ADITYA ENGINEERING COLLEGE

An Autonomous Institutuion

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

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Department of Information Technology

B.Tech - AR19 - Course Articulation Matrix

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

	CO Statements	POs												PSOs	
I SEM															
Course Code	**191HS1T01 - Communicative English**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Identify the ways to overcome fear and use of words paradoxically, interpret the developing conditions and the core competences of the state to prioritize education system.	-	-	-	-	-	-	**1**	-	-	**3**	-	-	-	-
CO2	Explain about world's most precious natural resources	-	-	-	-	-	-	**1**	-	-	**3**	-	-	-	-
CO3	Explain about importance of unity to aboilish war.	-	-	-	-	-	-	-	-	-	**3**	-	-	-	-
CO4	Respond well to the changing situations in life with independent knowledge for better decision making.	-	-	-	-	-	-	-	-	**2**	**3**	-	**2**	-	-
CO5	Demonstrate writing and concepts of effective writing skills.	-	-	-	-	-	-	-	-	**1**	**3**	-	-	-	-
Course Code	**191BS1T01 - Differential Equations and Linear Algebra**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Apply the concepts of Mean Value theorem, Partial Differentiation and identify the maxima and minima of a given function.	**3**	**2**	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Solve the linear differential equations and model various situations involving differential equations of first order.	**3**	**2**	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Solve linear differential equations of higher order and model various situations involving second order differential equations.	**3**	**2**	-	-	-	-	-	-	-	-	-	-	-	-
CO4	Calculate Rank of a matrix and solve the system of Linear equations and find the Eigen values and Eigen vectors.	**3**	**2**	-	-	-	-	-	-	-	-	-	-	-	-
CO5	Compute various powers of a matrix and identify the nature of the quadratic form	**3**	**2**	-	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191BS2T09 - Engineering Chemistry**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Compare the quality of drinking water and problems associated with hard water	**3**	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Explain the fundamentals and applications of Electrochemical Energy Systems.	**2**	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Explain the fundamentals and applications of Advance materials	**3**	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	Explain about renewable energy sources and their manufacturing methods	**2**	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	Summarize the importance of Nano materials and Green chemistry.	**3**	-	-	-	-	-	-	-	-	-	-	-	-	-

	CO Statements	POs												PSOs	
Course Code	**191ES1T01 - Programming For Problem Solving Using C**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Illustrate the fundamental concepts of computers and basics of computer programming	**2**	**3**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**1**	**-**
CO2	Make use of control structures and arrays in solving complex problems.	**3**	**2**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**-**
CO3	Develop modular program aspects and strings fundamentals	**2**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**-**
CO4	Demonstrate the ideas of pointers usage.	**2**	**3**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**-**
CO5	Solve real world problems using the concept of structures, unions and File operations.	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**-**
Course Code	**191HS1L01 - Communicative English Lab -I**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Make use of the concepts to communicate confidently and competently in English Language in all spheres.	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**3**	**-**	**1**	**-**	**-**
CO2	Express Creative skills to construct Dialogues / Conversations in Spoken and Written forms.	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**3**	**-**	**2**	**-**	**-**
CO3	Identify Accent for intelligibility	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**3**	**-**	**2**	**-**	**-**
CO4	Demonstrate communicative ability in everyday Conversation, JAM Sessions and Public Speaking	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**3**	**-**	**1**	**-**	**-**
CO5	Demonstrate nuances of Language through Audio – Visual Experience and group activities.	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**3**	**-**	**1**	**-**	**-**
Course Code	**191BS2L02 - Engineering Chemistry Lab**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Demonstrate Complexometric titrations by volumetric analysis	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**1**	**-**	**-**
CO2	Demonstrate Acid – Base titrations by instrumental analysis.	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**1**	**-**	**-**
CO3	Estimate Vitamin C using volumetric analysis	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**1**	**-**	**-**
CO4	Prepare polymer like Bakelite.	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**1**	**-**	**-**
CO5	Prepare alternative fuel like Bio-Diesel.	**2**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**1**	**1**	**-**	**1**	**-**	**-**
Course Code	**191ES1L01 - Programming For Problem Solving Using C Lab**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Develop the basic programs in C and draw the flowcharts using Raptor	**2**	**1**	**-**	**-**	**3**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**2**	**-**
CO2	Make use of conditional and iterative statements to solve real time scenarios in C	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**3**	**-**
CO3	Apply the concept of arrays, modularity and strings to handle complex problems.	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**3**	**-**
CO4	Apply the dynamic memory allocation functions using pointers	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**1**	**2**	**-**
CO5	Develop programs using structures, and Files.	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**3**	**-**
Course Code	**191ES1L02- Basic Engineering Workshop**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Prepare carpentry joints using carpentry tools	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**1**	**-**	**-**
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**	**-**	**-**

	CO Statements	POs												PSOs	
Course Code	**191MC1A01 - Environmental Science**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Outline the natural resources and their importance for the sustenance of the life	-	-	-	-	-	1	2	-	-	-	-	-	-	-
CO2	Explain about the biodiversity of India, threats and its conservation methods	-	-	-	-	-	1	2	-	-	-	-	-	-	-
CO3	Illustrate various attributes of the pollution, impacts and measures to control the pollution along with waste management practices	-	-	-	-	-	1	2	-	-	-	-	-	-	-
CO4	Describe social issues of both rural and urban environment to combat the challenges and the legislations of India in environmental protection	-	-	-	-	-	1	2	-	-	-	-	-	-	-
CO5	Explain the population growth and its implications	-	-	-	-	-	1	2	-	-	-	-	-	-	-
Course Code	**191MC1A02 - Constitution of India**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain historical background 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 selfgovernment	-	-	-	-	-	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	**191BS2T07 - Applied Physics**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Apply the principles of interference and diffraction to design and enhance the resolving power of various optical instruments.	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Explain the fundamental concepts of Quantum behaviour of matter	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Classify the solids based on energy band structure.	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO4	Explain the basic concepts of Semi-Conductors and Identify the type of semiconductors using Hall Effect.	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO5	Explain about magnetic and dielectric properties of different materials.	3	2	-	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191BS2T10 - Numerical Methods and Complex Variables**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Apply numerical methods to obtain approximate solution of equations.	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Apply various numerical methods to interpolate polynomials	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Apply numerical methods to initial value problems and problems involving integration.	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO4	Identify the analyticity of functions of complex variables	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO5	Apply Cauchy's theorem, Cauchy's integral formula and Cauchy's residue theorem.	3	2	-	-	-	-	-	-	-	-	-	-	-	-

	CO Statements	POs												PSOs	
Course Code	**191ES2T02 - Engineering Graphics and Design**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Make use of fundamentals of Engineering Drawing to sketch basic curves, conic sections, cycloid, epicycloid, hypocycloid and involute	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**1**	**1**	**-**
CO2	Apply the principles of orthographic projections for points, lines and planes.	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**1**	**1**	**-**
CO3	Apply the principles of orthographic projections for solids.	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**1**	**1**	**-**
CO4	Apply the AutoCAD software for the orthographic projection of the machine parts.	**1**	**-**	**-**	**-**	**3**	**-**	**-**	**-**	**-**	**1**	**-**	**1**	**1**	**-**
CO5	Apply the AutoCAD software for the isometric projection of the machine parts.	**1**	**-**	**-**	**-**	**3**	**-**	**-**	**-**	**-**	**1**	**-**	**1**	**1**	**-**
Course Code	**191ES2T03 - Essential Electrical andElectronics Engineering**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Construct simple electrical circuits using basic laws	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**
CO2	Explain the constructional features of DC Machines and working.	**2**	**1**		**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Examine the performance of single phase transformer	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Illustrate the principle of AC rotating machines.	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Analyze the device structure, operation and application of diode and BJT.	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191ES2T09 - Data Structures through C++**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Compare and contrast object oriented programming and procedural oriented Programming.	**-**	**-**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO2	Make use of constructor and destructor to initialize and destroy class objects.	**-**	**2**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO3	Illustrate function overloading and constructor overloading	**-**	**2**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO4	Develop programs using Templates &STL.	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**-**
CO5	Apply various searching and sorting techniques for computation problems.	**-**	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO6	Describe operations of linked list, stacks and queues	**-**	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**-**
Course Code	**191HS2L02 - Communicative English Lab-II**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Make effective use of Body language in all situations and contexts to enhance effective communication in all aspects	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**2**	**-**	**-**
CO2	Identify communicative competency to respond to others in different situations.	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**2**	**-**	**-**
CO3	Make use of effective delivery strategies to select, compile and synthesize information for oral presentation.	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**2**	**-**	**-**
CO4	Demonstrate in mock interviews, group discussion and public speaking	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**2**	**-**	**-**
CO5	Illustrate interpersonal skills using English language confidently and effectively for personal and professional growth.	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**2**	**-**	**-**
Course Code	**191BS1L03 - Applied Physics Lab**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Use spectrometer, travelling microscope for making measurements.	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**1**	**-**	**-**
CO2	Determine energy gap of a semiconductor, draw characteristic curves to estimate thermal coefficient of a thermistor, Zener diode.	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**1**	**-**	**-**

	CO Statements	POs												PSOs	
CO3	Determine the dielectric constant and resistivity.	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**1**	**-**	**-**
CO4	Determine wavelength of source and width of the narrow slits.	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**1**	**-**	**-**
CO5	Find the strength of magnetic field.	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**1**	**-**	**-**
Course Code	**191ES2L10 - Data Structures Through C++ Lab**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Apply object oriented techniques to solve computing problems.	**3**	**2**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**2**	**-**
CO2	Experiment with the key features of the object-oriented programming language.	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**2**	**2**	**-**
CO3	Develop C++ programs using templates.	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**2**	**2**	**-**
CO4	Analyze various searching and sorting techniques.	**3**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**2**	**-**
CO5	Make use of Linear Data Structures for solving complex problems.	**3**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**2**	**-**
CO6	Solve real time applications using linked lists.	**3**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**2**	**-**
Course Code	**191ES2L11 - IT Workshop**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Identify the components of a PC and Assemble & disassemble the same.	**3**	**1**	**-**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**1**	**-**
CO2	Experiment with installation of Operating System and Secure a computer from Cyber threats.	**3**	**2**	**1**	**1**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**2**	**-**
CO3	Create their own digital profile on social media	**3**	**2**	**1**	**1**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**2**	**-**
CO4	Develop presentation /documentation using Office tools and LaTeX.	**2**	**1**	**-**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**1**	**-**
CO5	Build an interactive visual programs using Scratch.	**3**	**2**	**1**	**1**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**2**	**-**
Course Code	**191PR2P01 -Engineering Exploration Project**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Analyze the surrounding environment and identify a design challenge.	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
CO2	Foster team collaboration, find inspiration from the environment and learn how to identify problems.	**-**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**-**	**-**	**-**
CO3	Encourage exploration to process the Design Challenge, empathize & brainstorm the users effectively.	**-**	**-**	**1**	**1**	**-**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
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	**191BS3T14 - Discrete Mathematics**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Apply the principles of mathematical logic to statement calculus and predicate calculus.	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Compute Transitive Closure, Equivalence Classes of binary relations	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Solve recurrence relations using various methods.	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Apply the concepts of graph theory to find euler paths, Hamiltonian paths.	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Apply the concepts of graph theory to trees.	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191ES3T13 - Digital Logic Design**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Interpret numeric information in different base representations.	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**
CO2	Simplify logic expressions using minimization techniques.	**2**	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**
CO3	Design combinational logic circuits as per the given specifications.	**2**	**3**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**

	CO Statements	POs												PSOs	
CO4	Design sequential logic circuits as per the given specifications.	**2**	**2**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**
CO5	Develop Registers and Counters using flip-flops	**1**	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**
Course Code	**191HS3T02 - Managerial Economics and Financial Analysis**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the Managerial Economic concepts for decision making and forward planning.	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**
CO2	Illustrate the law of demand and its exceptions by using different forecasting methods.	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**1**
CO3	Identify the cost behavior for managerial decision making and Break Even Point (BEP) of an enterprise	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**	**1**
CO4	Classify the different types of business organizations along with basic knowledge on business cycle.	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**
CO5	Make use of the process & principles of accounting for the preparation of final accounts.	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**	**-**	**1**
CO6	Utilize various techniques on investment project proposals with the help of capital budgeting techniques for decision-making.	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**	**-**
Course Code	**191CS3T01 - Software Engineering**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the key facts, concepts, principles, and theories of software & Software Engineering.	**2**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO2	Compare various software development process models with respective to advantages, disadvantages and applicability.	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO3	Describe the various responsibilities and activities of Software Project Management.	**2**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Prepare SRS Document for any real time scenario.	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO5	Apply various Design, Coding and testing Principles for developing the software products.	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO6	Discuss the importance of software reliability, quality management, software maintenance and reusability in Software development.	**1**	**2**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191CS3T02 - Object Oriented Programming through Java**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Apply object-oriented programming features and concepts for solving given problem.	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**
CO2	Solve real time problems using the concepts of class, inheritance, interface and packages.	**1**	**1**	**2**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO3	Test for runtime exceptions arise in java applications.	**1**	**1**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO4	Develop real time applications using multithreading and I/O streams.	**1**	**1**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO5	Develop GUI applications using event handlers, adapter classes, AWT and Swing components.	**1**	**1**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
Course Code	**191CS3T03 - Advanced Data Structures**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Demonstrate the Dictionaries and Hashing Techniques	**1**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Illustrate the concepts of Trees and Priority queues.	**2**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO3	Demonstrate the operations of Efficient and Multiway Search Trees.	**1**	**-**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**

	CO Statements	POs												PSOs	
CO4	Discuss the various Traversing Techniques and spanning trees.	**2**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO5	Apply Pattern Matching Techniques and Tries to real time applications	**2**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
Course Code	**191CS3L01 - Object Oriented Programming through Java Lab**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Make use of class, inheritance, interface and packages to develop solutions for complex problems.	**2**	**1**	**1**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Develop error-handling techniques using exception handling.	**2**	**1**	**1**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO3	Build java applications using Threads.	**2**	**1**	**1**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO4	Apply event handling to create interactive applications.	**2**	**1**	**1**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO5	Design GUI using AWT and Swing Components.	**2**	**1**	**1**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
Course Code	**191CS3L02 - Advanced Data Structures Lab**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Identify the appropriate data structure for a given problem	**1**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Implement Dictionary by using hashing techniques.	**1**	**1**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**
CO3	Analyze the efficiency of basic operations of AVL tree and B-Tree.	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Build a Binary Heap using Priority queues.	**-**	**1**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO5	Apply the concepts of graphs and pattern matching in real world applications.	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191MC3A03 - Employability Skills - I**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Solve problems of Series & Analogy for Numbers and Letters	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
CO2	Solve problems on Coding & Decoding and Divisibility rules	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
CO3	Solve problems on LCM & HCF and Simple Equations	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
CO4	Demonstrate Attitude, self-confidence and decision making in different situations	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**1**	**-**	**-**
CO5	Develop out of box and lateral thinking, better goal setting and time management	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**1**	**-**	**-**
Course Code	**191MC3A04 - Essence of Indian Traditional Knowledge**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Identify the concept of Traditional knowledge and its importance	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Explain the need and importance of protecting traditional knowledge.	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Illustrate the various enactments related to the protection of traditional knowledge.	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Interpret the concepts of Intellectual property to protect the traditional knowledge.	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Explain the importance of Traditional knowledge in Agriculture and Medicine	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
	IV SEM														
Course Code	**191BS4T18 - Probability and Statistics**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Compute mean, median, mode, standard deviation and variance.	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Apply various Probability distributions for both discrete and continuous random variables.	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Compute mean and variance of sample means with replacement and without replacement and estimating maximum errors.	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

	CO Statements	POs												PSOs	
CO4	Apply various tests to test the hypothesis concerning mean, Proportion, variance.	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Apply the concepts of correlation and regression to the given statistical data.	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191IT4T01 - Theory of Computation**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Illustrate the concepts of Finite Automaton.	**1**	**3**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**
CO2	Construct Regular expressions for various problems.	**1**	**2**	**1**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**
CO3	Classify Chomsky Hierarchy of languages.	**1**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**
CO4	Compare the powers of different kinds of automaton.	**-**	**2**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**
CO5	Analyze decidability and undecidability concepts.	**1**	**2**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**
CO6	Make use of automaton for solving problems in computing.	**1**	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**
Course Code	**191CS4T05 - Python Programming**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Develop programs using fundamental concepts and control statements in python.	**2**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO2	Utilize data structures in Python to solve various problems.	**2**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO3	Develop programs using functions and Standard libraries like math, turtle, tkinter in building real time applications.	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO4	Apply Object Oriented Programming concepts and exceptions.	**2**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO5	Build various applications using files and database connectivity.	**1**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**
Course Code	**191CS4T06 - Design and Analysis of Algorithms**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Develop algorithms for various computational problems.	**2**	**1**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO2	Apply important algorithmic design paradigms and methods of analysis.	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO3	Construct sorting and searching algorithms using Divide and Conquer approach.	**1**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO4	Compare the benefits of using Dynamic programming over Greedy method.	**-**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO5	Solve problems using Backtracking and Branch & Bound techniques.	**2**	**1**	**2**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
Course Code	**191ES4T15 - Internet of Things**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the usage of the term 'the internet of things' in different contexts.	**3**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**
CO2	Illustrate diversified layered architectures and design principles for IoT/M2M.	**2**	**1**	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO3	Discover the various network protocols used in IoT.	**2**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO4	Design a solution for a given IoT application.	**2**	**-**	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO5	Define the role of big data, cloud computing and data analytics in a typical IoT system.	**3**	**1**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
Course Code	**191CS4T07 - Computer Organization**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Describe the basic structure of a computer system, various number systems and arithmetic operations.	**2**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**

	CO Statements	POs												PSOs	
CO2	Explain the Operation of CPUs including RTL, ALU, Instruction Cycle and Buses.	**2**	**1**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**
CO3	Demonstrate the architecture and functionality of central processing unit.	**2**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO4	Illustrate the I/O and memory organization in an efficient way.	**2**	**1**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO5	Make use of multi processors and pipelining to improve the efficiency of computer system.	**2**	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
Course Code	**191CS4L03 - Python Programming Lab**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Develop python programs using conditional and iterative statements.	**3**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**	**-**	**2**	**-**
CO2	Make use of different data structures in solving problems.	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**	**-**	**2**	**-**
CO3	Apply standard libraries in building real time applications.	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**	**-**	**2**	**-**
CO4	Implement the Object Oriented concepts in Python for solving problems.	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO5	Design an application using database connectivity.	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
Course Code	**191ES4L17 - Internet of Things Lab**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Choose the sensors and actuators for an IoT application.	**-**	**1**	**2**	**-**	**3**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**1**	**-**
CO2	Select protocols for a specific IoT application.	**-**	**3**	**1**	**-**	**2**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**2**	**-**
CO3	Utilize the cloud platform and APIs for IoT application.	**-**	**1**	**2**	**-**	**3**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**2**	**-**
CO4	Experiment with embedded boards for creating IoT prototypes.	**-**	**2**	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**3**	**-**
CO5	Design a solution for a given IoT application.	**-**	**2**	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**2**	**-**
Course Code	**191MC4A05 - Employability Skills - II**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Examine the symbols, notations and Venn -diagrams.	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
CO2	Solve different types of number systems problems.	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
CO3	Solve ratio & proportion, ages and averages by using simple logic.	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
CO4	Apply negotiation skills and leadership skills in a team	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**1**	**-**	**-**
CO5	Apply listening skills and verbal skills of communication in a team	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**1**	**-**	**-**
Course Code	**191MC4A06 - Biology for Engineers**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Apply biological engineering principles, procedures needed to solve real-world problems.	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Demonstrate the fundamentals of living things, their classification, cell structure and 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	**191CS5T08 - Compiler Design**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Analyze the different phases in compilation process.	**1**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO2	Identify the similarities and differences among various parsing techniques.	**3**	**2**	**1**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**

	CO Statements	POs												PSOs	
CO3	Construct various forms of intermediate code.	**1**	**1**	**2**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO4	Explain the role of different types of runtime environments.	**-**	**3**	**2**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO5	Apply various optimization techniques on intermediate code.	**3**	**-**	**2**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**
CO6	Develop target optimized code for given intermediate code.	**1**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**
Course Code	**191CS5T09 - Computer Networks**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the computer network fundamentals and various topologies.	**3**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO2	Compare the OSI with TCP/IP reference model.	**2**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO3	Classify MAC layer protocols and LAN technologies.	**1**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO4	Analyze various routing algorithms and Congestion control techniques.	**1**	**1**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO5	Utilize the services provided by the transport layer and application layer.	**1**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
Course Code	**191CS5T10 - Database Management Systems**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Summarize the database characteristics.	**3**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Identify various database architectures.	**3**	**-**	**1**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Interpret relational database using SQL.	**1**	**-**	**1**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO4	Examine issues in data storage and query processing for appropriate solutions.	**1**	**2**	**1**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO5	Make use of normalization techniques for real world database design.	**2**	**2**	**1**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**
CO6	Illustrate the mechanisms of transaction management.	**2**	**3**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191CS5T11 - Operating Systems**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Interpret the basic structure, services, system calls and architectural components of Operating Systems.	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO2	Solve problems related to process scheduling, synchronization in unit and multi-processing systems.	**2**	**2**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO3	Explain the deadlock handling Mechanism in the processing System.	**2**	**3**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO4	Summarize the concepts of Memory Management, Virtual Memory Management and Thrashing.	**2**	**2**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO5	Describe the concepts of file system and mass storage structure.	**2**	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
Course Code	**191CS5E04 - Functional and Logic Programming Professional Elective I**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Apply functional and logic programming features and concepts for solving given problem.	**2**	**2**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO2	Solve Whiteboard problems in pure Lambda Calculus.	**2**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO3	Make Use of Reduction strategies to reduce expressions in lambda calculus and to combinatory logic.	**2**	**2**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**
CO4	Explain the principles of advanced functional programming techniques including recursion, data types, higher-order functions, functional data structures and algorithms.	**2**	**3**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO5	Explain the concepts of Logic Programming.	**3**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**

	CO Statements	POs												PSOs	
Course Code	**191CS5E01 - Advanced Computer Architecture Professional Elective I**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Summarize classes of computers, new trends and developments in computer architecture.	-	3	-	1	-	-	-	-	-	-	-	-	1	-
CO2	Compare several advanced optimizations to achieve cache performance, virtual memory and virtual machines to achieve memory consistency.	2	3	-	2	1	-	-	-	-	-	-	-	1	-
CO3	Distinguish CISC & RISC instructions in high performance computing.	2	2	-	3	-	-	-	-	-	-	-	-	1	-
CO4	Evaluate various multiprocessing configurations.	-	2	-	3	-	-	-	-	-	-	-	-	2	-
CO5	Examine performance benefits of integrating message passing in cache coherent multiprocessor.	1	2	-	3	-	-	-	-	-	-	-	-	3	-
Course Code	**191CS5E02 - Artificial Intelligence Professional Elective I**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the fundamentals of Artificial Intelligence and its applications.	-	3	-	2	-	-	-	-	-	-	-	-	-	2
CO2	Describe various problems solving techniques and searching techniques.	-	2	-	-	3	-	-	-	-	-	-	-	-	2
CO3	Apply various logical systems to inference the different logical problems.	-	2	3	1	2	-	-	-	-	-	-	-	-	3
CO4	Demonstrate the concept of Knowledge Representation Techniques.	-	2	2	1	3	-	-	-	-	-	-	-	-	2
CO5	Develop Expert System and applications.	-	3	1	-	-	-	-	-	-	-	-	-	-	2
CO6	Identify various interpretations of probability theory, basic knowledge of fuzzy sets and fuzzy logic.	-	3	-	2	-	-	-	-	-	-	-	-	-	3
Course Code	**191CS5E05 - Software Requirement and Estimation Professional Elective I**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Illustrate requirements elicitation techniques.	2	-	1	-	1	-	-	-	-	-	-	-	1	-
CO2	Identify the software requirements for a given project.	-	2	-	1	1	-	-	-	-	-	-	-	2	-
CO3	Explain software estimation.	3	1	-	-	-	-	-	-	-	-	-	-	1	-
CO4	Estimate the software in terms of effort, schedule and cost.	1	2	-	3	-	-	-	-	-	-	-	-	1	-
CO5	Describe the tools for requirements management and estimation.	-	2	-	1	2	-	-	-	-	-	-	-	2	-
Course Code	**191CS5E03 - Computer Graphics Professional Elective I**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Identify the applications of computer graphics and video display devices for implementing graphical user interface.	3	1	-	-	-	-	-	-	-	-	-	-	2	-
CO2	Analyse output primitives and filled area primitives in implementing various algorithms.	1	3	1	-	-	-	-	-	-	-	-	-	2	-
CO3	Make use of geometric tranformations , viewing and clipping in 2D and 3D graphics.	2	3	-	-	-	-	-	-	-	-	-	-	2	-
CO4	Illustrate the various Visible Surface detection methods in 3D graphics.	2	2	3	-	-	-	-	-	-	-	-	-	2	-

	CO Statements	POs												PSOs	
CO5	Apply openGL for general computer animations.	**2**	**1**	**2**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO6	Analyse different object and color modelling techniques, fractals and ray tracing classifications.	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
Course Code	**191CE5O01 - Basic Concrete Technology** **Open Elective I**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the basic concepts of concrete and admixtures	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Explain the properties of ingredients of concrete.	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Select the suitability of different types of aggregate for their use	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Explain the destructive and non-destructive tests on Hardened Concrete	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Illustrate the concept of special concrete and their use.	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191EE5O01 - Electrical Safety** **Open Elective I**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Describe electrical hazards and safety equipment	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Apply various grounding and bonding techniques	**1**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Select appropriate safety method for low, medium and high voltage equipment	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Discuss safety managmenet and organizing structure	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Demonstrate proper maintenance of electrical equipment by understanding various standards	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191EE5O02 - Electrical Materials** **Open Elective I**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Identify various types of dielectric materials, their properties in various conditions.	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Analyze magnetic materials and their behaviour.	**3**	**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**
CO1	Analyze the behaviour of different types of torques in instruments.	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Select the right type of instrument for measurement of voltage, current, power &energy	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Develop the suitable bridge for the measurement of electrical parameters.	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Analyze the behaviour of different types of Transducers and Sensors.	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Explain frequency and phase difference between signals using CRO.	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

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

	CO Statements	POs												PSOs	
CO5	Apply the AM techniques in different industries.	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
CO6	Select AM technologies using decision methods.	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
Course Code	**191ME5O05 - Entrepreneurship Development and Incubation Open Elective I**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Describe the meaning and concepts of entrepreneurship development.	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**-**	**-**	**2**	**-**	**-**	**-**	**-**
CO2	Apply the business plan for preparation and evaluation of project.	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**-**	**-**	**2**	**-**	**-**	**-**	**-**
CO3	Explain about Institutional Support to Entrepreneur and MSMEs	**-**	**-**	**-**	**-**	**-**	**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**
CO1	Categorize signals and systems based on their characteristics.	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Demonstrate the spectral characteristics of signals using Fourier series.	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Demonstrate the spectral characteristics of signals using Fourier Transform.	**2**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Identify system characteristics in time domain and frequency domain.	**2**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Apply Laplace transform techniques for the analysis of continuous time signals and Systems.	**2**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191EC5O02 - Digital Electronics and Logic Design Open Elective I**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Interpret numeric information in different code formats.	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Develop optimized logic by using various optimization algorithms.	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Construct various combinational logic circuits for required specifications.	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Build different Programmable Logic Device for required specifications.	**2**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Build different sequential logic circuits for required specifications.	**2**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191EC5O03 - Semi conductor Devices Open Elective I**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Interpret the characteristics of semiconductor diodes.	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Apply the knowledge of semiconductors in the functioning of BJT.	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Demonstrate the switching and amplification application of FET.	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Classify the semiconductor devices for special Applications.	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Identify the sensor types used in various applications and explain their principle of operation.	**2**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191CS5O01 - Data Structures Open Elective I**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Illustrate time and space complexities of an algorithm.	**2**	**1**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

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

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

	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**
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**	-	-	-	-	-	-	**3**	-	-
Course Code	**191CS5L04 - Operating Systems and Computer Networks Lab**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Summarize various process scheduling algorithms.	**2**	**3**	**2**	-	-	-	-	-	-	-	-	-	**2**	-
CO2	Experiment with various system calls.	**3**	**2**	**2**	-	-	-	-	-	-	-	-	-	**2**	-
CO3	Develop algorithm to implement deadlocks avoidance and memory management algorithms.	**2**	**2**	**3**	-	-	-	-	-	-	-	-	-	**3**	-
CO4	Summarize various Framing methods.	**1**	**3**	**2**	-	-	-	-	-	-	-	-	-	**2**	-
CO5	Make use of various routing algorithms for effective data transmission.	**2**	**1**	**3**	-	-	-	-	-	-	-	-	-	**2**	-
Course Code	**191CS5L05 - Database Management Systems Lab**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Make use of the concepts of relational model techniques for database design.	-	**1**	-	-	**3**	-	-	-	**1**	-	-	-	-	-
CO2	Construct a database schema for a given problem-domain.	-	**1**	-	-	**3**	-	-	-	**1**	-	-	-	-	-
CO3	Apply Normalization techniques on a database to avoid anomalies.	-	**2**	-	-	**3**	-	-	-	**1**	-	-	-	**2**	-
CO4	Build queries on a database using SQL DDL/DML commands.	-	**2**	-	-	**3**	-	-	-	**1**	-	-	-	**2**	-
CO5	Apply integrity constraints on a database using RDBMS.	-	**2**	-	-	**3**	-	-	-	**1**	-	-	-	**1**	-
CO6	Develop PL/SQL stored procedures, stored functions, cursors and packages.	-	**2**	-	-	**3**	-	-	-	**1**	-	-	-	**2**	-
Course Code	**191HS5T06 - Employability Skills - III**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain different types of puzzles,group reasoning,clock and calender problems	**1**	-	-	-	-	-	-	-	-	-	-	**1**	-	-
CO2	Solve problems on cubes & dice, partnership, percentages.	**1**	-	-	-	-	-	-	-	-	-	-	**1**	-	-
CO3	Solve problems on profit and loss, simple interest and compound interest	**1**	-	-	-	-	-	-	-	-	-	-	**1**	-	-

	CO Statements	POs												PSOs	
CO4	Apply interviewing skills, Group discussion skills and personal priorities	-	-	-	-	-	-	-	-	-	1	-	1	-	-
CO5	Apply resume writing skills, e-mail writing & business etiquette	-	-	-	-	-	-	-	-	-	1	-	1	-	-
Course Code	**191PR5P02 - Socially Relevant Project**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Conduct a literature survey in the selected area	1	-	-	-	-	-	-	-	1	1	1	-	2	2
CO2	Use scientific reasoning to gather, evaluate and interpret the survey data to identify the problem	-	2	-	-	-	2	2	-	-	-	-	2	1	2
CO3	Design and develop many solutions in the light of societal, cultural, legal and environmental issues	-	-	2	2	-	-	-	1	-	-	-	-	1	2
CO4	Select a final solution to the social problem and submit as a working prototype	-	-	-	2	-	-	-	-	-	-	-	-	2	2
CO5	Use modern tools to prepare the results of the project as a report adhering to professional ethics	-	-	-	-	2	-	-	2	-	-	1	1	2	2
Course Code	**191MC5A08 - Intellectual Property Rights and Patents**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Compare various types of Intellectual Property rights.	-	-	-	-	-	-	-	3	-	-	-	2	-	-
CO2	Discuss Intellectual Property and infer rights on such Intellectual Property owners	-	-	-	-	-	-	-	3	-	-	-	2	-	-
CO3	Explain the process of patenting	-	-	-	-	-	-	-	3	-	-	-	2	-	-
CO4	Apply for trade marks and trade secrets.	-	-	-	-	-	-	-	3	-	-	-	2	-	-
CO5	Interpret the legal issues on Intellectual Property Rights and cyber laws	-	-	-	-	-	-	-	3	-	-	-	2	-	-
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Course Code	**191CS6T12 - Data Ware Housing and Data Mining**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Compare OLTP and OLAP.	-	3	-	2	-	-	-	-	-	-	-	-	-	2
CO2	Explain the KDD process.	1	2	3	1	-	-	-	-	-	-	-	-	-	-
CO3	Make use of pre-processing and visualization techniques for data analysis.	2	1	-	3	-	-	-	-	-	-	-	-	-	1
CO4	Apply frequent pattern and association rule mining techniques for data analysis.	2	1	3	1	-	-	-	-	-	-	-	-	-	3
CO5	Apply appropriate classification techniques for data analysis.	2	1	3	1	-	-	-	-	-	-	-	-	-	2
CO6	Compare different types of clustering algorithms.	2	3	-	1	-	-	-	-	-	-	-	-	-	1
Course Code	**191CS6T13 - Object Oriented Analysis and Design**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Illustrate software design with UML diagrams.	2	-	1	-	1	-	-	-	-	-	-	-	2	-
CO2	Apply Object Oriented concepts in software design.	2	3	-	1	-	-	-	-	-	-	-	-	1	-
CO3	Identify various scenarios based on software requirements.	-	2	-	-	1	-	-	-	-	-	-	-	1	-
CO4	Illustrate the interaction among software components.	2	-	1	-	3	-	-	-	-	-	-	-	1	-
CO5	Build a deliverable model for a selected application.	1	-	2	-	2	-	-	-	-	-	-	-	2	-
Course Code	**191CS6T14 - Web Technologies**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Develop static web pages using HTML and CSS.	-	-	3	-	-	-	-	-	-	-	-	2	2	-
CO2	Apply JavaScript for Client side validations and Node.JS to learn server side applications using JavaScript.	-	2	2	-	2	-	-	-	-	-	-	3	3	-

	CO Statements	POs												PSOs	
CO3	Make use of Angular JS for developing dynamic and responsive web pages.	-	2	3	-	2	-	-	-	-	-	-	2	2	-
CO4	Utilize React JS for developing dynamic and responsive web pages.	-	3	2	-	-	-	-	-	-	-	-	2	2	-
CO5	Create and deploy secure, usable database driven web applications using PHP and MySQL/MongoDB.	-	-	2	-	3	-	-	-	-	-	-	2	3	-
Course Code	**191CS6E09 - Scripting languages Professional Elective II**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Illustrate the concepts of Perl language with simple Programs.	3	-	-	-	2	-	-	-	-	-	-	-	-	2
CO2	Develop internet-based application using Perl.	2	2	3	-	2	-	-	-	-	-	-	-	-	2
CO3	Make use of Ruby to explain the concepts.	2	-	3	-	2	-	-	-	-	-	-	-	-	2
CO4	Demonstrate basic Programming using TCl.	2	3	2	-	2	-	-	-	-	-	-	-	-	2
CO5	Build Small and efficient web systems using web application framework.	2	3	2	-	3	-	-	-	-	-	-	-	-	3
Course Code	**191CS6E06 - Advanced Operating Systems Professional Elective II**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Interpret the basic concepts and communication protocols of distributed systems.	1	1	-	3	2	-	-	-	-	-	-	-	-	2
CO2	Analyze synchronization algorithms and deadlock methods.	1	3	-	2	1	-	-	-	-	-	-	-	-	-
CO3	Demonstrate process scheduling in distributed systems.	1	1	-	3	-	-	-	-	-	-	-	-	-	2
CO4	Discuss distributed file system design and implementation.	2	1	3	2	-	-	-	-	-	-	-	-	-	1
CO5	Describe distributed shared memory models.	2	3	-	2	-	-	-	-	-	-	-	-	-	1
CO6	Summarize distributed system concepts in MACH and DCE.	-	1	-	2	3	-	-	-	-	-	-	-	-	-
Course Code	**191CS6E08 - Machine Learning Professional Elective II**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Identify machine learning techniques suitable for a given problem.	2	3	-	2	-	-	-	-	-	-	-	-	-	-
CO2	Evaluate the performance of an algorithm used in an ML model.	2	2	-	3	2	-	-	-	-	-	-	-	2	-
CO3	Apply probability approximations and frame ordered and unordered rules for given machine learning problem.	3	2	2	2	-	-	-	-	-	-	-	-	-	-
CO4	Design multilayer model using techniques like back propagation, quadratic programming solution.	1	2	3	-	2	-	-	-	-	-	-	-	1	-
CO5	Design models using conditional probability, logistic regression and distance based techniques.	2	2	3	1	-	-	-	-	-	-	-	-	2	-
Course Code	**191CS6E10 - Software Testing Methodologies Professional Elective II**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the fundamentals of software testing.	2	-	-	-	1	-	-	-	-	-	-	-	1	-
CO2	Summarize verification and validation activities.	2	1	-	1	-	-	-	-	-	-	-	-	1	-
CO3	Develop the test cases using different testing strategies.	-	2	3	-	1	-	-	-	-	-	-	-	2	-
CO4	Describe the concepts of Efficient Test Suite Management, Quality and Debugging.	3	-	-	1	-	-	-	-	-	-	-	-	1	-
CO5	Discuss about various Automation Testing tools.	2	2	-	-	3	-	-	-	-	-	-	-	1	-

	CO Statements	POs												PSOs	
Course Code	**191CS6E07 - Image Processing Professional Elective II**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Discuss the fundamental concepts of a digital image processing system.	**3**	**2**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO2	Demonstrate the fundamentals of color image models.	**3**	**2**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO3	Analyze images in spatial and frequency domain using various transforms.	**1**	**2**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO4	Evaluate the techniques for image restoration.	**2**	**2**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO5	Interpret an image using different segmentation techniques.	**2**	**3**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO6	Make use of different types of compression techniques in image data compression.	**2**	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
Course Code	**191CS6E11 - C# .Net Professional Elective III**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Develop programs using fundamental concepts, control statements and arrays in C#.	**3**	**2**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO2	Utilize Lambda expressions, events, collections, reflection and exception handling to solve various problems.	**2**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO3	Make use of base class libraries and XML for creating standalone applications.	**2**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO4	Develop windows and distributed applications using .Net Framework.	**3**	**2**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO5	Make use of .Net Compact Framework for developing mobile applications.	**2**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
Course Code	**191CS6E13 - Distributed Systems Professional Elective III**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Demonstrate the foundations and issues of distributed systems.	**1**	**1**	**1**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO2	Illustrate the various synchronization issues and global state for distributed systems.	**1**	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**
CO3	Analyze the Mutual Exclusion and Deadlock detection algorithms in distributed systems.	**2**	**3**	**-**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**
CO4	Explain the agreement protocols and fault tolerance mechanisms in distributed systems.	**2**	**1**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO5	Describe the features of peer-to-peer and distributed shared memory systems.	**2**	**1**	**-**	**1**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**
Course Code	**191CS6E14 - Natural Language Processing Professional Elective III**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Understand key concepts from NLP are used to describe and analyze language.	**2**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO2	Explain POS tagging and context free grammar for English language.	**3**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO3	Make use of the rule based system to tackle morphology/syntax of a language.	**1**	**1**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**

	CO Statements	POs												PSOs	
CO4	Demonstrate semantics and pragmatics of English language for processing.	**1**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO5	Compare and contrast the use of different statistical approaches for different types of NLP applications.	**3**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
Course Code	**191CS6E15 - Software Quality Assurance Professional Elective III**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain various components of Quality assurance system.	**2**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO2	Summarize various Testing Strategies.	**2**	**1**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**
CO3	Demonstrate various components of Quality assurance Infrastructure.	**1**	**2**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**
CO4	Illustrate various components of Quality assurance Management.	**2**	**-**	**1**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO5	Analyze various Standards and Certifications in SQA.	**-**	**3**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**
CO6	Outline the role of Management in SQA.	**3**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**
Course Code	**191CS6E12 - Cloud Computing Professional Elective III**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Interpret the key dimensions of the challenge of Cloud Computing.	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**
CO2	Identify the economics, financial, and technological implications for selecting cloud computing for own organization.	**1**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**
CO3	Demonstrate the basic concepts of virtualization and implementation levels of Virtualization.	**-**	**2**	**2**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO4	Classify various storage systems and models in cloud computing environment.	**3**	**2**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**
CO5	Analyze the Cloud Security risks and Mechanisms.	**-**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO6	Utilize cloud environment platform and tools for actively initiating, installing and developing cloud-based applications.	**-**	**3**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**
Course Code	**191CE6O02 - Disaster Management Open Elective II**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the aspects of disaster management and adopt remedial measures	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Explain the disaster vulnerability profile of India	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Explain the hazard assessment and mitigation measures	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Explain landslides and earthquake disasters and management	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Explain about cyclone, fire disasters and rehabilitation programmes	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191EE6O04 - Energy Audit and Conservation Management Open Elective II**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain energy efficiency, conservation, and various technologies.	**2**	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Design energy efficient lighting systems.	**3**	**1**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Calculate power factor of systems and propose suitable compensation techniques.	**2**	**3**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Explain energy conservation in HVAC systems.	**2**	**3**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Calculate life cycle costing analysis and return on investment on energy efficient technologies.	**1**	**2**	**1**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

	CO Statements	POs												PSOs	
Course Code	**191EE6O05 - Non Conventional Energy resources Open Elective II**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	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	**191EE6O06 - Instrumentation Open Elective II**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain various types of signals	**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**
CO1	Explain the concept of solar radiation and its measurement.	**3**	-	-	-	-	-	**3**	-	-	-	-	**1**	-	-
CO2	Describe the working principle of different types of collectors and its types	**3**	-	-	-	-	**2**	**3**	-	-	-	-	**2**	-	-
CO3	Explain the various solar thermal energy technologies and their applications	**3**	-	-	-	-	**2**	**3**	-	-	-	-	**2**	-	-
CO4	Analyze the various solar PV cell materials and conversion techniques.	**3**	-	-	-	-	**3**	**3**	-	-	-	-	**2**	-	-
CO5	Apply solar passive building techniques for cooling and heating applications.	**3**	-	-	-	-	**3**	**3**	-	-	-	-	**2**	-	-
Course Code	**191ME6O07 - Basic Thermodynamics and Heat Transfer Open Elective II**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain basic thermodynamic concepts and laws of thermodynamics	**2**	**1**	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Make use of steam tables to solve problems on properties of pure substance and gas mixture	**2**	**2**	**1**	-	-	-	-	-	-	-	-	-	-	-
CO3	Find the efficiency of a thermodynamic cycle	**1**	**2**	**1**	-	-	-	-	-	-	-	-	-	-	-
CO4	Explain basic heat transfer mechanisms	**1**	**2**	**1**	-	-	-	-	-	-	-	-	-	-	-
CO5	Evaluate the performance of heat exchangers	**1**	**2**	-	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191ME6O08 - Introduction to Hydraulics and Pneumatics Open Elective II**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Describe the fundamentals of fluid power systems.	**1**	**1**	**1**	-	-	-	**3**	-	-	-	-	-	-	-

	CO Statements	POs												PSOs	
CO2	Illustrate the working of fluid power actuators, hydraulic motors, and Hydraulic Components.	**1**	**1**	**1**	**-**	**-**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Analyze the design and drawings of hydraulic circuits.	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Explain the working of pneumatic systems.	**1**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Examine the concepts of pneumatic circuits.	**1**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191ME6O09 - 3D Printing Open Elective II**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Summarize the basics of AM technologies.	**1**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
CO2	Explain about vat photo polymerization, material jetting and binder jetting AM technologies.	**1**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
CO3	Explain material extrusion and sheet lamination AM technologies.	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
CO4	Illustrate powder bed fusion and directed energy deposition AM technologies.	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
CO5	Apply the AM techniques in different industries	**1**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
CO6	Select AM technologies using decision methods	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
Course Code	**191ME6O10 - Robotics Open Elective II**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the basic concepts, parts of robots and types of robots.	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
CO2	Identify various robot configuration and components,	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
CO3	Analyze the transformations and manitulator kinematics of robot using DH Notation	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
CO4	Analyze the differential transformations and dynamics of robots	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
CO5	Analyze the trajectory planning for a manipulator by avoiding Obstacles	**1**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
Course Code	**191ME6O11 - Management Science Open Elective II**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Apply management and motivation theories to renovate the practice of management.	**1**	**1**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
CO2	Explain concepts of quality management and use process control charts, concepts, and tools of quality engineering in the design of products and process controls.	**1**	**1**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
CO3	Appraise the functional management challenges associated with high levels of change in the organizations.	**1**	**1**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
CO4	Use scheduling techniques of project management PERT/CPM to calculate Critical path and Probabiltiy of completion of the project.	**1**	**1**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
CO5	Develop global vision and management skills both at strategic level and interpersonal level.	**1**	**1**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
Course Code	**191ME6O12 - Entrepreneurship Development and Incubation Open Elective II**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Describe the meaning and concepts of entrepreneurship development.	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**-**	**-**	**2**	**-**	**-**	**-**	**-**
CO2	Apply the business plan for preparation and evaluation of project.	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**-**	**-**	**2**	**-**	**-**	**-**	**-**

	CO Statements	POs												PSOs	
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	**191EC6O07 - Biomedical Instrumentation** **Open Elective II**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Summarize the physiological relation of the human body withthe environment.	2	2	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Make use of different electrodes and transducersfor biomedical applications.	2	2	2	1	-	-	-	-	-	-	-	-	-	-
CO3	Demonstrate the working principle of different biomedical instruments for heart and respiratory system monitoring.	2	3	3	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	**191EC6O08 - ECAD Tools** **Open Elective II**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Illustrate the basic concepts on ECAD tools and PSPICE.	2	1	-	-	-	-	-	-	-	-	-	2	-	-
CO2	Summarize the fundamental concepts of passive circuits using PSPICE.	2	2	-	-	-	-	-	-	-	-	-	2	-	-
CO3	Demonstrate the performance active circuits using PSPICE.	2	2	1	-	-	-	-	-	-	-	-	2	-	-
CO4	Develop the various functionality of MATLAB.	2	2	1	-	-	-	-	-	-	-	-	2	-	-
CO5	Apply the fundamentals and applications of MATLAB Simulink.	2	2	1	-	-	-	-	-	-	-	-	2	-	-
Course Code	**191CS6O05 - Python Programming** **Open Elective II**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Develop programs using fundamental concepts and control statements in python.	1	2	2	-	2	-	-	-	-	-	-	-	-	-
CO2	Utilize data structures in Python to solve various problems.	2	3	2	-	2	-	-	-	-	-	-	-	-	-
CO3	Develop programs using functions and Standard libraries like math, datetime, random etc. in building real time applications.	2	3	2	-	2	-	-	-	-	-	-	-	-	-
CO4	Apply Object Oriented concepts in Programming.	2	2	3	-	2	-	-	-	-	-	-	-	-	-
CO5	Apply concept of exception handling in solving runtime issues.	2	2	3	-	2	-	-	-	-	-	-	-	-	-
CO6	Build various applications using files.	2	2	3	-	2	-	-	-	-	-	-	-	-	-
Course Code	**191CS6O06 - Operating Systems** **Open Elective II**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Illustrate the basic structure, services, system calls and architectural components of Operating Systems.	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Solve problems related to process scheduling, synchronization in unit and multi-processing systems.	2	2	2	3	-	-	-	-	-	-	-	-	-	-
CO3	Explain the deadlock handling Mechanism in the processing System	2	3	1	2	-	-	-	-	-	-	-	-	-	-
CO4	Summarize the concepts of Memory Management, Virtual Memory Management and Thrashing	2	2	3	2	-	-	-	-	-	-	-	-	-	-
CO5	Describe the concepts of file system and mass storage structure.	2	3	2	2	-	-	-	-	-	-	-	-	-	-

	CO Statements	POs												PSOs	
Course Code	**191CS6O07 - Web Technologies** **Open Elective II**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Develop static web pages using HTML and CSS.	**2**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Apply JavaScript for Client-side validations and Node.JS to learn server-side applications using JavaScript.	**3**	**2**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Make use of Angular JS for developing dynamic and responsive web pages.	**2**	**2**	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Utilize React JS for developing dynamic and responsive web pages.	**2**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Create and deploy secure, usable database driven web applications using PHP and MySQL/Mongo DB.	**2**	**-**	**2**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191CS6O08 - Cyber Security** **Open Elective II**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the cyber security and security management methods to maintain security protection.	**2**	**1**	**-**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
CO2	Illustrate the nature of secure software development and operating systems.	**2**	**3**	**-**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
CO3	Summarize the Network management and cloud computing security issues.	**2**	**1**	**-**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
CO4	Analyze the data privacy techniques and data management.	**3**	**1**	**-**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
CO5	Demonstrate the role security management plays in cyber security defense and legal and social issues at play in developing solutions.	**2**	**1**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
Course Code	**191CS6O09 - AR / VR** **Open Elective II**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain VR, its environments and hardware technologies for 3D interfaces.	**2**	**1**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**-**
CO2	Summarize 3D user interface input hardware in VR environment.	**2**	**1**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**-**
CO3	Make use of software technologies to build VR applications.	**3**	**2**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**-**
CO4	Develop 3D user interfaces using 3D interaction techniques.	**3**	**2**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**-**
CO5	Describe the fundamental concepts of AR.	**2**	**1**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**-**
Course Code	**191IT6O03 - Computer Organization** **Open Elective II**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Describe the basic structure of a computer system, various number systems and arithmetic operations.	**2**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Explain the Operation of CPUs including RTL, ALU, Instruction Cycle and Buses.	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Demonstrate the architecture and functionality of central processing unit.	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Illustrate the I/O and memory organization in an efficient way.	**2**	**1**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Make use of multi processors and pipelining to improve the efficiency of computer system.	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

	CO Statements	POs												PSOs	
Course Code	**191IT6O04 - AI Tools & Techniques** **Open Elective II**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the fundamentals of Artificial Intelligence and its applications.	**3**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Describe various problems solving techniques and searching techniques.	**2**	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Apply various logical systems to inference the different logical problems.	**2**	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Demonstrate the concept of Knowledge Representation Techniques.	**2**	**2**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Develop Expert System and applications.	**2**	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO6	Identify various interpretations of probability theory, basic knowledge of fuzzy sets and fuzzy logic.	**2**	**2**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191IT6O05 - Robotic Process Automation** **Open Elective II**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Describe the fundamentals of Robotic Process Automation Technology.	**2**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Summarize the UiPath programming techniques to deploy robot configurations.	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Explore various data extraction techniques and learn about integrations with various popular applications like SAP and MS Office.	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Develop a programmed robot including logging and exception handling.	**3**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Create and Deploy the Bots and control it with UiPath Orchestrator.	**3**	**3**	**-**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191MI6O02 - Industrial Safety Practices** **Open Elective II**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the different hazards and its prevention in mining industries.	**1**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Distinguish the mine accidents occurring in surface and underground mining area.	**1**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Explain the safety concepts, emergency preparation and response in disaster.	**1**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Assess and minimize the risk using safety analysis techniques.	**1**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Explain Safety standards, safety information system and safety audit.	**1**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191MI6O03 - Electrical Equipment's in Mines** **Open Elective II**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain about power systems used in mines.	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Analyze various earthing methods used in mines.	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Summarize various electrical equipment used in mines.	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Explain the instrumentation and control systems used in mines	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Analyze about mine telephone system and intrinsic safety.	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191PT6O03 - Unconventional Hydrocarbon Resources** **Open Elective II**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Outline the fundamentals of Coal Bed Methane	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

	CO Statements	POs												PSOs	
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**
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**
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 thumbrules and verification of weather forecast with real events.	-	-	-	-	-	**1**	-	-	-	-	-	-	-	-
Course Code	**191AG6O03 - Bio-energy systems design and applications Open Elective II**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the importance of Bioenergy.	**2**	-	-	-	-	**2**	**3**	-	-	-	-	-	-	-
CO2	Compare and contrast Biomass and Agrochemical Conversion techniques.	**3**	**2**	-	**1**	-	**2**	-	-	-	-	-	-	-	-
CO3	Categorize different ways of biomass production.	**2**	**1**	-	-	-	**2**	**3**	-	-	-	-	-	-	-
CO4	Classify Gasification and Liquefaction.	**2**	**1**	-	-	-	**3**	**1**	-	-	-	-	-	-	-
CO5	Analyze advanced Bio-diesel production from Oils and Seeds.	**2**	**1**	-	-	-	**3**	**1**	-	-	-	-	-	-	-
Course Code	**191CS6L06 - Data Mining and Object Oriented Analysis and Design Lab**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Demonstrate different pre-processing techniques in Data Mining.	**2**	**3**	**2**	-	-	-	-	-	-	-	-	-	**2**	-
CO2	Apply algorithms for Association rule mining.	-	**2**	**2**	**3**	**3**	-	-	-	-	-	-	-	**2**	-
CO3	Apply Classification and Clustering methods for data mining.	-	**2**	**2**	-	**3**	-	-	-	**3**	**3**	-	-	**2**	-
CO4	Analyze the importance of unified modeling of various applications.	-	**2**	**3**	**2**	-	-	-	-	-	**3**	-	-	**2**	-
CO5	Show the role and function of each UML model in developing object-oriented software.	-	**2**	**2**	-	**3**	-	-	-	**3**	-	-	-	**2**	-
Course Code	**191CS6L07 - Web Technologies Lab**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Make use of HTML, CSS for designing static web pages.	-	**2**	**3**	-	**2**	-	-	-	-	-	-	**2**	**2**	-
CO2	Experiment with JavaScript to develop dynamic web pages, validate forms and Use DTD, Schema to validate XML file.	-	**2**	**2**	-	**2**	-	-	-	-	-	-	**2**	**2**	-
CO3	Apply Angular JS / React JS for developing dynamic web pages.	-	**2**	**2**	-	**3**	-	-	-	-	-	-	**3**	**3**	-
CO4	Develop server side in web applications using PHP.	-	**2**	**3**	-	**3**	-	-	-	-	-	-	**2**	**3**	-

	CO Statements	POs												PSOs	
CO5	Develop real time web application using the core concepts of frontend, backend and persistence in latest web development technologies.	-	2	3	-	3	-	-	-	-	-	-	2	2	-
Course Code	**191HS6T07 - Employability Skills - IV**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Solve problems of seating arrangements ,syllogism	1	-	-	-	-	-	-	-	-	-	-	1	-	-
CO2	Solve problems of Time and Work, Pipes and Cisterns, Time and Distance, Races and trains	1	-	-	-	-	-	-	-	-	-	-	1	-	-
CO3	Solve Problems on Boats and Streams, Permutation and Combination, Probability and Data Interpretation	1	-	-	-	-	-	-	-	-	-	-	1	-	-
CO4	Apply processes of Group discussion ,Phonetics, Leadership skills in real world	-	-	-	-	-	-	-	-	-	2	-	1	-	-
CO5	Apply principles of Group Dynamics, Interview Skills & Evaluation criteria in organizations	-	-	-	-	-	-	-	-	-	2	-	1	-	-
Course Code	**191MC6A09 - Professional Ethics and Human Values**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Make use of values, morals and ethics in their day to day life.	-	-	-	-	-	-	-	2	-	-	-	-	-	-
CO2	Identify what is right and wrong through moral ethics.	-	-	-	-	-	-	-	2	-	-	-	-	-	-
CO3	Analyze experimental learning while developing the society with ethics.	-	-	-	-	-	-	-	2	-	-	-	-	-	-
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	**191CS7T15 - Cryptography and Network Security**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Identify information security goals, classical encryption techniques and acquire fundamental knowledge on the concepts of finite fields and number theory.	3	2	-	-	-	-	-	-	-	-	-	-	2	-
CO2	Compare various symmetric cryptographic techniques to solve problems related to confidentiality and authentication.	2	3	1	-	2	-	-	-	-	-	-	-	2	-
CO3	Apply the concepts of Message digest algorithm & digital signature algorithm for verifying the integrity and authentication of an application.	1	3	2	-	2	-	-	-	-	-	-	-	1	-
CO4	Utilize the services provided by the PGP, S/MIME & SSL and estimate the performance of firewalls and security protocols.	2	2	-	-	2	-	-	-	-	-	-	-	2	-
CO5	Explain the concept of cryptographic utilities and authentication mechanisms to design secure applications.	2	2	-	-	-	-	-	-	-	-	-	-	1	-
Course Code	**191HS7T06 - Management Science**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Apply management and motivation theories to renovate the practice of management.	-	-	-	-	-	-	-	-	3	-	-	-	-	-
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	-	-	-	-	-	-	-	-	-	2	-	-	-

	CO Statements	POs												PSOs	
CO3	Appraise the functional management challenges associated with high levels of change in the organizations.	-	-	-	-	-	-	-	-	3	-	-	-	-	-
CO4	Identify activities with their interdependency and use scheduling techniques of project management PERT/CPM.	1	-	-	-	-	-	-	-	-	-	3	-	-	-
CO5	Develop global vision and management skills both at strategic level and interpersonal level.	-	-	-	-	-	-	-	-	-	-	-	2	-	-
Course Code	**191CS7T16 - Mobile Computing**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Describe the fundamental concepts of Mobile Computing, Adhoc network and GSM Architecture.	3	2	1	1	-	-	-	-	-	-	-	-	1	-
CO2	Discuss the importance of MAC and Mobile IP.	-	1	3	2	-	-	-	-	-	-	-	-	1	-
CO3	Compare Traditional TCP and Modified TCP.	1	2	2	3	-	-	-	-	-	-	-	-	2	-
CO4	Summarize the database issues, Data Dissemination and Synchronization in mobile environment.	3	2	2	-	2	-	-	-	-	-	-	-	2	-
CO5	Identify the various protocol & platforms for mobile computing.	3	2	2	-	2	-	-	-	-	-	-	-	2	-
Course Code	**191CS7E19 - Middleware Technologies Professional Elective IV**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Illustrate the benefits of Client Server computing in real time applications.	2	-	-	3	-	-	-	-	-	-	-	-	2	-
CO2	Make use of RMI, JDBC, C#.net components in middleware application.	3	-	-	2	-	-	-	-	-	-	-	-	2	-
CO3	Build a Client Server invocation with data access using C#.	2	3	-	2	-	-	-	-	-	-	-	-	2	-
CO4	Explain the importance of Java and CORBA Bean Component models.	1	2	3	2	-	-	-	-	-	-	-	-	2	-
CO5	Develop a client server application using EJB.	2	2	2	3	-	-	-	-	-	-	-	-	2	-
Course Code	**191CS7E17 - Embedded Systems Professional Elective IV**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the basic concepts of an embedded systems and design approaches.	3	2	2	-	-	-	-	-	-	-	-	-	1	-
CO2	Categorize the hardware modules required to design an embedded system.	2	1	3	-	-	-	-	-	-	-	-	-	1	-
CO3	Construct the firmware for an embedded systems by various design Approaches.	2	1	3	-	2	-	-	-	-	-	-	-	2	-
CO4	Examine to integrate hardware and firmware for an embedded system in the RTOS environment.	2	3	1	-	-	-	-	-	-	-	-	-	2	-
CO5	Develop the embedded systems by various implementation and development Tools.	2	1	2	-	3	-	-	-	-	-	-	-	3	-
Course Code	**191CS7E16 - Data Analytics Professional Elective IV**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Illustrate the impact of data analytics for business decisions and strategy.	2	3	-	2	2	-	-	-	-	-	-	-	-	2
CO2	Make use of data /statistical analysis in business intelligence and pattern matching.	2	2	-	3	2	-	-	-	-	-	-	-	-	2

	CO Statements	POs												PSOs	
CO3	Apply standard data visualization and formal inference procedures.	**2**	**3**	**-**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO4	Build models using various regression techniques .	**3**	**2**	**-**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO5	Understand various visualization techniques.	**2**	**2**	**-**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
Course Code	**191CS7E20 - Software Configuration Management Professional Elective IV**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Describe the software configuration management process.	**2**	**3**	**-**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO2	Discuss the importance of configuration management activities like Identification, Control, Accounting and Auditing.	**2**	**2**	**-**	**1**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO3	Explain SCM Standards and Process Improvement models.	**2**	**3**	**-**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO4	Summarize the concepts of SCM plans, Organization and tools.	**2**	**2**	**-**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO5	Illustrate the purpose of implementation and Maintenance in SCM.	**3**	**2**	**-**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
Course Code	**191CS7E18 - Human Computer Interaction Professional Elective IV**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Outline the importance of human computer interaction for a good design.	**2**	**-**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO2	Develop a GUI application for Understanding of Users.	**2**	**-**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO3	Distinguish Online Vs Paper documentation in various development processes and social networking.	**3**	**-**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO4	Analyze screen design of various applications in GUI and Web.	**3**	**-**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO5	Compare Device based and Screen based controls.	**2**	**-**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO6	Summarize effective feedback guidance and assistance.	**3**	**-**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
Course Code	**191CS7E22 - Design Patterns Professional Elective V**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Construct a design consisting of a collection of modules.	**2**	**1**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO2	Examine well-known design patterns (such as Iterator, Observer, Factory and Visitor).	**2**	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO3	Distinguish between different categories of design patterns.	**3**	**-**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO4	Ability to understand and apply common design patterns to incremental/iterative development.	**2**	**2**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO5	Identify appropriate patterns for design of given problem.	**2**	**-**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO6	Design the software using Pattern Oriented Architectures.	**-**	**2**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
Course Code	**191CS7E23 - Fault Tolerant Computing Professional Elective V**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Describe the different types of faults and causes of faults.	**3**	**1**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO2	Explain about fault models and comparison of different models.	**2**	**2**	**2**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO3	Demonstrate the Fault Detection and Diagnosis.	**2**	**2**	**1**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO4	Illustrate the Fault Isolation and Fault Recovery.	**2**	**3**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO5	Observe the Performance evaluation of fault tolerant systems.	**2**	**1**	**1**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
Course Code	**191CS7E24 - No SQL databases Professional Elective V**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Identify what type of NoSQL database to implement based on business requirements (key-value, document, full text, graph, etc.).	**2**	**1**	**-**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**

	CO Statements	POs												PSOs	
CO2	Apply NoSQL data modeling operations from application specific queries.	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO3	Demonstrate storage architectures of different NoSQL databases.	**2**	**1**	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO4	Use Atomic Aggregates and de-normalization as data modelling techniques to optimize query processing.	**2**	**3**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO5	Make use of NoSQL databases to prepare indexes on the given data sets.	**2**	**2**	**3**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
Course Code	**191CS7E21 - Agile Methodologies (Using Devops) Professional Elective V**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Summarize the life cycle & principles of agile software development.	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**2**	**-**
CO2	Describe the fundamentals of Devops.	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**2**	**-**
CO3	Analyze the adoption of Devops in Projects and Process.	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**2**	**-**
CO4	Illustrate the types of continuous integration and continuous delivery in Devops.	**2**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**2**	**-**
CO5	Discuss the maturity models employed in Devops.	**2**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**2**	**-**
Course Code	**191CS7E25 - Parallel Computing Professional Elective V**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Describe the need of parallel processing and parallel approaches.	**2**	**-**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO2	Make use of PRAM algorithms to solve various applications.	**3**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO3	Demonstrate different networks of processor organizations.	**2**	**2**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO4	Discuss on elementary parallel algorithms.	**2**	**-**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO5	Compare Matrix multiplication using different models.	**2**	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO6	Interpret sorting, dictionary operations, and graph search algorithms.	**2**	**2**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
Course Code	**191CE7O03 - Waste Water Management Open Elective III**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Summarizethe importance of sanitation and waste water management.	**2**	**1**	**-**	**-**	**-**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Estimate the rate of sewage flow and storm water drainage.	**1**	**1**	**1**	**-**	**-**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Identify the variouscharacteristics ofsewage and plan the treatment system.	**3**	**2**	**-**	**-**	**-**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Outline various waste water treatment technologies.	**2**	**1**	**-**	**-**	**-**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Explain the different treated effluent disposal methods.	**2**	**1**	**-**	**-**	**-**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191EE7O07 - Electrical and Hybrid Vehicles Open Elective III**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the characteristics of electrical and hybrid vehicles.	**1**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Analyze the models to describe electric trains and their performance.	**1**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Compare and evaluate the different possible ways of energy storage.	**1**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Demonstrate the sizing of the drive system.	**1**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Apply the different strategies related to energy management.	**1**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191EE7O08 - Special Electrical Machines Open Elective III**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Distinguish between brush dc motor and brush less dc motor.	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

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

	CO Statements	POs												PSOs	
Course Code	**191ME7O15 - Introduction to Material Handling Systems Open Elective III**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	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	Calculate the operating characteristics in material handling mechanisms	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191ME7O16 - Robotics Open Elective III**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the basic concepts, parts of robots and types of robots.	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
CO2	Identify various robot configuration and components,	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
CO3	Select appropriate actuators and sensors for a robot based on specific application	**1**	**-**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
CO4	Apply DH Notation for Joint coordinates and world coordinators in Manipulator kinematics problems	**-**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
CO5	Analyze the trajectory planning for a manipulator by avoiding Obstacles	**-**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
Course Code	**191ME7O17 - Entrepreneurship Development and Incubation Open Elective III**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Describe the meaning and concepts of entrepreneurship development	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**-**	**-**	**2**	**-**		**-**	**-**
CO2	Apply the business plan for preparation and evaluation of project.	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**-**	**-**	**2**	**-**		**-**	**-**
CO3	Explain about Institutional Support to Entrepreneur and MSMEs	**-**	**-**	**-**	**-**	**-**	**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**
CO1	Analyze Discrete Time Signals and Systems.	**2**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Apply various DFT properties to evaluate the given sequence.	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Make use of FFT Algorithms for the computation of DFT.	**2**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Design digital filters and implement with different structures.	**2**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Apply the knowledge of Multirate signal processing in the real time applications.	**2**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191EC7O07 - Basics of VLSI Design Open Elective III**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Demonstrate the fundamental concepts of basic MOS theory of fabrication process and the electrical properties of MOS and Bi-CMOS Circuits.	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

	CO Statements	POs												PSOs	
CO2	Develop the stick and layout models of MOS circuits using design rules.	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Develop various CMOS logic structures using different MOS logic technologies.	**2**	**2**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Demonstrate the scaling factors in determining the characteristics and performance of MOS circuits in silicon.	**2**	**3**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Explain different architectural issues of subsystem design process and testability.	**2**	**1**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191EC7O08 - Micro Electro Mechanical Systems Open Elective III**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Summarize the operation of micro systems, and their applications.	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Classify the materials for micro system applications.	**2**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Explain the state-of-the-art for lithography and packaging techniques.	**3**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Extend the knowledge of basic approaches for various sensors and actuators design.	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Apply the expertise on micro systems for interdisciplinary applications.	**2**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191EC7O09 -Image Processing Open Elective III**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the concepts of digital image processing.	**2**	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Identify various image enhancement and image restoration techniques.	**2**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Outline the color fundamentals and different color image processing methods.	**2**	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Utilize different morphological operators for image processing.	**2**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Analyze different image segmentation techniques for image processing.	**2**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191CS7O10 - Big Data Analytics Open Elective III**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Illustrate big data challenges in different domains including social media, transportation, finance, and medicine.	**2**	**3**	**-**	**-**	**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**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191CS7O11 - Mobile Application Development Open Elective III**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Make use of Android Studio to develop Android application.	**3**	**-**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Develop user Interfaces using Android platform.	**2**	**2**	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

	CO Statements	POs												PSOs	
CO3	Make Use of state information across important operating system events.	**2**	**3**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Apply Java programming concepts to Android application development.	**3**	**2**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Explain the concepts of GPS and mobile security.	**2**	**2**	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191CS7O12 - Data Science Open Elective III**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Describe Data Science and the skill sets needed to be a data scientist.	**-**	**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	**191IT7O06 - Machine Learning Open Elective III**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Identify machine learning techniques suitable for a given problem	**2**	**1**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Evaluate the performance of an algorithm used in an ML model	**3**	**3**	**1**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Apply probability approximations and frame ordered and unordered rules for given machine learning problem	**3**	**2**	**1**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Design multilayer model using techniques like back propagation, quadratic programming solution.	**3**	**2**	**1**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Design models using conditional probability, logistic regression, and distance-based techniques.	**3**	**2**	**1**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191IT7O07 - Quantum Computing Oen Elective III**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Illustrate fundamentals of quantum information processing	**3**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Explain quantum basics and principles	**3**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Apply various quantum algorithms for solving problems	**2**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Apply simple quantum algorithms and information channels in the quantum circuit model	**2**	**1**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Demonstrate Performance, Security and Scalability of quantum computing	**2**	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO6	Analyze various quantum computing models and approaches	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191IT7O08 - Block Chain Technologies Oen Elective III**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Demonstrate the foundation of the Blockchain technology and understand the processes in payment and funding.	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**
CO2	Identify the risks involved in building Blockchain applications.	**2**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**
CO3	Explain the legal implications using smart contracts.	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**
CO4	Choose the present landscape of Blockchain implementations and Understand Crypto currency markets	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**

	CO Statements	POs												PSOs	
CO5	Examine how to profit from trading crypto currencies.	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**
Course Code	**191MI7O04 - Communication System in Mines Open Elective III**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Demonstrate types of signals and relation of time domain representation to frequency domain.	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Apply signal concepts to continuous wave modulation.	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Interpret the basic concepts of pulse modulation.	**3**	**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**
CO1	Differentiate between explosives.	**1**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Use blasting accessories along with monitoring and assessment.	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Analyze problems associated with open cast blasting and mitigation.	**1**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Analyze problems associated with underground blasting and mitigation.	**1**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Assess blasting in metal mines.	**1**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191PT7O05 - Introduction to Earth Sciences Open Elective III**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Understand 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**
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**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191AG7O04 - Greenhouse Technology Open Elective III**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Design small scale polyhouse for drying purpose.	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**
CO2	Classify greenhouses based on construction materials.	**3**	**2**	**-**	**-**	**1**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Explain the scenario of protective cultivation around the globe and in India.	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

	CO Statements	POs												PSOs	
CO4	Make use of non-chemical and chemical pesticides and growth regulators effectively in an environmentally responsible way.	**1**	**-**	**1**	**-**	**-**	**-**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Assess the basic production requirements and the knowledge of horticulture crop cultivation in greenhouse.	**3**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191AG7O05 - Floods and Control Measures Open Elective III**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Determine the peak rate of flood by rational, empirical methods and flood frequency by log normal, Gumbel's extreme value and log-Pearson type-III distribution methods.	**2**	**2**	**1**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Explain importance of various flood routing techniques and flood control measures.	**3**	**2**	**1**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Design of flood control projects and their cost economics estimation.	**3**	**2**	**1**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Estimate seepage through earth embankments and understand causes of failures.	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Design of earthen dam and its stability analysis by different methods	**3**	**2**	**1**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191CS7L08 - Mobile Application Development Lab**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Use Classes to develop J2ME applications to solve real time problems.	**-**	**3**	**1**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO2	Apply Event handling technique using J2ME.	**-**	**2**	**1**	**1**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO3	Develop basic android mobile applications.	**-**	**1**	**2**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO4	Create an android application to implement Intents.	**-**	**2**	**3**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
CO5	Apply Layouts techniques to solve orientation problems.	**-**	**1**	**2**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO6	Build real time applications using android.	**-**	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**
Course Code	**191IT7P03 - Internship**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Conduct a technical survey to identify a real world engineering problem	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**1**	**2**	**2**
CO2	Analyze the industrial plant layout using technical expertise	**2**	**-**	**-**	**-**	**-**	**1**	**1**		**-**	**-**	**-**	**1**	**1**	**2**
CO3	Compare theoretical and real work environments in technical perspective	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**1**	**1**	**2**
CO4	Identify the challenges in the execution of operations	**1**	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2**
CO5	Execute the operations and report the results of assigned tasks using modern tools adhering to professional ethics	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**2**	**1**	**1**	**-**	**-**	**2**	**2**
Course Code	**191IT7P04 - Project Part I**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Conduct technical survey to identify a real industrial problem to solve as a project work	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**1**	**2**	**2**
CO2	Estimate the resources & constraints in the process of execution	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**2**
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**	**2**
CO4	Estimate the costs of individual stages and overall cost of the project in light of optimum resources allocation	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**2**
CO5	Estimate the optimum project duration using quantitative techniques	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**2**

	CO Statements	POs												PSOs	
VIII SEM															
Course Code	**191CS8E26 - Block chain Architecture Design and Use cases Professional Elective VI**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Demonstrate the foundation of the Blockchain technology and understand the processes in payment and funding.	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**2**	**-**
CO2	Identify the risks involved in building Blockchain applications.	**2**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**-**
CO3	Review of legal implications using smart contracts.	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**2**	**-**
CO4	Choose the present landscape of Blockchain implementations and Understand Crypto currency markets.	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**2**	**-**
CO5	Examine how to profit from trading crypto currencies.	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**2**	**-**
Course Code	**191CS8E29 - Real Time Operating Systems Professional Elective VI**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Illustrate real time programming concepts.	**2**	**1**	**-**	**-**	**2**	**-**	**-**	**-**	**3**	**-**	**-**	**-**	**2**	**-**
CO2	Apply RTOS functions to implement embedded applications.	**3**	**2**	**-**	**-**	**2**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**2**	**-**
CO3	Describe fundamentals of design consideration for embedded applications.	**2**	**1**	**-**	**-**	**2**	**-**	**-**	**-**	**3**	**-**	**-**	**-**	**2**	**-**
CO4	Summarize the different memory management techniques.	**2**	**3**	**-**	**-**	**2**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**2**	**-**
CO5	Make use of concept of synchronization to overcome the problem of deadlock.	**2**	**2**	**-**	**-**	**3**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**2**	**-**
Course Code	**191CS8E28 - Deep Learning Professional Elective VI**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Demonstrate the mathematical foundation of neural network.	**3**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO2	Describe the machine learning basics.	**3**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO3	Differentiate architecture of deep neural network.	**2**	**2**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO4	Build a convolutional neural network.	**2**	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO5	Build and train RNN and LSTMs.	**2**	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
Course Code	**191CS8E30 - Software Project Management Professional Elective VI**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain Software Project Management fundamentals and Planning activities.	**-**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**2**	**-**	**2**	**-**
CO2	Compare SDLC models in project framework.	**-**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**3**	**-**	**2**	**-**
CO3	Apply various Effort estimation techniques and tools in real time applications.	**-**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**2**	**-**	**2**	**-**
CO4	Discuss various Risk categories, Project Monitoring Control and Resource Allocation.	**-**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**2**	**-**	**2**	**-**
CO5	Demonstrate the concept Software Quality.	**-**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**3**	**-**	**2**	**-**
Course Code	**191CS8E27 - Cyber Security Professional Elective VI**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the cyber security and security management methods to maintain security protection.	**3**	**1**	**-**	**-**	**2**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**2**	**-**
CO2	Illustrate the nature of secure software development and operating systems.	**2**	**3**	**-**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**

	CO Statements	POs												PSOs	
CO3	Summarize the Network management and cloud computing security issues.	**1**	**2**	**-**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO4	Analyze the data privacy techniques and data management.	**1**	**2**	**-**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO5	Demonstrate the role security management plays in cyber security defense and legal and social issues at play in developing solutions.	**2**	**1**	**-**	**-**	**2**	**-**	**-**	**3**	**-**	**-**	**-**	**-**	**2**	**-**
Course Code	**191CE8O04 - Integrated Waste Management for a Smart City Open Elective IV**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Describe generation rates, composition, and issues of Solid waste.	**2**	**1**	**-**	**-**	**-**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Explain the issues, collection, recovery, reuse, processing of Municipal solid waste.	**2**	**1**	**-**	**-**	**-**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Illustrate the rules regarding MSW and current issues in Solid waste management.	**1**	**2**	**-**	**-**	**-**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Interpret Construction and demolition waste management.	**2**	**1**	**-**	**-**	**-**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Assess the issues related to E-waste generation and current management practices.	**1**	**2**	**-**	**-**	**-**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191EE8O10 - Fundamentals of Electrical Engineering Open Elective IV**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the concepts of basic circuits and basic laws for electrical networks.	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Summarize the behaviour of RLC networks.	**3**	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Analyse the network by obtaining solution through mesh and nodal analysis.	**3**	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Determine resonance frequency and Q factor of an AC Circuit.	**2**	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Explain the operation of the Transformer.	**3**	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO6	Explain the operation of the Induction motors and DC Machines.	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191EE8O11 - Basic Electrical Circuits Open Elective IV**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Construct various theories of electrical networks.	**3**	**2**	**1**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Explain the importance of three phase circuits with Star& Delta connected balanced and unbalanced loads.	**2**	**1**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Illustrate various electrical networks by using principles of network theorems	**2**	**1**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Obtain the various network parameters for the given two port networks.	**3**	**2**	**1**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Analyse the transient behaviour of electrical networks for DC excitations.	**2**	**1**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191EE8O12 - Electrical Machines Open Elective IV**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Evaluate the effects of armature reaction in dc machines	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Determine the torque production mechanism and control the speed of dc motors.	**3**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

	CO Statements	POs												PSOs	
CO3	Determine the voltage regulation and efficiency of single-phase transformers.	**2**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Explain the operation and performance of three phase induction motor.	**1**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Apply methods of staring and correction of power factor with synchronous motor	**3**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191EE8O13 - Power Electronics** **Open Elective IV**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the different types of power semiconductor devices and their Characteristics.	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Distinguish between 1ϕ and 3ϕ phase-controlled converters.	**3**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Analyze the operation of AC voltage controllers and cycloconverters.	**3**	**2**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Analyze the operation of different types of DC-DC converters.	**3**	**2**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Illustrate the operation of Inverters and application of PWM techniques.	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191EE8O14 - Non-Conventional Energy Sources** **Open Elective IV**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the prospects of renewable energy and solar energy.	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Apply the knowledge of solar principles for its applications.	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Discuss the working principles of wind and Bio-mass energy resources.	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Illustrate the techniques and conversion principles of Geothermal and tidal energy resources.	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Explain the concept of Direct energy conversion .	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191ME8O18 - Fabrication processes** **Open Elective IV**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the fundamentalsof Casting and Casting Processes.	**-**	**2**	**-**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
CO2	Explain the basics of Welding and types of Welding processes.	**-**	**2**	**-**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
CO3	Explain the various technological approaches applied to the different hot working and cold working operations.	**1**	**-**	**-**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
CO4	Explain the concept of various Extrusion processes and forces in extrusion.	**1**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
CO5	Explain the concept of Forging processes, Forging defects and forces in forging operations.	**2**	**-**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
Course Code	**191ME8O19 - Smart Materials** **Open Elective IV**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Describe and characterize mechanical behaviour of smart materials.	**2**	**1**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
CO2	Select materials for sensor applications based on required properties.	**2**	**1**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
CO3	Characterize interaction between smart materials and simple structures in actuation and sensing.	**2**	**1**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**1**	**-**	**-**

	CO Statements	POs												PSOs	
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**	**-**	**2**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
Course Code	**191EC8O10 - Micro Electro Mechanical Systems Open Elective IV**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Summarize the operation of micro systems, and their applications.	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Classify the materials for micro system applications.	**2**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Explain the state-of-the-art for lithography and packaging techniques.	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Extend the knowledge of basic approaches for various sensors and actuators design .	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Apply the experience on micro systems for interdisciplinary applications.	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191EC8O11 - Basic Electronic Circuits Open Elective IV**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain Superposition theorem and Phasors.	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Interpret about BJT and BJT Amplifier.	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Develop Operations performed by OP-AMP circuits.	**2**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Develop Counters and Registers using Flip-flops.	**2**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Contrast Analog-to-digital and Digital-to -analog conversions.	**3**	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191EC8O12 - Principles of Communications Open Elective IV**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Illustrate Analog communication systems using amplitude modulation and demodulation.	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
CO2	Demonstrate Analog communication systems using angle modulation and demodulation.	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
CO3	Analyze various pulse analog and pulse digital modulation techniques.	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
CO4	Explain the process of reproduction of baseband signal.	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
CO5	Compare and contrast various Multiplexing techniques used in Communication systems.	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
Course Code	**191EC8O13 - Electronic Instrumentation Open Elective IV**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the fundamental characteristics of different Instruments	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Compare different signal generators and function generators in terms of their performance.	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Distinguish the operation of various types of analog and digital meters.	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Interpret the working of various potentiometers and AC bridges.	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Compare various data acquisition systems for analog to digital conversion and digital to analog conversion.	**2**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

	CO Statements	POs												PSOs	
Course Code	**191EC8O14 - Digital Image Processing Open Elective IV**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the concepts of digital image processing.	**2**	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Utilize various image transforms techniques for image analysis.	**3**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Identify the image enhancement and restoration methods.	**3**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Utilize color fundamentals and different color image processing methods.	**3**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Explain different image segmentation techniques and image morphological operators for image processing.	**2**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191CS8O13 - Cyber Security Open Elective IV**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Illustrate cybercrime fundamentals.	**2**	**1**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Distinguish type of tools and methods used in cyber crimes.	**3**	**3**	**2**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Interpret the nature and effect of cybercrime 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**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Explain the importance of cyber security.	**2**	**1**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191CS8O14 - Data Science Open Elective IV**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Describe Data Science and the skill sets needed to be a data scientist.	**-**	**3**	**1**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**
CO2	Apply basic tools for visualizing Data& optimization.	**-**	**2**	**1**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**
CO3	Describe the process of reading and exploring data.	**-**	**2**	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**
CO4	Implement various machine learning algorithms for analyzing various datasets.	**-**	**2**	**2**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**
CO5	Analyze datasets using clustering and recommender systems.	**-**	**3**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**
Course Code	**191IT8O12 - Game Programming Open Elective IV**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the concepts of Game design and development.	**-**	**1**	**2**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Design the processes and use mechanics for game development.	**-**	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Explain the Core architectures of Game Programming.	**-**	**1**	**3**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	Make use of Game programming platforms, frame works and engines to develop a game.	**-**	**2**	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Create interactive Games.	**-**	**3**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191IT8O11 - Cloud Computing Open Elective IV**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Interpret the key dimensions of the challenge of Cloud Computing.	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	Identify the economics, financial, and technological implications for selecting cloud computing for own organization.	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	Demonstrate the basic concepts of virtualization and implementation levels of Virtualization.	**2**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**

	CO Statements	POs												PSOs	
CO4	Classify various storage systems and models in cloud computing environment.	**2**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**
CO5	Analyze the Cloud Security risks and Mechanisms.	**2**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**		**-**	**-**
CO6	Utilize cloud environment platform and tools for actively initiating, installing, and developing cloud-based applications.	**2**	**-**	**1**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
Course Code	**191CS8O16 - AR / VR** **Open Elective IV**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain VR, its environments and hardware technologies for 3D interfaces.	**2**	**1**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
CO2	Summarize 3D user interface input hardware in VR environment.	**2**	**1**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
CO3	Make use of software technologies to build VR applications.	**3**	**2**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
CO4	Develop 3D user interfaces using 3D interaction techniques.	**3**	**2**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
CO5	Describe the fundamental concepts of AR	**2**	**1**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
Course Code	**191IT8O09 - Deep learning** **Open Elective IV**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Demonstrate the mathematical foundation of neural network.	**-**	**2**	**1**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO2	Explain various machine learning algorithms and their importance for data analysis.	**-**	**2**	**1**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**
CO3	Illustrate the challenges and optimization strategies of deep neural network.	**-**	**2**	**-**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
CO4	Build a convolutional neural network using different activation functions.	**2**	**2**	**3**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	Build and train RNN and LSTMs using sequence modelling.	**1**	**2**	**3**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Course Code	**191IT8O10 - Block Chain Technologies** **Open Elective IV**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Demonstrate the foundation of the Blockchain technology and understand the processes in payment and funding.	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**
CO2	Identify the risks involved in building Blockchain applications.	**2**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**
CO3	Review of legal implications using smart contracts.	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**
CO4	Analyze the present landscape of Blockchain implementations to understand Crypto currency markets.	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**
CO5	Examine how to profit from trading crypto currencies.	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**
Course Code	**191PT8O07 - Chemical Process Safety** **Open Elective IV**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the Process Safety, Accidents and Loss statistics, Toxicological Studies.	**2**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
CO2	Explain the fire and explosion and its prevention.	**2**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
CO3	Explain the Source model and dispersion, Relief sizing.	**2**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
CO4	Illustrate Hazard Identification, HAZOP analysis, Risk Assessment.	**2**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
CO5	Explain the Process of Accident Investigation, Reliability Engineering, Economics of loss prevention.	**2**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**

	CO Statements	POs												PSOs	
Course Code	**191PT8O08 - Mechanical Unit Operations Open Elective IV**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Explain the fundamentals of Mechanical unit operations.	**2**	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Explain storage of bulk solids and flow measurements.	**2**	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Explain the Flow past immersed solid objects and motion of particles through fluids, beds of solids.	**2**	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	Apply Filtration, flow through packed and fluidized beds, cross flow filtration.	**2**	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	Explain the Gravity sedimentation, centrifugal separations, floatation.	**2**	-	-	-	-	-	-	-	-	-	-	-	-	-
Course Code	**191AG8O06 - Applications of RS and GIS in Land and Water Resources Management (Open Elective IV)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Apply the knowledge of RS and GIS in land and water resources management.	**1**	-	-	-	**3**	-	-	-	-	-	-	**1**	-	-
CO2	Explain DEM hydro-processing for watershed characterization.	**1**	-	-	-	**2**	-	-	-	-	-	-	-	-	-
CO3	Demonstrate the digital image processing techniques using ERDAS/ARC GIS software.	**1**	**1**	-	-	**2**	-	-	-	-	-	-	-	-	-
CO4	Apply the Geospatial techniques in irrigation water management.	**1**	-	**1**	-	**3**	-	-	-	-	-	-	**1**	-	-
CO5	Apply RS & GIS inputs for site suitability for various water related projects.	**1**	**1**	**3**	-	**1**	-	**2**	-	-	-	-	-	-	-
Course Code	**191AG8O07 - Plastic Applications in Agriculture Open Elective IV**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Assess the types and quality of plastics used in soil and water conservation.	**2**	**1**	-	-	-	-	**3**	-	-	-	**2**	-	-	-
CO2	Design, estimation and laying of plastic films in lining of canal, reservoir and water harvesting ponds.	**3**	**1**	**2**	**2**	-	-	-	-	-	-	-	-	-	-
CO3	Design, estimation and installation of green, poly and shade net houses, low tunnels etc.	**3**	**1**	**2**	**2**	-	-	-	-	-	-	-	-	-	-
CO4	Explain plastics application in drying, preservation, handling and storage of agricultural produce.	**3**	**1**	-	**2**	-	**2**	-	-	-	-	-	-	-	-
CO5	Outline plastic usage due to hands on experience through visit to a greenhouse and farmer's field.	**3**	**1**	-	**2**	-	**2**	-	-	-	-	-	-	-	-
Course Code	**191IT8P05 - Project Part II**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	Demonstrate technical skills of data collection and data analysis adhering to professional ethics.	**1**	**3**	**2**	**2**	**1**	-	-	-	**2**	**2**	**2**	**3**	**2**	**1**
CO2	Design the solutions for the critical problem areas marked in data analysis in the light of environmental and societal adherence.	**1**	**3**	**2**	-	**1**	**1**	-	-	**2**	**2**	**2**	**2**	**2**	**1**
CO3	Build a team of people to work together and communicate well in the critical stages of project progress.	**1**	**3**	**3**	**2**	-	-	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**1**
CO4	Use modern tools to derive conclusions of the project work effectively.	**1**	**3**	**2**	**1**	-	-	-	-	**2**	**2**	**2**	**2**	**2**	**1**
CO5	Demonstrate the results of the project work as a functional product prototype/application/analytical solution for a specified operation.	**1**	**3**	**2**	**1**	**1**	**1**	-	**1**	**1**	**2**	**1**	**1**	**2**	**1**