ADITYA ENGINEERING COLLEGE

An Autonomous Institutuion

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Department of Mining Engineering

B.Tech - AR19 - Course Articulation Matrix

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

	CO Statements	POs												PSOs		
I SEM																
Course Code	**191HS1T01 - Communicative English**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Identify the ways to overcome fear and use of words paradoxically, interpret the developing conditions and the core competences of the state to prioritize education system.	-	-	-	-	-	-	1	-	-	3	-	-	-	-	-
CO2	Explain about world's most precious natural resources.	-	-	-	-	-	-	1	-	-	3	-	-	-	-	-
CO3	Explain about importance of unity to aboilish war.	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-
CO4	Respond well to the changing situations in life with independent knowledge for better decision making.	-	-	-	-	-	-	-	-	2	3	-	2	-	-	-
CO5	Demonstrate writing and concepts of effective writing skills.	-	-	-	-	-	-	-	-	1	3	-	-	-	-	-
Course Code	**191BS1T01 - Differential Equations and Linear Algebra**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Apply the concepts of Mean Value theorem, Partial Differentiation and identify the maxima and minima of a given function.	3	2	-	-	-	-	-	-	-	-	-	-	3	-	-
CO2	Solve the linear differential equations and model various situations involving differential equations of first order.	3	2	-	-	-	-	-	-	-	-	-	-	3	-	-
CO3	Solve linear differential equations of higher order and model various situations involving second order differential equations.	3	2	-	-	-	-	-	-	-	-	-	-	3	-	-
CO4	Calculate Rank of a matrix and solve the system of Linear equations and find the Eigen values and Eigen vectors.	3	2	-	-	-	-	-	-	-	-	-	-	3	-	-
CO5	Compute various powers of a matrix and identify the nature of the quadratic form.	3	2	-	-	-	-	-	-	-	-	-	-	3	-	-
Course Code	**191BS1T02 - Engineering Physics**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain the basic concepts of crystal structure and X-ray diffraction Techniques.	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Apply the knowledge of acoustics to improve acoustic quality of concert halls and understand the concepts of flaw detection techniques using ultrasonics.	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-

	CO Statements	POs												PSOs		
CO3	Apply the structure- property relationship exhibited by solid materials within the elastic limit.	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Explain the basic concepts of LASERs along with its Engineering applications and engineering applicationsfamiliarize with types of sensors for various	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Explain about magnetic and dielectric properties of different materials.	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191ES1T01 - Programming for Problem Solving Using C**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Illustrate the fundamental concepts of computers and basics of computer programming	**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**	**PSO3**
CO1	Make use of the concepts to communicate confidently and competently in English Language in all spheres.	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**3**	**-**	**1**	**-**	**-**	**-**
CO2	Express Creative skills to construct Dialogues / Conversations in Spoken and Written forms.	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**3**	**-**	**2**	**-**	**-**	**-**
CO3	Identify Accent for intelligibility.	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**3**	**-**	**2**	**-**	**-**	**-**
CO4	Demonstrate communicative ability in everyday Conversation, JAM Sessions and Public Speaking.	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**3**	**-**	**1**	**-**	**-**	**-**
CO5	Demonstrate nuances of Language through Audio – Visual Experience and group activities.	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**3**	**-**	**1**	**-**	**-**	**-**
Course Code	**191BS1L01 - Engineering Physics Lab**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Determine the rigidity and young's modulus to understand material properties.	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**1**	**-**	**-**	**-**
CO2	Determine Acceleration due to Gravity 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 wavelength of unknown source, particle size using lasers.	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**1**	**-**	**-**	**-**
CO5	Determination of velocity of sound, moment of inertia.	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**1**	**-**	**-**	**-**
Course Code	**191ES1L01 - Programming for Problem Solving Using C Lab**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Develop the basic programs in C and draw the flowcharts using Raptor.	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
CO2	Make use of conditional and iterative statements to solve real time scenarios in C.	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**

	CO Statements	POs												PSOs		
CO3	Apply the concept of arrays, modularity and strings to handle complex problems.	**3**	-	-	-	-	-	-	-	-	-	-	**1**	-	-	-
CO4	Apply the dynamic memory allocation functions using pointers.	**2**	-	-	-	-	-	-	-	-	-	-	**1**	-	-	-
CO5	Develop programs using structures, and Files.	**3**	-	-	-	-	-	-	-	-	-	-	**1**	-	-	-
Course Code	**191ES1L02 - Basic Engineering Workshop**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Prepare carpentry joints using carpentry tools	**1**	-	-	-	-	-	-	-	**1**	-	-	**1**	-	-	-
CO2	Develop various fitting joints using fitting tools.	**1**	-	-	-	-	-	-	-	**1**	-	-	**1**	-	-	-
CO3	Develop component drawings for making the sheet metal models.	**1**	-	-	-	-	-	-	-	**1**	-	-	**1**	-	-	-
CO4	Prepare sheet metal models using drawings and tin smithy tools	**1**	-	-	-	-	-	-	-	**1**	-	-	**1**	-	-	-
CO5	Experiment with the various house wiring connections.	**1**	-	-	-	-	-	-	-	**1**	-	-	**1**	-	-	-
Course Code	**191MC1A01 - Environmental Science**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Outline the natural resources and their importance for the sustenance of the life	-	-	-	-	-	**1**	**2**	-	-	-	-	-	-	-	-
CO2	Explain about the biodiversity of India, threats and its conservation methods	-	-	-	-	-	**1**	**2**	-	-	-	-	-	-	-	-
CO3	Illustrate various attributes of the pollution, impacts and measures to control the pollution along with waste management practices	-	-	-	-	-	**1**	**2**	-	-	-	-	-	-	-	-
CO4	Describe social issues of both rural and urban environment to combat the challenges and the legislations of India in environmental protection	-	-	-	-	-	**1**	**2**	-	-	-	-	-	-	-	-
CO5	Explain the population growth and its implications	-	-	-	-	-	**1**	**2**	-	-	-	-	-	-	-	-
Course Code	**191MC1A02 - Constitution of India**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain historical background of the constitution making and its importance for building a democratic India.	-	-	-	-	-	**1**	-	-	-	-	-	-	-	-	-
CO2	Compare the functioning of three wings of the government ie., executive,legislative and judiciary.	-	-	-	-	-	**1**	-	-	-	-	-	-	-	-	-
CO3	Interpret the value of the fundamental rights and duties for becoming good citizen of India.	-	-	-	-	-	**1**	-	-	-	-	-	-	-	-	-
CO4	Compare the decentralization of power between central, state and local self-government.	-	-	-	-	-	**1**	-	-	-	-	-	-	-	-	-
CO5	Extend the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.	-	-	-	-	-	**1**	-	-	-	-	-	-	-	-	-
II SEM																
Course Code	**191BS2T05 - Partial Differential Equations and Vector Calculus**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Solve improper integrals using beta and gamma functions.	**3**	**2**	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Solve partial differential equations of first order.	**3**	**2**	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Compute thedoubleintegralover a regionandtriple integralover a volume.	**3**	**2**	-	-	-	-	-	-	-	-	-	-	-	-	-

	CO Statements	POs												PSOs		
CO4	Calculate the gradient of a scalar function, divergence and curl of a vector function.	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Apply line, surface and volume integrals.	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191BS2T06 - Chemistry of Materials**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Compare the quality of drinking water and problems associated with hardwater.	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Explain the fundamentals and applications of Electrochemical energy systems.	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Explain fundamentals and applications of polymers and building materials.	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Explain the fundamentals and controlling methods of corrosion.	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Explain the properties and applications of nano materials, conductors, Semiconductors and Super conductors.	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191ES2T02 - Engineering Graphics and Design**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Make use of fundamentals of Engineering Drawing to sketch basic curves, conic sections, cycloid, epicycloid, hypocycloid and involute.	**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**	**PSO3**
CO1	Construct simple electrical circuits using basic laws.	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Explain the constructional features of DC Machines and working.	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Examine the performance of single phase transformer.	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Illustrate the principle of AC rotating machines.	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Analyze the device structure, operation and application of diode and BJT.	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191ES2T04 - Engineering Mechanics**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Determine the resultant force and moment for a given force system.	**3**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Solve the member forces in trusses.	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Apply concept of Virtual work to find the work done by force and couple.	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Solve the centre of gravity and moment of inertia for various geometric shapes.	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

	CO Statements	POs												PSOs		
CO5	Determine the displacement, velocity and acceleration relations in dynamic systems.	**3**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO6	Apply the concepts of kinematics, kinetics, work - energy and impulse - momentum methods to particle motion.	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191HS2L02 - Communicative English Lab–II**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Make effective use of Body language in all situations and contexts to enhance effective communication in all aspects.	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**2**	**-**	**-**	**-**
CO2	Identify communicative competency to respond to others in different situations.	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**2**	**-**	**-**	**-**
CO3	Make use of effective delivery strategies to select, compile and synthesize information for oral presentation.	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**2**	**-**	**-**	**-**
CO4	Demonstratein mock interviews, group discussion and public speaking.	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**2**	**-**	**-**	**-**
	Illustrate interpersonal skills using English language confidently and effectively for personal and professional growth.	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**2**	**-**	**-**	**-**
Course Code	**191BS2L04 - Engineering Chemistry Lab**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Demonstrate Acid –Complexometric titrations by volumetric analysis.	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**1**	**-**	**-**	**-**
CO2	Demonstrate Acid – Base titrations by instrumental analysis.	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**1**	**-**	**-**	**-**
CO3	Estimate Vitamin C using volumetric analysis	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**1**	**-**	**-**	**-**
CO4	Prepare polymer like Bakelite.	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**1**	**-**	**-**	**-**
CO5	Prepare alternative fuel like Bio-Diesel.	**2**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**1**	**1**	**-**	**1**	**-**	**-**	**-**
Course Code	**191ES2L03 - Essential Electrical and Electronics Engineering Lab**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Analyze the electrical networks using network theorems.	**3**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Analyze the performance of AC and DC Machines.	**3**	**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	**191ES2L12 - Mining Engineering Workshop**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Demonstrate pattern making process, mold making process by using greensand and casting process.	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**
CO2	Differentiate between various metal fabrication processes Such as ArcweldingGas Welding, Resistance spotwelding process and Soldering & Brazing	**3**	**1**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Analyze bending capacity of different materials.	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**1**	**-**	**-**	**-**	**-**
CO4	Estimate strengths of various materials.	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**-**	**-**	**-**
CO5	Identify the basic machine tools and power tools used in manufacturing.	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**-**	**-**	**-**

	CO Statements	POs												PSOs		
Course Code	**191PR2P01 - Engineering Exploration Project**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Analyze the surrounding environment and identify a design challenge	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
CO2	Foster team collaboration, find inspiration from the environment and learn how to identify problems	**-**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**-**	**-**	**-**	**-**
CO3	Encourage exploration to process the Design Challenge, empathize &brainstorm the users effectively	**-**	**-**	**1**	**1**		**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Build effective prototypes as tangible models to use as communication tools	**-**	**-**	**-**	**1**		**-**	**-**	**-**	**1**	**1**	**-**	**-**	**-**	**-**	**-**
CO5	Test the prototype for design challenge and submit the report adhering to professional ethics	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**1**	**-**	**1**	**1**	**-**	**-**	**-**	**-**
III SEM																
Course Code	**191BS3T15 - NUMERICAL METHODS AND INTEGRAL TRANSFORMS**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Apply numerical methods to solve equations and interpolation of polynomials.	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Apply numerical methods to solve initial value problems and problems involving integration.	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Compute Fourier series of a function	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Compute the Fourier transform of a function.	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Apply Laplace transform to solve initial value problems.	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191ES3T10 - INTERNET OF THINGS**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Identify the application areas of IoT.	**1**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Illustrate revolution of Internet in Mobile Devices, Cloud & Sensor Networks.	**2**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Identify 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	**191ES3T14 - BASIC MECHANICAL ENGINEERING**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Apply different laws of thermodynamics.	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Analyze various engine system along with the function and working.	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Explain the concepts of Fluid statics, kinematics and dynamics.	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Explain the concepts of Fluid kinematics and dynamics.	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Explain the concept of Boundary layer theory	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191MI3T01 - MINING GEOLOGY**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain the general facts of the earth.	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO2	Classify the different minerals and their properties.	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO3	Compare and classify the different rocks.	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO4	Explain and classify the different structural discontinuities.	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**

	CO Statements	POs												PSOs		
CO5	Explain the occurrence of groundwater and water bearing rocks.	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
Course Code	**191MI3T02 - MINE SURVEYING-I**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Analyze different types of surveying methods.	**3**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO2	Determine levels and Contours.	**3**	**-**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO3	Apply modern instruments of surveying.	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO4	Evaluate the geodetic surveying GIS & GPS.	**3**	**-**	**-**	**-**	**-**	**-**		**-**	**2**	**-**	**-**	**-**	**3**	**-**	**-**
CO5	Estimate volumes of borrow pits and areas of fields	**3**		**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
Course Code	**191MI3T03 - DEVELOPMENT OF MINERAL DEPOSITS**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Summarize different stages in the life of a mine.	**1**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO2	Choose a suitable location for opening to a deposit.	**1**	**-**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO3	Explain Exploratory and Production Drilling.	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**3**	**-**	**-**
CO4	Categorize the use of explosives and blasting.	**2**	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO5	Summarize material handling and transportation in mining	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
Course Code	**191MI3L01 - GEOLOGY LAB**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Study and identify different minerals.	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**1**	**3**	**-**	**-**
CO2	Study and identify different rocks.	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**1**	**3**	**-**	**-**
CO3	Construct strike and dip of outcrops.	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**1**	**3**	**-**	**-**
CO4	Prepare the geological map.	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**1**	**3**	**-**	**-**
CO5	Study and identify the rocks and structures in the field.	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**1**	**3**	**-**	**-**
CO6	Construct crystal models.	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**1**	**3**	**-**	**-**
Course Code	**191MI3L02 - BASIC MECHANICAL ENGINEERING LAB**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Calculate the coefficient of discharge for venturimeter of pipes and orificemeter.	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**1**	**-**	**-**	**-**
CO2	Estimate the head losses in pipe flow.	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**1**	**-**	**-**	**-**
CO3	Analyse the performance characteristics of impulse of reaction turbines.	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**1**	**-**	**-**	**-**
CO4	Determine the coefficient of discharge slip and efficiency of Reciprocating Pump.	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**1**	**-**	**-**	**-**
CO5	Analyse the performance of characteristics of reciprocating and centrifugal pumps.	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**1**	**-**	**-**	**-**
Course Code	**191MC3A03 - EMPLOYABILITY SKILLS – I**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Solve problems of Series & Analogy for Numbers and Letters	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
CO2	Solve problems on Coding & Decoding and Divisibility rules	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
CO3	Solve problems on LCM & HCF and Simple Equations	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
CO4	Demonstrate Attitude, self-confidence and decision making in different situations	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**1**	**-**	**-**	**-**
CO5	Develop out of box and lateral thinking, better goal setting and time management	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**1**	**-**	**-**	**-**

	CO Statements	POs												PSOs		
Course Code	**191MC3A04 - ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Identify the concept of Traditional knowledge and its importance.	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-
CO2	Explain the need and importance of protecting traditional knowledge.	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-
CO3	Explain 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**	**PSO3**
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	-	-	-	-	-	-	-	-	-	-	-	-	-
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	**191MI4T04 - MINE SURVEYING-II**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain different correlation survey methods.	3	-	-	-	-	-	-	-	-	-	-	-	3	-	-
CO2	Use suitable type of curve setting method in mines	3	-	-	-	-	-	-	-	-	-	-	-	3	-	-
CO3	Solve the various problems on mine surveying.	3	-	-	-	-	-	-	-	-	-	-	-	3	-	-
CO4	Solve the problem of related mine surveying.	-	3	1	-	-	-	-	-	-	-	-	-	3	-	-
CO5	Apply special modern surveying in mining industries.	3	-	-	-	-	-	-	-	-	-	-	-	3	-	-
Course Code	**191MI4T05 - SURFACE MINING**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Analyze different surface mining methods.	3	1	-	2	-	-	-	-	-	-	-	-	3	-	-
CO2	Design the layout and open of a large open cast mine.	3	1	1	-	-	-	-	-	-	-	-	-	3	-	-
CO3	Design drilling and blasting for Surface mining.	3	1	1	-	-	-	-	-	-	-	-	-	3	-	-
CO4	Choose the better excavation and loading method.	3	1	-	-	-	-	-	-	-	-	-	-	3	-	-
CO5	Organize the transportation system.	3	2	-	-	-	-	-		-	-	-	-	3	-	-
Course Code	**191MI4T06 - UNDERGROUND COAL MINING TECHNOLOGY**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Illustrate the fundamentals of underground coal mining.	3	-	-	-	-	-	-	-	-	2	-	-	-	3	-
CO2	Explain the various mine development methods.	2	-	3	-	-	-	-	-	-	-	-	-	-	3	-

	CO Statements	POs												PSOs		
CO3	Explain the long wall mining method.	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO4	Analyze the various thick and deep seam mining methods.	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO5	Categorize the various modern mining methods.	**2**	**-**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
Course Code	**191MI4T07 - FUNDAMENTALS OF ROCK MECHANICS**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Estimate stress and strain in various mining applications.	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO2	Evaluate the properties of rocks.	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO3	Use various measuring devices to measure the load.	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO4	Analyze the failure criteria in mines.	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO5	Analyze stress concentration around mine openings.	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
Course Code	**191MI4T08 - GEO-STATISTICS**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Describe importance of statistics and probability distribution function.	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**	**-**	**3**	**-**
CO2	Explain theories of probability	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO3	Explain the methods of sampling.	**-**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO4	Estimate the tonnage of ore reserve.	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO5	Assess statistical approach to reserve estimation..	**-**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
Course Code	**191MI4L03 - ROCK MECHANICS LAB**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Prepare rock samples for testing.	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**1**	**3**	**-**	**-**
CO2	Evaluate rock properties.	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**1**	**3**	**-**	**-**
CO3	Estimate weathering effects on rock	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**1**	**3**	**-**	**-**
CO4	Examine various mechanical properties of rock.	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**1**	**3**	**-**	**-**
CO5	Choose appropriate support system.	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**1**	**3**	**-**	**-**
Course Code	**191ES4L18 - MINE SURVEYING LAB**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Determine the area by triangulation survey using theodolite.	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**1**	**3**	**-**	**-**
CO2	Measure horizontal angles by method of repetition and reiteration using the Theodolite.	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**1**	**3**	**-**	**-**
CO3	Determine the area using total station.	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**1**	**3**	**-**	**-**
CO4	Determination of remote height using total station.	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**1**	**3**	**-**	**-**
CO5	Find distance, gradient, difference, height between two inaccessible points using total stations.	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**1**	**3**	**-**	**-**
Course Code	**191MC4A05 - EMPLOYABILITY SKILLS – II**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Examine the symbols, notations and Venn -diagrams.	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
CO2	Solve different types of number systems problems.	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
CO3	Solve ratio & proportion, ages and averages by using simple logic.	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
CO4	Apply negotiation skills and leadership skills in a team	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**1**	**-**	**-**	**-**
CO5	Apply listening skills and verbal skills of communication in a team	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**1**	**-**	**-**	**-**
Course Code	**191MC4A06 - BIOLOGY FOR ENGINEERS**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Apply biological engineering principles, procedures needed to solve real-world problems**.**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

	CO Statements	POs												PSOs		
CO2	Demonstrate the fundamentals of living things, their classification, cell structure and biochemical constituents**.**	**1**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Apply the concept of plant, animal and microbial systems and growth in real life Situations.	**1**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	Explain genetics and the immune system to know the cause, symptoms, diagnosis and treatment of common diseases.	**1**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	Demonstrate basic knowledge of the applications of biological systems in relevant industries.	**1**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
V SEM																
Course Code	**191MI5T09 - MINE SYSTEMS ENGINEERING**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Apply mathematical modelling to formulate real-world problems involving decision making.	**1**	**1**	-	-	-	-	-	-	-	-	-	**1**	**2**	-	-
CO2	Solve Linear programming problem, transportation and assignment problems.	**1**	**1**	-	-	-	-	-	-	-	-	-	**1**	**2**	-	-
CO3	Solve sequencing problem, replacement problem and inventory problem.	**1**	**1**	-	-	-	-	-	-	-	-	-	**1**	**2**	-	-
CO4	Apply game theory problems, queuing theory in decision making	**1**	**1**	-	-	-	-	-	-	-	-	-	**1**	**2**	-	-
CO5	Apply dynamic programming &simulation techniques in real-world problems.	**1**	**1**	-	-	-	-	-	-	-	-	-	**1**	**2**	-	-
Course Code	**191MI5T10 - UNDERGROUND METAL MINING TECHNOLOGY**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Illustrate the fundamentals of metal mining.	**3**	-	-	-	-	-	-	-	-	-	-	-	-	**3**	-
CO2	Analyze the various mine development methods.	**3**	**2**	-	-	-	-	-	-	-	-	-	-	-	**3**	-
CO3	Analyze the basics of stoping.	**3**	**2**	-	-	-	-	-	-	-	-	-	-	-	**3**	-
CO4	Compare the various stoping methods.	**3**	**2**	-	-	-	-	-	-	-	-	-	-	-	**3**	-
CO5	Categorize the various special stoping methods.	**3**	**2**	-	-	-	-	-	-	-	-	-	-	-	**3**	-
Course Code	**191MI5T11 - MINE ENVIRONMENT & VENTILATION ENGINEERING**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Outline various gases-origins, occurrence, physiological effects.	**3**	**2**	-	-	-	-	-	-	-	-	-	-	**3**	-	-
CO2	Identify mine climatic conditions by using various devices	**3**	**2**	-	-	-	-	-	-	-	-	-	-	**3**	-	-
CO3	Analyze the necessity of mine ventilation systems.	**3**	**2**	-	-	-	-	-	-	-	-	-	-	**3**	-	-
CO4	Analyze the operation of mine fans and related laws.	**3**	**2**	-	-	-	-	-	-	-	-	-	-	**3**	-	-
CO5	Assess the ventilation planning, design and ventilation survey.	**3**	**2**	**1**	-	-	-	-	-	-	-	-	-	**3**	-	-
Course Code	**191MI5T12 - MINE MACHINERY**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Outline different types of machinery used in mines.	**1**	-	**3**	-	-	-	-	-	-	-	-	-	-	**3**	-
CO2	Compare types of rope haulages and its safety appliances.	**1**	**1**	**3**	**2**	-	-	-	-	-	-	-	-	-	**3**	-
CO3	Predict optimist conveyor system in mines.	**1**	**1**	**3**	-	-	-	-	-	-	-	-	-	-	**3**	-
CO4	Design winding system and its safety.	**1**	**1**	**3**	-	-	-	-	-	-	-	-	-	-	**3**	-

	CO Statements	POs												PSOs		
CO5	Design drainage and pumping system in surface and underground mines.	**1**	**1**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
Course Code	**191MI5E02 - ENVIRONMENTAL IMPACT ASSESSMENT (PROFESSIONAL ELECTIVE - I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Analyze different stages in the EIA.	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**
CO2	Analyze the participation of public and NGO'S in environmental decision making.	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**
CO3	Analyze the special methods and components of EIA.	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**
CO4	Generate the awareness of assessment of impacts air, water, soil, noise biological, socio & cultural environments.	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**3**
CO5	Analyze the Case studies related to the Mining sectors.	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**
Course Code	**191MI5E03 - PLANNING OF UNDERGROUND COAL MINING PROJECT (PROFESSIONAL ELECTIVE - I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Analyze different stages in the life of a mine.	**-**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**3**	**-**	**-**
CO2	Distinguish the method of mining on the basis of planning of exploitation.	**-**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**3**	**-**	**-**
CO3	Illustrate the planning and automation of deep underground coal mines.	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO4	Discuss the planning and designing layouts of ventilation.	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO5	Evaluate Coal Mining Project.	**-**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
Course Code	**191MI5E04 - SUSTAINABLE MINING (PROFESSIONAL ELECTIVE - I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain Environmental impacts of mining and associated activities and ecosystem structures.	**1**	**3**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**
CO2	Explain sources and measures of air, noise pollution and vibration.	**1**	**3**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**3**
CO3	Explain sources and control measures of water pollution.	**1**	**3**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**3**
CO4	Explain the land degradation due to mining activities.	**1**	**3**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**3**
CO5	Explain the concepts of CSR and mine closure.	**1**	**3**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**3**
Course Code	**191MI5E01 - DRILLING & BLASTING (PROFESSIONAL ELECTIVE - I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Differentiate between Exploratory and Production Drilling	**1**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO2	Use blasting accessories along with monitoring and assessment.	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO3	Analyse problems associated with open cast blasting and mitigation.	**1**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO4	Analyse problems associated with underground blasting and mitigation.	**1**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO5	Assess blasting in underground metal mines.	**1**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**

	CO Statements	POs												PSOs		
Course Code	**191CE5O01- BASIC CONCRETE TECHNOLOGY (OPEN ELECTIVE - I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain the basic concepts of concrete and admixtures	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
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**	**PSO3**
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**	**PSO3**
CO1	Identify various types of dielectric materials, their properties in various conditions.	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Analyze magnetic materials and their behaviour.	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Evaluate semiconductor materials and technologies.	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
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**	**PSO3**
CO1	Analyze the behaviour of different types of torques in instruments.	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Select the right type of instrument for measurement of voltage, current, power &energy.	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Develop the suitable bridge for the measurement of electrical parameters.	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Analyze the behaviour of different types of Transducers and Sensors.	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Explain frequency and phase difference between signals using CRO.	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191ME5O01 RENEWABLE ENERGY SOURCES (OPEN ELECTIVE - I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Analyze solar radiation data, extraterrestrial radiation, and radiation on earth’s surface.	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

	CO Statements	POs												PSOs		
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**	**PSO3**
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**	**PSO3**
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**	**PSO3**
CO1	Summarize the basics of Additive manufacturing (AM) technologies.	**1**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
CO2	Explain about vat photo polymerization, material jetting and binder jetting AM technologies.	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
CO3	Explain material extrusion and sheet lamination AM technologies.	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
CO4	Illustrate Powder Bed Fusion and Directed Energy Deposition AM technologies.	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
CO5	Apply the AM techniques in different industries	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
CO6	Select AM technologies using decision methods	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**

	CO Statements	POs												PSOs		
Course Code	**191ME5O05 ENTREPRENEURSHIP DEVELOPMENT AND INCUBATION (OPEN ELECTIVE - I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Describe the meaning and concepts of entrepreneurship development	-	-	-	-	-	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	-	-	-	-	-	3	3	-	-	3	2	-	-	-	-
CO4	Explain about the Opportunities of Entrepreneurship Internationally.	-	-	-	-	-	3	3	-	-	3	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**	**PSO3**
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**	**PSO3**
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**	**PSO3**
CO1	Interpret the characteristics of semiconductor diodes.	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Apply the knowledge of semiconductors in the functioning of BJT.	2	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Demonstrate the switching and amplification application of FET.	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	Classify the semiconductor devices for special Applications.	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	Identify the sensor types used in various applications and explain their principle of operation.	2	2	1	1	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191CS5O01 DATA STRUCTURES (OPEN ELECTIVE - I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Illustrate time and space complexities of an algorithm	2	3	2	1	-	-	-	-	-	-	-	-	-	-	-
CO2	Apply various searching and sorting techniques to solve computing problems.	3	2	2	1	-	-	-	-	-	-	-	-	-	-	-
CO3	Make use of linear data structures to solve real time problems.	3	1	2	-	-	-	-	-	-	-	-	-	-	-	-

	CO Statements	POs												PSOs		
CO4	Develop applications using Tree Data Structures.	**2**	**1**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Solve problems using Graph Algorithms.	**1**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191CS5O02 OBJECT ORIENTED PROGRAMMING THROUGH C++ (OPEN ELECTIVE - I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
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.	**-**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191CS5O03 JAVA PROGRAMMING (OPEN ELECTIVE - I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Apply object oriented programming features and concepts for solving given problem.	**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**	**PSO3**
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**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191IT5O01 DATA BASE MANAGEMENT SYSTEMS (OPEN ELECTIVE - I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Identify the database characteristics and various database architectures.	**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**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

	CO Statements	POs												PSOs		
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**	**PSO3**
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**	**PSO3**
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**	**PSO3**
CO1	Explain the basic principles and mechanisms that are responsible for process intensification.	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO2	Analyze various modifications to process equipment and designs with which process intensification becomes a reality in unit operations and unit processes.	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO3	Analyze various case studies available in petrochemical, fine chemical, bioprocesses for Downhole separation	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO4	Explain the role of photo voltaic cells, solar power in offshore oil and gas operations.	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO5	Apply the working principles of Divided wall distillation for separation of natural gas -liquid	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
Course Code	**191PT5O02 FUNDAMENTALS OF PETROLEUM INDUSTRY (OPEN ELECTIVE - I)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Apply the basic principles and mechanisms that are responsible for petroleum industry.	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

	CO Statements	POs												PSOs		
CO2	Analyze various modifications to equipment and designs with which evaluate the lithological characteristics and behavior of reservoir.	**2**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Explain the hydro carbon activity in reservoir, logging, testing and completion.	**2**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	Analyze various case studies available in petrochemical, chemical, bioprocesses for treatment of wastage.	**2**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	Analyze various modifications to well for better production rate.	**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**	**PSO3**
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	**191MI5L04 MINE ENVIROMENT AND VENTILATION ENGINEERING LAB**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Determine the composition of various gases by using corresponding detectors.	**3**	-	-	-	-	-	-	-	**1**	-	**1**	**1**	**3**	-	-
CO2	Analyze gases by using Gas Chromatograph and infrared gas analyzer.	**3**	-	-	-	-	-	-	-	**1**	-	**1**	**1**	**3**	-	-
CO3	Determine of Relative humidity& cooling power of mine air.	**3**	-	-	-	-	-	-	-	**1**	-	**1**	**1**	**3**	-	-
CO4	Conduct Illumination survey using Lux meter.	**3**	-	-	-	-	-	-	-	**1**	-	**1**	**1**	**3**	-	-
CO5	Determine index of flammability of coal dust.	**3**	-	-	-	-	-	-	-	**1**	-	**1**	**1**	**3**	-	-
Course Code	**191HS5T06 - EMPLOYABILITY SKILLS – III**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Calculate the clock and calendar problems by simple methods.	**1**	-	-	-	-	-	-	-	-	-	-	**1**	-	-	-
CO2	Discuss about different types of puzzles.	**1**	-	-	-	-	-	-	-	-	-	-	**1**	-	-	-
CO3	Breakdown the typical write-up skills.	**1**	-	-	-	-	-	-	-	-	-	-	**1**	-	-	-
CO4	Apply different types of models on percentages, profit and loss, simple interest and compound interest.	-	-	-	-	-	-	-	-	-	**1**	-	**1**	-	-	-
CO5	Demonstrate the tools of the soft skills.	-	-	-	-	-	-	-	-	-	**1**	-	**1**	-	-	-
Course Code	**191PR5P02 - SOCIALLY RELEVANT PROJECT**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
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**	-	-	-	-	-	-	-

	CO Statements	POs												PSOs		
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**	**PSO3**
CO1	Compare various types of Intellectual Property rights.	-	-	-	-	-	-	-	3	-	-	-	2	-	-	-
CO2	Discuss Intellectual Property and infer rights on such Intellectual owners.Property	-	-	-	-	-	-	-	3	-	-	-	2	-	-	-
CO3	Explain the process of patenting	-	-	-	-	-	-	-	3	-	-	-	2	-	-	-
CO4	Apply for trade mark, copyrights and patents.	-	-	-	-	-	-	-	3	-	-	-	2	-	-	-
CO5	Interpret the legal issues on Intellectual Property Rights and cyber laws.	-	-	-	-	-	-	-	3	-	-	-	2	-	-	-
VI SEM																
Course Code	**191MI6T13 - MINERAL PROCESSING TECHNOLOGY**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Illustrate the fundamentals of mineral processing.	2	1	-	-	-	-	-	-	-	-	-	-	-	3	-
CO2	Examine size separation of float & sink analysis of coal.	2	1	-	-	-	-	-	-	-	-	-	-	-	3	-
CO3	Analyze methods of froth flotation and settling of particles.	1	1	-	-	-	-	-	-	-	-	-	-	-	3	-
CO4	Explain Flocculation and separation methods of minerals.	1	1	-	-	-	-	-	-	-	-	-	-	-	3	-
CO5	Explain Hydro metallurgical methods of concentration.	2	1	-	-	-	-	-	-	-	-	-	-	-	3	-
Course Code	**191MI6T14 - MINE HAZARDS & RESCUE**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain the fundamentals of Mine Fires	2	3	-	-	-	-	-	-	-	-	-	-	-	3	-
CO2	Examine the various causes of Mine Explosions.	1	3	-	1	-	-	-	-	-	-	-	-	-	3	-
CO3	Analyze the reasons of Inundation	1	3	-	-	-	-	-	-	-	-	-	-	-	3	-
CO4	Summarize the dust, noise and illumination in mines.	1	3	-	-	-	-	-	-	-	-	-	-	-	3	-
CO5	Explain the rescue and recovery procedures in mining.	1	3	-	1	-	-	-	-	-	-	-	-	-	3	-
Course Code	**191MI6T15 - ENVIRONMENTAL MANAGEMENT IN MINES**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Illustrate the fundamentals of environmental issues in mining.	3	-	-	-	-	-	-	-	-	-	-	-	-	-	3
CO2	Examine the various causes of water pollution.	3	-	-	1	-	-	-	-	-	-	-	-	-	-	3
CO3	Analyze the various causes of air pollution.	3	2	-	-	-	-	-	-	-	-	-	-	-	-	3
CO4	Analyze the methods for mine reclamation.	3	-	-	-	-	-	-	-	-	-	-	-	-	-	3
CO5	Asses environmental impact due to mining.	3	-	-	1	-	-	-	-	-	-	-	-	-	-	3
Course Code	**191MI6E06 - MINE HEALTH & SAFETY ENGINEERING (Professional Elective – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain the different health hazards and its prevention in mining industries.	2	3	-	-	-	-	-	-	-	-	-	-	-	-	3

	CO Statements	POs												PSOs		
CO2	Distinguish the mine accidents occurring in surface and underground mining area.	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**
CO3	Illustrate the various approaches towards safety risk assessment.	**2**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**
CO4	Discuss the safety planning and safety management systems	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**
CO5	Analyze the innovations in mine safety engineering.	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**
Course Code	**191MI6E07 - PLANNING OF UNDERGROUND METAL MINING PROJECT (Professional Elective – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Estimate of production rate, stope sizing & global sequencing in metal mines.	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**
CO2	Plan and scheduling of activities in metal mining and processing of underground metal mines.	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**
CO3	Analyze underground metal mining equipment selection & support	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**
CO4	Estimate the grade control of ore in metal mines.	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**
CO5	Design surface layouts including mill and concentrator plants.	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**
Course Code	**191MI6E05 - GREEN MINING (Professional Elective – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain the importance of green mining.	**-**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**
CO2	Plan and scheduling of activities related to mine waste management	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**
CO3	Analyze the impact of water pollution due to mining	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**
CO4	Distinguish progressive and final mine closure planning	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**
CO5	Explain the usage of renewable energy in mines.	**-**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**
Course Code	**191MI6E08 - ROCK FRAGMENTATION ENGINEERING (Professional Elective – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain general theory of rock cutting and classification of drilling system.	**1**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**
CO2	Explain the mechanics of rotary drilling.	**1**	**1**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**
CO3	Illustrate the mechanism of rock fragmentation and fracture by explosive action.	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**
CO4	Distinguish the blasting parameters	**1**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**
CO5	Explain the impact of ground vibration and air over pressure.	**1**	**1**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**
Course Code	**191MI6E10 - ENVIRONMENTAL POLLUTION & CONTROL (Professional Elective – III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Illustrate the fundamentals of environmental issues in mining.	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**-**	**3**	**-**
CO2	Examine the various causes of water pollution.	**3**	**1**	**-**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO3	Analyze the various causes of air pollution.	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO4	Analyze the methods for mine reclamation.	**-**	**3**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO5	Asses environmental impact due to mining.	**-**	**3**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**

	CO Statements	POs												PSOs		
Course Code	**191MI6E11 - PLANNING OF SURFACE MINING PROJECT (Professional Elective – III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Prepare feasibility report.	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**	**3**	**-**	**-**
CO2	Design open pit slope angels & ultimate pit limit	**1**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO3	Select transport and dumping systems.	**1**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO4	Examine stability analysis.	**1**	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO5	Explain transition of underground to opencast mines.	**1**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
Course Code	**191MI6E09 - DEEP SEA MINING (Professional Elective – III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain about marine environment profile of sea.	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO2	Explain profile of the sea, Shelf, slope and rise, nature of the deposits.	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO3	Examine marine sediments and continental slope.	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO4	Choose methods of off shore exploration of oil and gas.	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO5	Explain deep sea bed mining.	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
Course Code	**191MI6E12 - ROCK EXCAVATION ENGINEERING (Professional Elective – III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain general theory of rock cutting and classification of drilling system.	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**	**-**	**3**	**-**
CO2	Explain the mechanics of rotary drilling.	**2**	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO3	Illustrate the mechanism of rock fragmentation and fracture by explosive action.	**2**	**3**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO4	Distinguish the blasting parameters	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**	**-**	**3**	**-**
CO5	Explain the impact of ground vibration and air over pressure.	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
Course Code	**191CE6O02 Disaster Management (Open Elective – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain the aspects of disaster management and adopt remedial measures	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Explain the disaster vulnerability profile of India	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Explain the hazard assessment and mitigation measures	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Explain landslides and earthquake disasters and management	**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**	**PSO3**
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**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

	CO Statements	POs												PSOs		
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**	**PSO3**
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**	**PSO3**
CO1	Explain various types of signals	**3**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Explain various types of Transducers principles	**2**	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Measure various parameters such as strain, velocity, temperature, pressure etc.	**2**	**1**	**1**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Explain the working principle of various types of digital Voltmeters and measure various parameter like phase and frequency of a signal with the help of CRO.	**2**	**3**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Analyze the different signals using various types of signal analyzers	**1**	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191ME6O06 Solar Energy Utilisation (Open Elective – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain the concept of solar radiation and its measurement.	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**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**	**PSO3**
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**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

	CO Statements	POs												PSOs		
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**	**PSO3**
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**	**PSO3**
CO1	Summarize the basics of AM technologies.	**1**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
CO2	Explain about vat photo polymerization, material jetting and binder jetting AM technologies.	**1**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
CO3	Explain material extrusion and sheet lamination AM technologies.	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
CO4	Illustrate powder bed fusion and directed energy deposition AM technologies.	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
CO5	Apply the AM techniques in different industries	**1**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
CO6	Select AM technologies using decision methods	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
Course Code	**191ME6O10 Robotics (Open Elective – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
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**	**PSO3**
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**	**-**	**-**	**-**

	CO Statements	POs												PSOs		
Course Code	**191ME6O12 Entrepreneurship Development and Incubation (Open Elective – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Describe the meaning and concepts of entrepreneurship development	-	-	-	-	-	1	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	-	-	-	-	-	3	3	-	-	3	2	-	-	-	-
CO4	Utilize the Opportunities of Entrepreneurship Internationally.	-	-	-	-	-	3	3	-	-	3	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**	**PSO3**
CO1	Summarize the physiological relation of the human body with the environment.	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Make use of different electrodes and transducers for biomedical applications.	2	2	2	1	-	-	-	-	-	-	-	-	-	-	-
CO3	Demonstrate the working principle of different biomedical instruments for heart and respiratory system monitoring.	2	3	2	1	-	-	-	-	-	-	-	-	-	-	-
CO4	Illustrate Intensive-Care Monitoring system for patient management.	2	2	3	-	-	-	-	-	-	-	-	-	-	-	-
CO5	Outline different diagnostic techniques for telemedicine.	2	2	3	-	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191EC6O05 ECAD Tools (Open Elective – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
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**	**PSO3**
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**	**PSO3**
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	-	-	-	-	-	-	-	-	-	-	-

	CO Statements	POs												PSOs		
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**	**PSO3**
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**	**PSO3**
CO1	Explain the cyber security and security management methods to maintain security protection.	**3**	**1**	**-**	**-**	**2**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Illustrate the nature of secure software development and operating systems.	**2**	**3**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Summarize the Network management and cloud computing security issues.	**1**	**2**	**-**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Analyze the data privacy techniques for data management.	**1**	**3**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Demonstrate the role security management plays in cyber security defense and legal and social issues at play in developing solutions.	**3**	**1**	**-**	**-**	**2**	**-**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191CS6O09 AR / VR (Open Elective – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain VR, its environments and hardware technologies for 3D interfaces.	**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**	**PSO3**
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**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

	CO Statements	POs												PSOs		
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**	**PSO3**
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**	**PSO3**
CO1	Describe the fundamentals of Robotic Process Automation Technology.	**-**	**3**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Summarize the UiPath programming techniques to deploy robot configurations.	**-**	**1**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Explore various data extraction techniques and learn about integrations with various popular applications like SAP and MS Office	**-**	**2**	**-**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Develop a programmed robot including logging and exception handling	**-**	**2**	**2**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Create and Deploy the Bots and control it with UiPath Orchestrator.	**-**	**2**	**1**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191MI6O02 Industrial Safety Practices (Open Elective – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain the different hazards and its prevention in mining industries.	**1**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
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 in Mines (Open Elective – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain about power systems used in mines.	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Analyze various earthing methods used in mines.	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Summarize various electrical equipment used in mines.	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Explain the instrumentation and control systems used in mines	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Analyze about mine telephone system and intrinsic safety.	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

	CO Statements	POs												PSOs		
Course Code	**191PT6O03 Unconventional Hydrocarbon Resources (Open Elective – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Outline the fundamentals of Coal Bed Methane	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Estimate the shale gas reserves for Indian Scenario	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Determine the extent of gas hydrates resource estimation	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Illustrate the Origin and Characterize Shale Gas.	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Explain the Heavy oil reservoirs and their Challenges	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191PT6O04 Asset Management (Open Elective – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain the Asset Management in corporate approach	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**
CO2	Estimate the running cost and value for Asset Management	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**
CO3	Determine value using Asset Management Interpretation	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**
CO4	Illustrate Asset Management Decision making framework	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**
CO5	Explain the Capital Planning System	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**
Course Code	**191AG6O02 Weather forecast in Agriculture (Open Elective – II)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain the weather elements and their impact on crop production.	**1**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
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**	**PSO3**
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	**191MI6L05 - MINE PLANNING AND DESIGN LAB**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Determine stripping ratio and pit limits.	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**1**	**3**	**-**	**-**
CO2	Design blasting in open cost and underground mines.	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**1**	**3**	**-**	**-**
CO3	Analyse the fleet size for shovel, dumper combination in open cast mine	**-**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**1**	**3**	**-**	**-**
CO4	Design bord and pillar supporting system in underground mines.	**-**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**1**	**3**	**-**	**-**
CO5	Design ventilation network in underground mines.	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**1**	**3**	**-**	**-**

	CO Statements	POs												PSOs		
Course Code	**191MI6L06 - MINERAL PROCESSING TECHNOLOGY LAB**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Illustrate the fundamentals of mineral processing technology.	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**1**	**3**	**-**	**-**
CO2	Categorize material by sieve analysis.	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**1**	**3**	**-**	**-**
CO3	Select various mineral crushers	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**1**	**3**	**-**	**-**
CO4	Choose the various mineral separators.	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**1**	**3**	**-**	**-**
CO5	Analyze the mineral processing techniques	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**1**	**3**	**-**	**-**
Course Code	**191HS6T07 - EMPLOYABILITY SKILLS– IV**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Solve problems of seating arrangements ,syllogism	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
CO2	Solve problems of Time and Work, Pipes and Cisterns, Time and Distance, Races and trains	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
CO3	Solve Problems on Boats and Streams, Permutation and Combination, Probability and Data Interpretation	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
CO4	Apply processes of Group discussion ,Phonetics, Leadership skills in real world	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**1**	**-**	**-**	**-**
CO5	Apply principles of Group Dynamics, Interview Skills & Evaluation criteria in organizations	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**1**	**-**	**-**	**-**
Course Code	**191MC6A09 - PROFESSIONAL ETHICS AND HUMAN VALUES**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Make use of values, morals and ethics in their day to day life	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Identify what is right and wrong through moral ethics.	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Analyze experimental learning while developing the society with ethos.	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**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	**191MI7T16 - Mine Legislation and General Safety**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Illustrate the general principle of mining laws and regulations	**1**	**3**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**1**	**-**	**-**	**3**	**-**	**-**
CO2	Compare the rules and regulation framed under CMR& MMR.	**1**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO3	Explain the various mining rules and Indian electricity rules	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO4	Explain the Mineral concession rules and mine act	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**3**	**-**	**-**
CO5	Explain the training rules and DGMS circular	**-**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
Course Code	**191MI7T17 - Mineral Economics**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Describe importance of strategic minerals.	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**3**	**-**	**-**
CO2	Classify grading and pricing of minerals.	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO3	Estimate total reserve of minerals.	**2**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO4	Estimate Internal Rate of Return and Net Present Value	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO5	Assess organizational and financial project management.	**2**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**

	CO Statements	POs												PSOs		
Course Code	**191MI7T18 - Strata Mechanics**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Describe importance of strata mechanics.	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**3**	**-**	**-**
CO2	Classify the risk due to roof & side falls.	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO3	Design support system in mining	**2**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO4	Explain strata behavior studies.	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO5	Assess mining subsidence.	**2**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
Course Code	**191MI7E16 - Safety Practices In Mines (Professional Elective-IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Describe about Mine Vocational Training Rules (MVTR)	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO2	Analyze safety operating procedures of mine machinery.	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO3	Analyze safe act and safe environment.	**2**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO4	Use safety appliances	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO5	Apply safety audit methods.	**2**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
Course Code	**191MI7E14 - Planning For Mine Closure & Reclamation (Professional Elective-IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Describe about strategies for mine reclamation and closure planning	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**	**3**	**-**	**-**
CO2	Analyze challenges of mine closure.	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO3	Analyze Socio- economic Aspects of Mine closure.	**2**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO4	Analyze financial provisions	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO5	Assess best practices in mine closure planning.	**2**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
Course Code	**191MI7E13 - Geo Spatial Imaging & Geo-Informatics (Professional Elective-IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Describe importance of remote sensing in mining	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO2	Explain about Geographic Information System.	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO3	Analyze Data acquisition and satellite data formats	**2**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO4	Analyze Image Fundamentals, Sensor models and spectral response	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO5	Assess Computational Analysis Methods (CAM),	**2**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
Course Code	**191MI7E15 - Rock Slope Technology (Professional Elective-IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Analyze geological investigation, data interpretation in slope stability analysis.	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO2	Evaluate Mechanisms of slope failure in mining	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO3	Design Mechanism of failure of jointed rock mass	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO4	Analyze Instrumentation and Monitoring techniques of rock slopes.	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO5	Apply Slope stabilization techniques	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
Course Code	**191MI7E18 - Industrial Safety (Professional Elective-IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Describe Safety scenario in national and international arena	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**

	CO Statements	POs												PSOs		
CO2	Analyze Ergonomics Hazards	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**
CO3	Describe Importance of Industrial safety.	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**
CO4	Analyze protective equipment and their usages	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**
CO5	Conduct Accident Prevention Techniques	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**
Course Code	**191MI7E19 - Mine Closure & Reclamation (Professional Elective-IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Describe different strategies and principle of mine reclamation.	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**
CO2	Analyze of challenges of mine planning and mine closure plan.	**1**	**2**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**
CO3	Illustrate the socio-economic aspects of mining & development of closure plan	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**
CO4	Analyze the handling of waste dumps	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**
CO5	Explain the closure risk assessment	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**
Course Code	**191MI7E20 - Space Mining Technology (Professional Elective-V)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Describe about Space mining operations.	**2**	**3**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**3**	**-**	**-**
CO2	Analyze the challenges of Moon mining	**2**	**3**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO3	Illustrate about Space Mining Excavation	**2**	**3**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO4	Analyze the Economic and legal considerations in space mining	**2**	**3**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO5	Explain the Environmental impacts of space mining	**2**	**3**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
Course Code	**191MI7E17 - Ground Control (Professional Elective-V)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Describe about concept of ground control in mines	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO2	Analyze Strata pressure and management	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO3	Illustrate types of Roof support.	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO4	Analyze the Economic and legal considerations in space mining	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO5	Explain about the Subsidence	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
Course Code	**191CE7O03 Waste Water Management (Open Elective -III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Summarize the importance of sanitation and waste water management.	**2**	**1**	**-**	**-**	**-**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Estimatethe rate of sewage flow and storm water drainage	**1**	**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**	**PSO3**
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**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

	CO Statements	POs												PSOs		
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**	**PSO3**
CO1	Distinguish between brush dc motor and brush less dc motor.	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Explain the performance and control of stepper motors and their applications.	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Describe theory of operation and control of switched reluctance motor.	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Explicate the theory of travelling magnetic field and applications of linear motors.	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Explain the significance of electrical motors for traction drives.	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191EE7O09 Industrial Electrical Systems (Open Elective -III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
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**	**PSO3**
CO1	Use advanced optimization techniques to solve real-life problems.	**3**	**3**	**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	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
CO5	Use Advance techniques to formulate and solve the optimization problems.	**2**	**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**	**PSO3**
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**	**-**	**-**	**-**

	CO Statements	POs												PSOs		
CO4	Explain the energy efficiency of components like pumps, blowers, fans, and various refrigeration equipment.	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**
CO5	Apply the concepts of energy economics like payback period, internal rate of returns life cycle costing etc.	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**
Course Code	**191ME7O15 Introduction to Material Handling Systems (Open Elective -III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain principal groups and applications of material handling equipment	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Explain the working and applications of Flexible hoisting applicances	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Explain the working of Load handling and Special Material handling equipment.	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Explain the brake systems used in Material handling equipment	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Explain the brake systems used in Material handling equipment.	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191ME7O16 Robotics (Open Elective -III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain the basic concepts, parts of robots and types of robots.	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
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**	**PSO3**
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	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**-**	**-**	**3**	**2**	**-**	**-**	**-**	**-**
CO4	Explain about the Opportunities of Entrepreneurship Internationally.	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**-**	**-**	**3**	**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**	**PSO3**
CO1	Analyze Discrete Time Signals and Systems.	**2**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Apply various DFT properties to evaluate the given sequence.	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Make use of FFT Algorithms for the computation of DFT.	**2**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Design digital filters and implement with different structures.	**2**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Apply the knowledge of Multirate signal processing in the real time applications.	**2**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

	CO Statements	POs												PSOs		
Course Code	**191EC7O07 Basics of VLSI Design (Open Elective -III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Demonstrate the fundamental concepts of basic MOS theory of fabrication process and the electrical properties of MOS and Bi-CMOS 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**	**PSO3**
CO1	Summarize the operation of micro systems, and their applications	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Classify the materials for micro system applications	**2**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Explain the state-of-the-art for lithography and packaging techniques	**3**	**2**	**1**	**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**	**PSO3**
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**	**PSO3**
CO1	Illustrate big data challenges in different domains including social media, transportation, finance, and medicine.	**2**	**3**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Use various techniques for mining data stream.	**3**	**1**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Demonstrate building blocks of Hadoop.	**2**	**1**	**3**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Apply map reduce procedure to solve big data problems.	**2**	**3**	**-**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Make use of Pig & Hive Frameworks to work with big data.	**2**	**1**	**3**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO6	Explore various visualization techniques	**3**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

	CO Statements	POs												PSOs		
Course Code	**191CS7O11 Mobile Application Development (Open Elective -III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Make use of Android Studio to develop Android application.	**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**	**PSO3**
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**	**PSO3**
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**	**PSO3**
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**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
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**	**PSO3**
CO1	Demonstrate the foundation of the Blockchain technology and understand the processes in payment and funding.	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**
CO2	Identify the risks involved in building Blockchain applications.	**2**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**

	CO Statements	POs												PSOs		
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**	**PSO3**
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**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Analyze the concepts of digital modulation techniques.	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Summarize different advanced communication networks.	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191MI7O05 Drilling & Blasting (Open Elective -III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Differentiate between explosives.	**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**	**PSO3**
CO1	Explain various branches of earth sciences and universe	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
CO2	Explain the origin of the universe and solar systems	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Explain the concepts of earth's magnetic field	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Illustrate the concepts of the plate tectonics	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
CO5	Explain the origin of the oceans, continents, mountains, and valleys	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
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**	**PSO3**
CO1	Explain the types of drilling equipment and drilling hydraulics.	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Explain about Casings, cement slurry design, directional drilling, and fishing, well control concepts.	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Explain different types of wells, well testing, surface, and subsurface equipment.	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Explain well completion equipment and different perforation techniques.	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Illustrate different Subsurface circulating equipment and different types of packers	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

	CO Statements	POs												PSOs		
Course Code	**191AG7O04 Greenhouse Technology (Open Elective -III)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Design small scale polyhouse for drying purpose.	**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**	**PSO3**
CO1	Determine the peak rate of flood by rational, empirical methods and flood frequency by log normal, Gumbel's extreme value and log-Pearson type-III distribution methods.	**2**	**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	**191MI7P03 - Internship**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Conduct a technical survey to identify a real world engineering problem	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**1**	**3**	**-**	**-**
CO2	Analyze the industrial plant layout using technical expertise	**2**	**-**	**-**	**-**	**-**	**1**	**1**		**-**	**-**	**-**	**1**	**-**	**3**	**-**
CO3	Compare theoretical and real work environments in technical perspective	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**1**	**3**	**-**	**-**
CO4	Identify the challenges in the execution of operations	**1**	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO5	Execute the operations and report the results of assigned tasks using modern tools adhering to professional ethics	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**2**	**1**	**1**	**-**	**-**	**-**	**3**	**-**
Course Code	**191MI7P04 - Project-Part 1**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Conduct technical survey to identify a real industrial problem to solve as a project work	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**1**	**2**	**1**	**1**
CO2	Estimate the resources & constraints in the process of execution	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**2**	**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**	**2**	**1**	**1**
CO4	Estimate the costs of individual stages and overall cost of the project in light of optimum resources allocation	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**1**	**1**
CO5	Estimate the optimum project duration using quantitative techniques	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**2**	**1**

	CO Statements	POs												PSOs		
VIII SEM																
Course Code	**191MI8E24 - WASTE WATER TREATMENT AND RECYCLING (Professional Elective – VI)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Analyze about Wastewater Generation..	**2**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**
CO2	Explain about the Sources and Types of Waste water	**2**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**
CO3	Analyze Waste water Characteristics.	**2**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**
CO4	Analyze Secondary Treatment Processes OF waste water..	**2**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**
CO5	Assess Wastewater Treatment Systems.	**2**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**
Course Code	**191MI8E21 - ADVANCE SURVEYING TECHNOLOGY (Professional Elective – VI)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Analyse Astronomical Surveying in mining	**2**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO2	Use Aerial Surveying tools and equipments in mining	**2**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO3	Analyse problems associated with Total Station Surveying.	**2**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO4	Analyse problems associated with GPS Surveying.	**2**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO5	Assess Reconnaissance – Rout surveys for highways, railways and waterways	**3**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
Course Code	**191MI8E23 - SOLAR ENERGY UTILISATION (Professional Elective – VI)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Analyze about Solar Radiation.	**1**	**2**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO2	Analyze about Solar Radiation measurement.	**1**	**2**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO3	Analyze problems associated with Solar Collectors.	**1**	**2**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO4	Analyze about the application of Solar Energy.	**1**	**2**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO5	Analyze the Energy Storage technique and its type .	**1**	**2**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
Course Code	**191MI8E22 - FLOW THROUGH POROUS MEDIA (Professional Elective – VI)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Differentiate between Permeability and Porosity of rocks.	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**
CO2	Analyze transport mechanisms.	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**
CO3	Analyze the relative permeability and saturation.	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**
CO4	Analyze the flow through deformable porous media.	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**
CO5	Assess viscous flow in capillary.	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**
Course Code	**191CE8O04 Integrated Waste Management for a Smart City (Open Elective - IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
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**	**PSO3**
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**	**PSO3**
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**	**PSO3**
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**	**PSO3**
CO1	Explain the different types of power semiconductor devices and their Characteristics.	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Distinguish between 1ϕ and 3ϕ phase-controlled converters.	**3**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Analyze the operation of AC voltage controllers and cycloconverters.	**3**	**2**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Analyze the operation of different types of DC-DC converters.	**3**	**2**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

	CO Statements	POs												PSOs		
CO5	Illustrate the operation of Inverters and application of PWM techniques.	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191EE8O14 Non-Conventional Energy Sources (Open Elective - IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain the prospects of renewable energy and solar energy.	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Apply the knowledge of solar principles for its applications.	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Discuss the working principles of wind and Bio-mass energy resources.	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Illustrate the techniques and conversion principles of Geothermal and tidal energy resources.	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Explain the concept of Direct energy conversion	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191ME8O18 Fabrication processes (Open Elective - IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain the fundamentals of Casting and Casting Processes.	**-**	**2**	**-**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
CO2	Explain the basics of Welding and types of Welding processes.	**-**	**2**	**-**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
CO3	Explain the various technological approaches applied to the different hot working and cold working operations.	**1**	**-**	**-**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
CO4	Explain the concept of various Extrusion processes and forces in extrusion.	**1**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
CO5	Explain the concept of Forging processes, Forging defects and forces in forging operations.	**2**	**-**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
Course Code	**191ME8O19 Smart Materials (Open Elective - IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Describe and characterize mechanical behaviour of smart materials.	**2**	**1**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
CO2	Select materials for sensor applications based on required properties.	**2**	**1**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
CO3	Characterize interaction between smart materials and simple structures in actuation and sensing.	**2**	**1**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
CO4	Describe and characterize novel functions of smart materials using structure-property relationships.	**1**	**1**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
CO5	Demonstrate the functions of smart structures.	**1**	**1**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
Course Code	**191EC8O10 Micro Electro Mechanical Systems (Open Elective - IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Summarize the operation of micro systems, and their applications	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Classify the materials for micro system applications	**2**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Explain the state-of-the-art for lithography and packaging techniques	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Extend the knowledge of basic approaches for various sensors and actuators design	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Apply the experience on micro systems for interdisciplinary applications	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

	CO Statements	POs												PSOs		
Course Code	**191EC8O11 Basic Electronic Circuits (Open Elective - IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain Superposition theorem and Phasors.	**3**	**1**	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Interpret about BJT and BJT Amplifier.	**2**	**1**	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Develop Operations performed by OP-AMP circuits.	**2**	**2**	**1**	**1**	-	-	-	-	-	-	-	-	-	-	-
CO4	Develop Counters and Registers using Flip-flops.	**2**	**2**	**1**	**1**	-	-	-	-	-	-	-	-	-	-	-
CO5	Contrast Analog-to-digital and Digital-to -analog conversions.	**3**	**2**	**2**	**2**	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191EC8O12 Principles of Communications (Open Elective - IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Illustrate Analog communication systems using amplitude modulation and demodulation.	**2**	**2**	**1**	-	-	-	-	-	-	-	-	**1**	-	-	-
CO2	Demonstrate Analog communication systems using angle modulation and demodulation.	**2**	**2**	**1**	-	-	-	-	-	-	-	-	**1**	-	-	-
CO3	Analyze various pulse analog and pulse digital modulation techniques.	**2**	**2**	**2**	-	-	-	-	-	-	-	-	**1**	-	-	-
CO4	Explain the process of reproduction of baseband signal.	**2**	**2**	**1**	-	-	-	-	-	-	-	-	**1**	-	-	-
CO5	Compare and contrast various Multiplexing techniques used in Communication systems.	**2**	**2**	**2**	-	-	-	-	-	-	-	-	**1**	-	-	-
Course Code	**191EC8O13 Electronic Instrumentation (Open Elective - IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain the fundamental characteristics of different Instruments	**3**	**2**	**1**	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Compare different signal generators and function generators in terms of their performance	**2**	**2**	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Distinguish the operation of various types of analog and digital meters.	**3**	**2**	**2**	-	-	-	-	-	-	-	-	-	-	-	-
CO4	Interpret the working of various potentiometers and AC bridges	**3**	**2**	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	Compare various data acquisition systems for analog to digital conversion and digital to analog conversion.	**2**	**2**	**1**	**1**	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191EC8O14 Digital Image Processing (Open Elective - IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain the concepts of digital image processing.	**2**	**1**	**1**	**1**	-	-	-	-	-	-	-	-	-	-	-
CO2	Utilize various image transforms techniques for image analysis.	**3**	**2**	**2**	**2**	-	-	-	-	-	-	-	-	-	-	-
CO3	Identify the image enhancement and restoration methods.	**3**	**2**	**1**	**1**	-	-	-	-	-	-	-	-	-	-	-
CO4	Utilize color fundamentals and different color image processing methods.	**3**	**2**	**1**	**1**	-	-	-	-	-	-	-	-	-	-	-
CO5	Explain different image segmentation techniques and image morphological operators for image processing.	**2**	**2**	**1**	**1**	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191CS8O13 Cyber Security (Open Elective - IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Illustrate cyber crime fundamentals.	**2**	**1**	-	-	**2**	-	-	-	-	-	-	-	-	-	-
CO2	Distinguish type of tools and methods used in cyber crimes.	**3**	**2**	**2**	-	**2**	-	-	-	-	-	-	-	-	-	-
CO3	Interpret the nature and effect of cyber crime in society and forensics fundamentals.	**2**	**1**	**1**	-	**2**	-	-	-	-	-	-	-	-	-	-
CO4	Utilize the history of Cyber Crimesand Liturgical Procedures to analyze the real time current scenarios.	**3**	**2**	**2**	-	**2**	-	-	-	-	-	-	-	-	-	-

	CO Statements	POs												PSOs		
CO5	Explain the importance of cyber security.	**2**	**1**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191CS8O14 Data Science (Open Elective - IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Describe Data Science and the skill sets needed to be a data scientist.	**-**	**3**	**1**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**
CO2	Apply basic tools for visualizing Data& optimization.	**-**	**2**	**1**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**
CO3	Describe the process of reading and exploring data.	**-**	**2**	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**
CO4	Implement various machine learning algorithms for analyzing various datasets.	**-**	**2**	**2**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**
CO5	Analyze datasets using clustering and recommender systems	**-**	**3**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**
Course Code	**191IT8O12 Game Programming (Open Elective - IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain the concepts of Game design and development.	**-**	**1**	**2**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Design the processes and use mechanics for game development.	**-**	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Explain the Core architectures of Game Programming.	**-**	**1**	**3**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Make use of Game programming platforms, frame works and engines to develop a game.	**-**	**2**	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Create interactive Games.	**-**	**3**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191IT8O11 Cloud Computing (Open Elective - IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Interpret the key dimensions of the challenge of Cloud Computing	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Identify the economics, financial, and technological implications for selecting cloud computing for own organization	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Demonstrate the basic concepts of virtualization and implementation levels of Virtualization	**2**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
CO4	Classify various storage systems and models in cloud computing environment.	**2**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**
CO5	Analyze the Cloud Security risks and Mechanisms.	**2**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO6	Utilize cloud environment platform and tools for actively initiating, installing, and developing cloud-based applications	**2**	**-**	**1**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
Course Code	**191CS8O16 AR / VR (Open Elective - IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain VR, its environments and hardware technologies for 3D interfaces.	**3**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Summarize 3D user interface input hardware in VR environment.	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Make use of software technologies to build VR applications.	**2**	**1**	**2**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Develop 3D user interfaces using 3D interaction techniques.	**2**	**1**	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Describe the fundamental concepts of AR	**2**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**		**-**	**-**
Course Code	**191IT8O09 Deep learning (Open Elective - IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Demonstrate the mathematical foundation of neural network	**3**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Explain various machine learning algorithms and their importance for data analysis.	**3**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

	CO Statements	POs												PSOs		
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**	**PSO3**
CO1	Demonstrate the foundation of the Blockchain technology and understand the processes in payment and funding.	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**
CO2	Identify the risks involved in building Blockchain applications.	**2**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**
CO3	Review of legal implications using smart contracts.	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**
CO4	Analyze the present landscape of Blockchain implementations to understand Crypto currency markets.	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**
CO5	Examine how to profit from trading crypto currencies.	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**
Course Code	**191PT8O07 Chemical Process Safety (Open Elective - IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain the Process Safety, Accidents and Loss statistics, Toxicological Studies	**2**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**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**	**PSO3**
CO1	Explain the fundamentals of Mechanical unit operations	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO2	Explain storage of bulk solids and flow measurements.	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO3	Explain the Flow past immersed solid objects and motion of particles through fluids, beds of solids	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO4	Apply Filtration, flow through packed and fluidized beds, cross flow filtration	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO5	Explain the Gravity sedimentation, centrifugal separations, floatation	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
Course Code	**191AG8O06 Applications of RS and GIS in Land and Water Resources Management (Open Elective - IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Apply the knowledge of RS and GIS in land and water resources management.	**1**	**-**	**-**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
CO2	Explain DEM hydro-processing for watershed characterization.	**1**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Demonstrate the digital image processing techniques using ERDAS/ARC GIS software.	**1**	**1**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Apply the Geospatial techniques in irrigation water management.	**1**	**-**	**1**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**

	CO Statements	POs												PSOs		
CO5	Apply RS & GIS inputs for site suitability for various water related projects.	**1**	**1**	**3**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191AG8O07 Plastic Applications in Agriculture (Open Elective - IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Assess the types and quality of plastics used in soil and water conservation	**2**	**1**	**-**	**-**	**-**	**-**	**3**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**-**
CO2	Design, estimation and laying of plastic films in lining of canal, reservoir and water harvesting ponds	**3**	**1**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Design, estimation and installation of green, poly and shade net houses, low tunnels etc.	**3**	**1**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Explain plastics application in drying, preservation, handling and storage of agricultural produce.	**3**	**1**	**-**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
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**	**PSO3**
CO1	Demonstrate technical skills of data collection and data analysis adhering to professional ethics	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**1**	**2**	**1**	**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**	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**1**
CO3	Build a team of people to work together and communicate well in the critical stages of project progress.	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**1**	**1**	**2**	**1**	**1**
CO4	Use modern tools to derive conclusions of the project work effectively	**-**	**-**	**-**	**-**	**3**	**-**	**-**	**-**	**-**	**2**	**1**	**1**	**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**	**1**	**2**	**1**