about Institutional Support to Entrepreneur and MSMEs	-	-	-	-	-	2	3	-	-	2	2	-	-	-
CO4	Explain about the Opportunities of Entrepreneurship Internationally.	-	-	-	-	-	2	3	-	-	2	2	-	-	-
CO5	Explain about Informaal Risk Capital, Venture capital and Social responsibility for entrepreneurship	-	-	-	-	-	1	2	-	-	2	-	-	-	-
Course Code	**191EC7O06 - Overview of Digital Signal Processing (Open Elective - III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Analyze Discrete Time Signals and Systems.	2	2	1	1	-	-	-	-	-	-	-	-	-	-

	CO Statements	POs												PSOs	
CO2	Apply various DFT properties to evaluate the given sequence.	2	1	1	-	-	-	-	-	-	-	-	-	-	-
CO3	Make use of FFT Algorithms for the computation of DFT.	2	2	1	1	-	-	-	-	-	-	-	-	-	-
CO4	Design digital filters and implement with different structures.	2	2	1	1	-	-	-	-	-	-	-	-	-	-
CO5	Apply the knowledge of Multirate signal processing in the real time applications.	2	2	2	2	-	-	-	-	-	-	-	-	-	-
Course Code	**191EC7O07 - Basics of VLSI Design (Open Elective - III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Demonstrate the fundamental concepts of basic MOS theory of fabrication process and the electrical properties of MOS and Bi-CMOS Circuits.	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Develop the stick and layout models of MOS circuits using design rules.	2	3	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Develop various CMOS logic structures using different MOS logic technologies.	2	2	1	2	-	-	-	-	-	-	-	-	-	-
CO4	Demonstrate the scaling factors in determining the characteristics and performance of MOS circuits in silicon.	2	3	1	1	-	-	-	-	-	-	-	-	-	-
CO5	Explain different architectural issues of subsystem design process and testability.	2	1	3	1	-	-	-	-	-	-	-	-	-	-
Course Code	**191EC7O08 - Micro Electro Mechanical Systems (Open Elective - III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Summarize the operation of micro systems, and their applications	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Classify the materials for micro system applications	2	1	2	-	-	-	-	-	-	-	-	-	-	-
CO3	Explain the state-of-the-art for lithography and packaging techniques	3	2	1	1	-	-	-	-	-	-	-	-	-	-
CO4	Extend the knowledge of basic approaches for various sensors and actuators design	2	2	1	-	-	-	-	-	-	-	-	-	-	-
CO5	Apply the expertise on micro systems for interdisciplinary applications	2	2	2	1	-	-	-	-	-	-	-	-	-	-
Course Code	**191EC7O09 - Image Processing (Open Elective - III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the concepts of digital image processing.	2	1	1	1	-	-	-	-	-	-	-	-	-	-
CO2	Identify various image enhancement and image restoration techniques.	2	2	2	2	-	-	-	-	-	-	-	-	-	-
CO3	Outline the color fundamentals and different color image processing methods.	2	1	1	1	-	-	-	-	-	-	-	-	-	-
CO4	Utilize different morphological operators for image processing.	2	2	2	2	-	-	-	-	-	-	-	-	-	-
CO5	Analyze different image segmentation techniques for image processing.	2	2	2	2	-	-	-	-	-	-	-	-	-	-
Course Code	**191CS7O10 - Big Data Analytics (Open Elective - III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Illustrate big data challenges in different domains including social media, transportation, finance, and medicine.	-	2	3	-	2	2	-	-	-	-	-	-	-	-

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

	CO Statements	POs												PSOs	
CO5	Demonstrate Performance, Security and Scalability of quantum computing	2	3	1	2	-	-	-	-	-	-	-	-	-	-
CO6	Analyze various quantum computing models and approaches	1	2	3	2	-	-	-	-	-	-	-	-	-	-
Course Code	**191IT7O08 - Block Chain Technologies (Open Elective - III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Demonstrate the foundation of the Blockchain technology and understand the processes in payment and funding.	2	2	1	-	-	-	-	-	-	-	-	2	-	-
CO2	Identify the risks involved in building Blockchain applications.	2	3	1	-	-	-	-	-	-	-	-	2	-	-
CO3	Explain the legal implications using smart contracts.	2	2	1	-	-	-	-	-	-	-	-	2	-	-
CO4	Choose the present landscape of Blockchain implementations and Understand Crypto currency markets	2	2	1	-	-	-	-	-	-	-	-	2	-	-
CO5	Examine how to profit from trading crypto currencies.	2	2	1	-	-	-	-	-	-	-	-	2	-	-
Course Code	**191MI7O04 - Communication System in Mines (Open Elective - III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Demonstrate types of signals and relation of time domain representation to frequency domain.	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Apply signal concepts to continuous wave modulation.	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Interpret the basic concepts of pulse modulation.	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO4	Analyze the concepts of digital modulation techniques.	2	2	-	-	-	-	-	-	-	-	-	-	-	-
CO5	Summarize different advanced communication networks.	3	2	-	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191MI7O05 - Drilling & Blasting (Open Elective - III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Differentiate between explosives.	1	3	2	-	-	-	-	-	-	-	-	-	-	-
CO2	Use blasting accessories along with monitoring and assessment.	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Analyze problems associated with open cast blasting and mitigation.	1	3	-	-	-	-	-	-	-	-	-	-	-	-
CO4	Analyze problems associated with underground blasting and mitigation.	1	3	-	-	-	-	-	-	-	-	-	-	-	-
CO5	Assess blasting in metal mines.	1	3	-	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191PT7O05 - Introduction to Earth Sciences (Open Elective - III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain various branches of earth sciences and universe	2	-	-	-	-	-	-	-	-	-	-	1	-	2
CO2	Explain the origin of the universe and solar systems	2	-	-	-	-	-	-	-	-	-	-	-	-	2
CO3	Explain the concepts of earth's magnetic field	2	-	-	-	-	-	-	-	-	-	-	-	-	2
CO4	Illustrate the concepts of the plate tectonics	2	-	-	-	-	-	-	-	-	-	-	1	-	2
CO5	Explain the origin of the oceans, continents, mountains, and valleys	2	-	-	-	-	-	-	-	-	-	-	1	-	2
Course Code	**191PT7O06 - Basic Concepts in Petroleum Drilling and Completions (Open Elective - III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the types of drilling equipment and drilling hydraulics.	2	1	-	-	-	-	-	-	-	-	-	-	-	2

	CO Statements	POs												PSOs	
CO2	Explain about Casings, cement slurry design, directional drilling, and fishing, well control concepts.	2	1	-	-	-	-	-	-	-	-	-	-	-	2
CO3	Explain different types of wells, well testing, surface, and subsurface equipment.	2	1	-	-	-	-	-	-	-	-	-	-	-	2
CO4	Explain well completion equipment and different perforation techniques.	2	1	-	-	-	-	-	-	-	-	-	-	-	2
CO5	Illustrate different Subsurface circulating equipment and different types of packers	2	1	-	-	-	-	-	-	-	-	-	-	-	2
Course Code	**191AG7O04 - Greenhouse Technology (Open Elective - III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Design small scale polyhouse for drying purpose.	3	2	1	-	-	-	-	-	-	-	2	-	-	-
CO2	Classify greenhouses based on construction materials.	3	2	-	-	1	-	-	1	-	-	-	-	-	-
CO3	Explain the scenario of protective cultivation around the globe and in India.	3	1	-	-	-	-	-	-	-	-	-	-	-	-
CO4	Make use of non-chemical and chemical pesticides and growth regulators effectively in an environmentally responsible way.	1	-	1	-	-	-	2	3	-	-	-	-	-	-
CO5	Assess the basic production requirements and the knowledge of horticulture crop cultivation in greenhouse.	3	-	-	-	-	-	2	-	-	-	-	-	-	-
Course Code	**191AG7O05 - Floods and Control Measures (Open Elective - III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Determine the peak rate of flood by rational, empirical methods and flood frequency by log normal, Gumbel's extreme value and log-Pearson type-III distribution methods.	2	2	1	-	3	-	-	-	-	-	-	-	-	-
CO2	Explain importance of various flood routing techniques and flood control measures.	3	2	1	-	1	-	-	-	-	-	-	-	-	-
CO3	Design of flood control projects and their cost economics estimation.	3	2	1	-	2	-	-	-	-	-	-	-	-	-
CO4	Estimate seepage through earth embankments and understand causes of failures.	3	2	1	-	-	-	-	-	-	-	-	-	-	-
CO5	Design of earthen dam and its stability analysis by different methods	3	2	1	-	2	-	-	-	-	-	-	-	-	-
Course Code	**191PT7L08 - Petroleum Equipment Design and Simulation Lab**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Design and simulation of the two-phase, three phase separators and compressors.	-	-	-	-	2	-	-	-	2	2	-	1	-	2
CO2	Design and simulation of absorber-stripper unit for removal of CO2 and H2S from natural gas.	-	-	-	-	2	-	-	-	2	2	-	1	-	2
CO3	Size /rate the pipeline & pumping systems for liquid pumping & simulate water hammer conditions.	-	-	-	-	2	-	-	-	2	2	-	1	-	2
CO4	Design and simulation of flash vaporization units.	-	-	-	-	2	-	-	-	2	2	-	1	-	2

	CO Statements	POs												PSOs	
CO5	Generating sized equipment data sheets as per the industry standards with required information for detailed design / manufacture	-	-	-	-	2	-	-	-	2	2	-	1	-	2
Course Code	**191PT7L09 - Petroleum Reservoir Simulation Lab**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Apply properties of single-phase fluid, porous media, multi- dimensional flow in cartesian coordinates, radial, cylindrical coordinates.	-	-	-	-	3	-	-	-	2	2	-	2	-	2
CO2	Calculate flow equations in radial, cylindrical coordinates, block ordering scheme.	-	-	-	-	3	-	-	-	2	2	-	2	-	2
CO3	Apply Reservoir Discretization for transmissibility, symmetry and its use in solving practical problems.	-	-	-	-	3	-	-	-	2	2	-	2	-	2
CO4	Apply Single Block wells, multi block wells, Practical considerations dealing with modeling and well conditions, pressure dependence of fluid and rock properties.	-	-	-	-	3	-	-	-	2	2	-	2	-	2
CO5	Calculate non-linear terms inflow equations and equations in time.	-	-	-	-	3	-	-	-	2	2	-	2	-	2
Course Code	**191PR7P02 - Internship**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Conduct a technical survey to identify a real world engineering problem	1	1	-	-	-	-	-	-	-	1	-	1	-	-
CO2	Analyze the industrial plant layout using technical expertise	2	-	-	-	-	1	1	-	-	-	-	1	-	-
CO3	Compare theoretical and real work environments in technical perspective	2	-	-	-	-	-	-	-	-	1	1	1	-	-
CO4	Identify the challenges in the execution of operations	1	1	1	1	-	-	-	-	-	-	-	-	-	-
CO5	Execute the operations and report the results of assigned tasks using modern tools adhering to professional ethics	-	-	-	-	2	-	-	2	1	1	-	-	-	-
Course Code	**191PT7P03 - Project Part 1**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Conduct technical survey to identify a real industrial problem to solve as a project work	1	1	-	-	-	-	-	-	-	1	-	1	-	-
CO2	Estimate the resources & constraints in the process of execution	1	1	1	-	-	-	-	-	-	-	-	1	-	-
CO3	Develop technical procedure of planning & scheduling to execute an identified project work in line with societal and environmental implications.	-	2	-	-	-	2	2	-	-	-	-	1	-	-
CO4	Estimate the costs of individual stages and overall cost of the project in light of optimum resources allocation	1	1	-	-	-	-	-	-	-	-	-	1	-	-
CO5	Estimate the optimum project duration using quantitative techniques	1	1	-	-	-	-	-	-	-	-	-	1	-	-
VIII SEM															
Course Code	**191MI8E22 - Flow Through Porous Media (Professional Elective - VI)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Apply basic concepts of Porous Media	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**2**

	CO Statements	POs												PSOs	
CO2	Apply the concepts of Reynold's Number for Porous media	-	**2**	-	-	-	-	-	-	-	-	-	**2**	-	**2**
CO3	Apply and estimate the reserves based on General Material Balance Equation.	-	**2**	-	-	-	-	-	-	-	-	-	**2**	-	**2**
CO4	Apply the theory's in displacement mechanisms	-	**2**	-	-	-	-	-	-	-	-	-	**2**	-	**2**
CO5	Apply Basic Heat Transfer for flow through Deformable Porous Media	-	**2**	-	-	-	-	-	-	-	-	-	**2**	-	**2**
Course Code	**191PT8E17 - Offshore Loading Structures Under Special Loads Including Fire Resistance (Professional Elective - VI)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Identify types of offshore structures and recommend a specific offshore structure for a given site condition and requirements of the platform.	3	2	-	-	-	-	-	-	-	-	-	2	-	**2**
CO2	Estimate water particles kinematics using linear airy's wave theory and estimate maximum wave force.	2	2	-	-	-	-	-	-	-	-	-	2	-	**2**
CO3	Identify different types of loads to increase the strength of offshore structures.	3	2	-	-	-	-	-	-	-	-	-	2	-	**2**
CO4	Do analysis and design of structures.	3	2	-	-	-	-	-	-	-	-	-	2	-	**2**
CO5	Design the Fire resistant for offshore structures.	2	2	-	-	-	-	-	-	-	-	-	2	-	**2**
Course Code	**191PT8E16 - HSE Practices for Offshore and Petroleum Industry (Professional Elective - VI)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explainthe environmental issues in drilling and production operations	2	-	-	-	-	-	2	-	-	-	-	2	-	**2**
CO2	Summarize impacts of petroleum industry wastes and waste treatment methods	2	-	-	-	-	-	2	-	-	-	-	2	-	**2**
CO3	Demonstrate the oil mines regulations in various petroleum industry operations	2	-	-	-	-	-	2	-	-	-	-	2	-	**2**
CO4	Make use of the hazop study concepts for safe practices in Petroleum industry	2	-	-	-	-	-	2	-	-	-	-	2	-	**2**
CO5	Illustrate the fire triangle, different methods of suppression of hydrocarbon fires	2	-	-	-	-	-	2	-	-	-	-	2	-	**2**
Course Code	**191CE8O04 - Integrated Waste Management for a Smart City (Open Elective - IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO 1	Describe generation rates, composition and issues of Solid waste	2	1	-	-	-	2	3	-	-	-	-	-	-	-
CO 2	Explain about issues, collection, recovery, reuse, processing of Municipal solid waste	2	1	-	-	-	2	3	-	-	-	-	-	-	-
CO 3	Illustrate the rules regarding MSW and current issues in Solid waste management	1	2	-	-	-	2	3	-	-	-	-	-	-	-
CO 4	Interpret Construction and demolition waste management	2	1	-	-	-	2	3	-	-	-	-	-	-	-

	CO Statements	POs												PSOs	
CO 5	Assess the issues related to E-waste generation and current management practices	1	2	-	-	-	2	3	-	-	-	-	-	-	-
Course Code	**191EE8O10 - Fundamentals of Electrical Engineering (Open Elective - IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the concepts of basic circuits and basic laws for electrical networks.	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Summarize the behaviour of RLC networks	3	1	1	1	-	-	-	-	-	-	-	-	-	-
CO3	Analyse the network by obtaining solution through mesh and nodal analysis	3	1	1	1	-	-	-	-	-	-	-	-	-	-
CO4	Determine resonance frequency and Q factor of an AC Circuit.	2	1	1	1	-	-	-	-	-	-	-	-	-	-
CO5	Explain the operation of the Transformer	3	1	1	1	-	-	-	-	-	-	-	-	-	-
CO6	Explain the operation of the Induction motors and DC Machines	1	1	-	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191EE8O11 - Basic Electrical Circuits (Open Elective - IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain various theories of electrical networks	3	2	1	1	2	-	-	-	-	-	-	-	-	-
CO2	Explain the importance of three phase circuits with Star& Delta connected balanced and unbalanced loads.	2	1	-	-	2	-	-	-	-	-	-	-	-	-
CO3	Illustrate various electrical networks by using principles of network theorems	2	1	-	-	2	-	-	-	-	-	-	-	-	-
CO4	Obtain the various network parameters for the given two port networks	3	2	1	-	2	-	-	-	-	-	-	-	-	-
CO5	Analyse the transient behaviour of electrical networks for DC excitations	2	1	-	-	2	-	-	-	-	-	-	-	-	-
Course Code	**191EE8O12 - Electrical Machines (Open Elective - IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Evaluate the effects of armature reaction in dc machines	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Determine the torque production mechanism and control the speed of dc motors.	3	2	2	1	-	-	-	-	-	-	-	-	-	-
CO3	Determine the voltage regulation and efficiency of single-phase transformers.	2	2	1	1	-	-	-	-	-	-	-	-	-	-
CO4	Explain the operation and performance of three phase induction motor.	1	1	2	-	-	-	-	-	-	-	-	-	-	-
CO5	Apply methods of staring and correction of power factor with synchronous motor	3	2	1	1	-	-	-	-	-	-	-	-	-	-
Course Code	**191EE8O13 - Power Electronics (Open Elective - IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the different types of power semiconductor devices and their Characteristics.	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Distinguish between 1ϕ and 3ϕ phase-controlled converters.	3	2	2	1	-	-	-	-	-	-	-	-	-	-
CO3	Analyze the operation of AC voltage controllers and cycloconverters.	3	2	1	2	-	-	-	-	-	-	-	-	-	-

	CO Statements	POs												PSOs	
CO4	Analyze the operation of different types of DC-DC converters.	3	2	1	2	-	-	-	-	-	-	-	-	-	-
CO5	Illustrate the operation of Inverters and application of PWM techniques.	2	1	-	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191EE8O14 - Non-Conventional Energy Sources (Open Elective - IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the prospects of renewable energy and solar energy.	1	-	-	-	-	-	1	-	-	-	-	-	-	-
CO2	Apply the knowledge of solar principles for its applications.	1	-	-	-	-	-	1	-	-	-	-	-	-	-
CO3	Discuss the working principles of wind and Bio-mass energy resources.	1	-	-	-	-	-	1	-	-	-	-	-	-	-
CO4	Illustrate the techniques and conversion principles of Geothermal and tidal energy resources.	1	-	-	-	-	-	1	-	-	-	-	-	-	-
CO5	Explain the concept of Direct energy conversion	1	-	-	-	-	-	1	-	-	-	-	-	-	-
Course Code	**191ME8O18 - Fabrication processes (Open Elective - IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the fundamentals of Casting and Casting Processes.	-	2	-	2	-	2	-	-	-	-	-	1	-	-
CO2	Explain the basics of Welding and types of Welding processes.	-	2	-	2	-	2	-	-	-	-	-	1	-	-
CO3	Explain the various technological approaches applied to the different hot working and cold working operations.	1	-	-	2	2	-	-	-	-	-	-	1	-	-
CO4	Explain the concept of various Extrusion processes and forces in extrusion.	1	-	2	-	-	-	-	-	-	-	-	1	-	-
CO5	Explain the concept of Forging processes, Forging defects and forces in forging operations.	2	-	2	-	2	-	-	-	-	-	-	1	-	-
Course Code	**191ME8O19 - Smart Materials (Open Elective - IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Describe and characterize mechanical behaviour of smart materials.	2	1	-	-	-	-	1	-	-	-	-	1	-	-
CO2	Select materials for sensor applications based on required properties.	2	1	-	-	-	-	2	-	-	-	-	1	-	-
CO3	Characterize interaction between smart materials and simple structures in actuation and sensing.	2	1	-	-	-	-	2	-	-	-	-	1	-	-
CO4	Describe and characterize novel functions of smart materials using structure-property relationships.	1	1	-	-	-	-	2	-	-	-	-	1	-	-
CO5	Demonstrate the functions of smart structures.	1	1	-	-	-	-	2	-	-	-	-	1	-	-
Course Code	**191EC8O10 - Micro Electro Mechanical Systems (Open Elective - IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Summarize the operation of micro systems, and their applications	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Classify the materials for micro system applications	2	1	2	-	-	-	-	-	-	-	-	-	-	-
CO3	Explain the state-of-the-art for lithography and packaging techniques	3	2	1	-	-	-	-	-	-	-	-	-	-	-
CO4	Extend the knowledge of basic approaches for various sensors and actuators design	3	2	1	-	-	-	-	-	-	-	-	-	-	-

	CO Statements	POs												PSOs	
CO5	Apply the experience on micro systems for interdisciplinary applications	2	2	2	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191EC8O11 - Basic Electronic Circuits (Open Elective - IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain Superposition theorem and Phasors.	3	1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Interpret about BJT and BJT Amplifier.	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Develop Operations performed by OP-AMP circuits.	2	2	1	1	-	-	-	-	-	-	-	-	-	-
CO4	Develop Counters and Registers using Flip-flops.	2	2	1	1	-	-	-	-	-	-	-	-	-	-
CO5	Contrast Analog-to-digital and Digital-to -analog conversions.	3	2	2	2	-	-	-	-	-	-	-	-	-	-
Course Code	**191EC8O12 - Principles of Communications (Open Elective - IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Illustrate Analog communication systems using amplitude modulation and demodulation.	2	2	1	-	-	-	-	-	-	-	-	1	-	-
CO2	Demonstrate Analog communication systems using angle modulation and demodulation.	2	2	1	-	-	-	-	-	-	-	-	1	-	-
CO3	Analyze various pulse analog and pulse digital modulation techniques.	2	2	2	-	-	-	-	-	-	-	-	1	-	-
CO4	Explain the process of reproduction of baseband signal.	2	2	1	-	-	-	-	-	-	-	-	1	-	-
CO5	Compare and contrast various Multiplexing techniques used in Communication systems.	2	2	2	-	-	-	-	-	-	-	-	1	-	-
Course Code	**191EC8O13 - Electronic Instrumentation (Open Elective - IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the fundamental characteristics of different Instruments	3	2	1	-	-	-	-	-	-	-	-	-	-	-
CO2	Compare different signal generators and function generators in terms of their performance	2	2	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Distinguish the operation of various types of analog and digital meters.	3	2	2	-	-	-	-	-	-	-	-	-	-	-
CO4	Interpret the working of various potentiometers and AC bridges	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO5	Compare various data acquisition systems for analog to digital conversion and digital to analog conversion.	2	2	1	1	-	-	-	-	-	-	-	-	-	-
Course Code	**191EC8O14 - Digital Image Processing (Open Elective - IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the concepts of digital image processing.	2	1	1	1	-	-	-	-	-	-	-	-	-	-
CO2	Utilize various image transforms techniques for image analysis.	3	2	2	2	-	-	-	-	-	-	-	-	-	-
CO3	Identify the image enhancement and restoration methods.	3	2	1	1	-	-	-	-	-	-	-	-	-	-
CO4	Utilize color fundamentals and different color image processing methods.	3	2	1	1	-	-	-	-	-	-	-	-	-	-
CO5	Explain different image segmentation techniques and image morphological operators for image processing.	2	2	1	1	-	-	-	-	-	-	-	-	-	-

	CO Statements	POs												PSOs	
Course Code	**191CS8O13 - Cyber Security (Open Elective - IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Illustrate cyber crime fundamentals.	2	1	-	-	2	-	-	-	-	-	-	-	-	-
CO2	Distinguish type of tools and methods used in cyber crimes.	3	2	2	-	2	-	-	-	-	-	-	-	-	-
CO3	Interpret the nature and effect of cyber crime in society and forensics fundamentals.	2	1	1	-	2	-	-	-	-	-	-	-	-	-
CO4	Utilize the history of Cyber Crimesand Liturgical Procedures to analyze the real time current scenarios.	3	2	2	-	2	-	-	-	-	-	-	-	-	-
CO5	Explain the importance of cyber security.	2	1	-	-	2	-	-	-	-	-	-	-	-	-
Course Code	**191CS8O14 - Data Science (Open Elective - IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Describe Data Science and the skill sets needed to be a data scientist.	-	3	1	-	1	-	-	-	-	-	-	2	-	-
CO2	Apply basic tools for visualizing Data& optimization.	-	2	1	-	3	-	-	-	-	-	-	2	-	-
CO3	Describe the process of reading and exploring data.	-	2	3	-	2	-	-	-	-	-	-	2	-	-
CO4	Implement various machine learning algorithms for analyzing various datasets.	-	2	2	-	3	-	-	-	-	-	-	2	-	-
CO5	Analyze datasets using clustering and recommender systems	-	3	2	-	2	-	-	-	-	-	-	2	-	-
Course Code	**191IT8O12 - Game Programming (Open Elective - IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the concepts of Game design and development.	-	1	2	1	2	-	-	-	-	-	-	-	-	-
CO2	Design the processes and use mechanics for game development.	-	3	2	2	-	-	-	-	-	-	-	-	-	-
CO3	Explain the Core architectures of Game Programming.	-	1	3	1	2	-	-	-	-	-	-	-	-	-
CO4	Make use of Game programming platforms, frame works and engines to develop a game.	-	2	3	-	2	-	-	-	-	-	-	-	-	-
CO5	Create interactive Games.	-	3	2	-	2	-	-	-	-	-	-	-	-	-
Course Code	**191IT8O11 - Cloud Computing (Open Elective - IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Interpret the key dimensions of the challenge of Cloud Computing	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Identify the economics, financial, and technological implications for selecting cloud computing for own organization	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Demonstrate the basic concepts of virtualization and implementation levels of Virtualization	2	-	1	-	-	-	-	-	-	-	-	1	-	-
CO4	Classify various storage systems and models in cloud computing environment.	2	-	1	-	-	-	-	-	-	-	-	2	-	-
CO5	Analyze the Cloud Security risks and Mechanisms.	2	-	1	-	-	-	-	-	-	-	-	-	-	-
CO6	Utilize cloud environment platform and tools for actively initiating, installing, and developing cloud-based applications	2	-	1	-	1	-	-	-	-	-	-	1	-	-
Course Code	**191CS8O16 - AR / VR (Open Elective - IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain VR, its environments and hardware technologies for 3D interfaces.	3	1	1	-	-	-	-	-	-	-	-	-	-	-

	CO Statements	POs												PSOs	
CO2	Summarize 3D user interface input hardware in VR environment.	3	2	1	-	-	-	-	-	-	-	-	-	-	-
CO3	Make use of software technologies to build VR applications.	2	1	2	-	3	-	-	-	-	-	-	-	-	-
CO4	Develop 3D user interfaces using 3D interaction techniques.	2	1	3	-	2	-	-	-	-	-	-	-	-	-
CO5	Describe the fundamental concepts of AR	2	3	1	-	-	-	-	-	-	-	-	-		-
Course Code	**191IT8O09 - Deep learning (Open Elective - IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Demonstrate the mathematical foundation of neural network	3	2	-	2	-	-	-	-	-	-	-	-	-	-
CO2	Explain various machine learning algorithms and their importance for data analysis.	3	2	-	2	-	-	-	-	-	-	-	-	-	-
CO3	Illustrate the challenges and optimization strategies of deep neural network.	2	2	-	3	-	-	-	-	-	-	-	-	-	-
CO4	Build a convolutional neural network using different activation functions.	2	3	-	2	-	-	-	-	-	-	-	-	-	-
CO5	Build and train RNN and LSTMs using sequence modelling.	2	3	-	2	-	-	-	-	-	-	-	-	-	-
Course Code	**191IT8O10 - Block Chain Technologies (Open Elective - IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Demonstrate the foundation of the Blockchain technology and understand the processes in payment and funding.	2	2	1	-	-	-	-	-	-	-	-	2	-	-
CO2	Identify the risks involved in building Blockchain applications.	2	3	1	-	-	-	-	-	-	-	-	2	-	-
CO3	Review of legal implications using smart contracts.	2	2	1	-	-	-	-	-	-	-	-	2	-	-
CO4	Analyze the present landscape of Blockchain implementations to understand Crypto currency markets.	2	2	1	-	-	-	-	-	-	-	-	2	-	-
CO5	Examine how to profit from trading crypto currencies.	2	2	1	-	-	-	-	-	-	-	-	2	-	-
Course Code	**191PT8O07 - Chemical Process Safety (Open Elective - IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the Process Safety, Accidents and Loss statistics, Toxicological Studies	2	-	-	-	-	1	-	-	-	-	-	1	-	2
CO2	Explain the fire and explosion and its prevention	2	-	-	-	-	1	-	-	-	-	-	1	-	2
CO3	Explain the Source model and dispersion, Relief sizing	2	-	-	-	-	1	-	-	-	-	-	1	-	2
CO4	Illustrate Hazard Identification, HAZOP analysis, Risk Assessment	2	-	-	-	-	1	-	-	-	-	-	1	-	2
CO5	Explain the Process of Accident Investigation, Reliability Engineering, Economics of loss prevention	2	-	-	-	-	1	-	-	-	-	-	1	-	2
Course Code	**191PT8O08 - Mechanical Unit Operations (Open Elective - IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the fundamentals of Mechanical unit operations	2	-	-	-	-	-	-	-	-	-	-	-	-	2
CO2	Explain storage of bulk solids and flow measurements.	2	-	-	-	-	-	-	-	-	-	-	-	-	2
CO3	Explain the Flow past immersed solid objects and motion of particles through fluids, beds of solids	2	-	-	-	-	-	-	-	-	-	-	-	-	2

	CO Statements	POs												PSOs	
CO4	Apply Filtration, flow through packed and fluidized beds, cross flow filtration	2	-	-	-	-	-	-	-	-	-	-	-	-	2
CO5	Explain the Gravity sedimentation, centrifugal separations, floatation	2	-	-	-	-	-	-	-	-	-	-	-	-	2
Course Code	**191AG8O06 - Applications of RS and GIS in Land and Water Resources Management (Open Elective - IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Apply the knowledge of RS and GIS in land and water resources management.	1	-	-	-	3	-	-	-	-	-	-	1	-	-
CO2	Explain DEM hydro-processing for watershed characterization.	1	-	-	-	2	-	-	-	-	-	-	-	-	-
CO3	Demonstrate the digital image processing techniques using ERDAS/ARC GIS software.	1	1	-	-	2	-	-	-	-	-	-	-	-	-
CO4	Apply the Geospatial techniques in irrigation water management.	1	-	1	-	3	-	-	-	-	-	-	1	-	-
CO5	Apply RS & GIS inputs for site suitability for various water related projects.	1	1	3	-	1	-	-	-	-	-	-	-	-	-
Course Code	**191AG8O07 - Plastic Applications in Agriculture (Open Elective - IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Assess the types and quality of plastics used in soil and water conservation	2	1	-	-	-	-	3	-	-	-	2	-	-	-
CO2	Design, estimation and laying of plastic films in lining of canal, reservoir and water harvesting ponds	3	1	2	2	-	-	-	-	-	-	-	-	-	-
CO3	Design, estimation and installation of green, poly and shade net houses, low tunnels etc.	3	1	2	2	-	-	-	-	-	-	-	-	-	-
CO4	Explain plastics application in drying, preservation, handling and storage of agricultural produce.	3	1	-	2	-	2	-	-	-	-	-	-	-	-
CO5	Outline plastic usage due to hands on experience through visit to a greenhouse and farmer's field.	3	1	-	2	-	2	-	-	-	-	-	-	-	-
Course Code	**191PT8P04 - Project Part 2**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Demonstrate technical skills of data collection and data analysis adhering to professional ethics	1	1	-	-	-	-	-	2	-	-	-	1	-	-
CO2	Design the solutions for the critical problem areas marked in data analysis in the light of environmental and societal adherence	-	-	3	2	-	1	1	-	-	-	-	-	-	-
CO3	Build a team of people to work together and communicate well in the critical stages of project progress.	-	-	-	-	-	-	-	-	1	2	1	1	-	-
CO4	Use modern tools to derive conclusions of the project work effectively	-	-	-	-	3	-	-	-	-	2	1	1	-	-
CO5	Demonstrate the results of the project work as a functional product prototype/ application/ analytical solution for a specified operation	-	-	-	-	1	-	-	-	-	1	1	1	-	-