VASIREDDY VENKATADRI INSTITUTE OF TECHNOLOGY
(Autonomous)
Permanently Affiliated to JNTU, Kakinada, Approved by AICTE
Accredited by NAAC with 'A' Grade, ISO 9001:2015 Certified
Nambur, Pedakakani (M), Guntur (Dt) - 522508
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
B.Tech Programme Accredited by NBA

R19 Articulation Matrix

I-I

Communicative English

CO1	Identify the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English.
CO2	Formulate sentences using proper grammatical structures and correct word forms.
CO3	Speak clearly on a specific topic using suitable discourse markers in informal discussions.
CO4	Write summaries based on global comprehension of reading/listening texts.
CO5	Produce a coherent paragraph interpreting a figure/graph/chart/table.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	-	-	-	-	-	-	-	2	3	-
CO2	-	-	-	-	-	-	-	-	2	3	-
CO3	-	-	-	-	-	-	-	-	2	3	-
CO4	-	-	-	-	-	-	-	-	2	3	-
CO5	-	-	-	-	-	-	-	-	2	3	-

Chemistry

CO1	Explain the preparation, properties and applications of thermoplastics, thermosettings, elastomers and conducting polymers
CO2	Know the importance of various materials and their uses in the construction of batteries and fuel cells
CO3	Acquire the knowledge of nano-materials, refractories, lubricants and cement.
CO4	Assess the quality of various fuels.
CO5	Summarize the importance of water and its usage in various industries.

Applied C

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	-	-	-	-	2	-	-	-	-
CO2	2	3	-	-	-	-	1	-	-	-	-
CO3	3	2	-	-	-	-	1	-	-	-	-
CO4	2	2	-	-	-	-	2	-	-	-	-
CO5	2	2	-	-	-	-	3	-	-	-	-

Mathematics-I

CO1	Solve the differential equations related to various engineering fields. .
CO2	Utilize mean value theorems to real life problems.
CO3	Familiarize with functions of several variables which is useful in optimization.
CO4	Apply double integration techniques in evaluating areas bounded by region
CO5	Learn important tools of calculus in higher dimensions. Students will become familiar with 2-dimensional and 3 – dimensional coordinate systems.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-

Solving using C

CO1	Summarize algorithms and basic terminology of C.
CO2	Solve problems using control structures and modular approach.
CO3	Make use of 1D and 2D arrays along with strings for linear data handling.
CO4	Determine the use of pointers and structures.
CO5	Implement various operations on data files.

Programming for Problem

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	-	-	-	-	-	-	-	-	-	-
CO2	2	-	2	-	-	-	-	-	-	-	-
CO3	-	2	2	-	-	-	-	-	-	-	-
CO4	-	2	2	-	-	-	-	-	-	-	-
CO5	2	2	2	1	-	-	-	-	-	-	2

Communicative English Lab I

CO1	Identify the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English and speak clearly on
CO2	Take notes while listening to a talk/lecture; to answer questions in English; formulate sentences using proper grammatical structures and correct word forms;
CO3	Write summaries based on global comprehension of reading/listening texts; produce a coherent write-up interpreting a figure/graph/chart/table; and use

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	-	-	-	-	-	-	-	2	3	-
CO2	-	-	-	-	-	-	-	-	2	3	-
CO3	-	-	-	-	-	-	-	-	2	3	-

Applied Chemistry Lab

CO1	Estimate the amount of metal ions present in different solutions.
CO2	Analyze the quality parameters of water.
CO3	Determine the strength of different solutions by using different instrumentation techniques.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	3	2	-	-	1	2	-	-	2	-
CO2	-	2	3	-	-	1	3	-	-	1	-
CO3	-	1	2	-	-	1	2	-	-	1	-

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11

Programming For Problem Solving Using C Lab

CO1	Comprehend the various concepts of a C language.
CO2	Develop algorithms and flowchart.
CO3	Design and development of C problem solving skill.
CO4	Acquire modular programming skills.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	1	2	3	2	1	-	-	-	3	3	1
CO2	2	3	3	2	-	-	-	-	1	1	2
CO3	3	3	3	2	-	-	-	-	2	1	2
CO4	2	2	2	2	-	-	-	-	2	1	2

Engineering Work Shop

CO1	Apply wood working skills in real world applications.
CO2	Build different parts with metal sheets in real world applications.
CO3	Apply fitting operations in various applications.
CO4	Apply different types of basic electric circuit connections.
CO5	Demonstrate soldering and brazing.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	1	2	3	2	1	-	-	-	3	3	1
CO2	2	3	3	2	-	-	-	-	1	1	2
CO3	3	3	3	2	-	-	-	-	2	1	2
CO4	2	2	2	2	-	-	-	-	2	1	2
CO5	2	2	2	2	-	-	-	-	2	1	2

Mathematics – II

CO1	Evaluate approximate in the roots of polynomial and transcendental equations by different algorithms.	
CO2	Solve system of linear algebraic equations using Gauss Jacobi, Gauss Seidel and apply Newton's forward and backward interpolation and Lagrange's formulae for	
CO3	Apply different algorithms for approximating the solutions of ordinary differential equations to its analytical computations and also by Laplace the transforms for	
CO4	Find or compute the Fourier series of periodic signals (SOLVE, APPLY, FIND, ANALYSE).	
CO5	Know and be able to apply integral expressions for the forwards and inverse Fourier transform to range of non-periodic waveforms.	

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-

Mathematics – III

CO1	Develop the use of matrix algebra techniques that is needed by engineers for practical applications.	
CO2	Solve system of linear algebraic equations using Gauss elimination, Gauss Jordan.	
CO3	Interpret the physical meaning of different operators such as gradient, curl and divergence.	
CO4	Estimate the work done against a field, circulation and flux using vector calculus.	
CO5	Identify the solution methods for partial differential equation that model physical processes.	

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
	CO5	3	2	-	-	-	-	-	-	-	-	-

Applied Physics	CO1	Summarize the principles to design and enhance the resolving power of various optical instruments.
	CO2	Learn concepts of LASER light Sources and Apply them to holography.
	CO3	Study the magnetic and dielectric materials to enhance the utility aspects of materials.
	CO4	Learn the fundamental concepts of Quantum behavior of matter.
	CO5	Identify the type of semiconductors using Hall Effect.

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
	CO1	3	2	-	-	-	-	-	-	-	-	-
	CO2	3	2	-	-	-	-	-	-	-	-	-
	CO3	3	2	-	-	-	-	-	-	-	-	-
	CO4	3	2	-	-	-	-	-	-	-	-	-
	CO5	3	2	-	-	-	-	-	-	-	-	-

Python Programming	CO1	Summarize the need and the Jargon of Python language.
	CO2	Experiment with various Data structures in interpreted Language.
	CO3	Build modules and packages for real software needs.
	CO4	Implement object-oriented principles in Python.
	CO5	Identify solutions using GUI and testing mechanisms.

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
	CO1	2	2	1	-	-	-	-	-	-	-	-
	CO2	1	2	2	-	-	-	-	-	-	-	-
	CO3	1	-	2	2	-	-	-	-	-	-	-

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO4	2	-	2	1	-	-	-	-	-	-	-
CO5	-	2	1	2	-	-	-	-	-	-	-

Basic Electrical & Electronics Engineering

CO1	Apply concepts of KVL/KCL in solving DC circuits.
CO2	Choose correct machine for a specific application.
CO3	Illustrate working principles of DC and AC Machines.
CO4	Describe working principles of diodes and transistors.
CO5	Summarize the applications of diodes and transistors.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-
CO3	3	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-
CO5	3	-	-	-	-	-	-	-	-	-	-

Engineering Graphics and Design

CO1	Prepare engineering drawings as per BIS conventions.
CO2	Produce computer generated of orthographic projections of Lines and Plane Surfaces using CAD software.
CO3	Use the knowledge of orthographic projections of Solids to represent engineering information / concepts and present the same in the form of drawings.
CO4	Use the knowledge of sectional views and Development of Solid Surfaces in Real time Applications.
CO5	Develop isometric drawings of simple objects reading the orthographic projections of those objects.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	1	1	-	3	-	-	-	-	2	-
CO2	2	1	1	-	3	-	-	-	-	2	-

CO3	2	2	2	-	3	-	-	-	-	2	-
CO4	2	2	2	-	3	-	-	-	-	2	-
CO5	2	2	2	-	3	-	-	-	-	2	-

Python Programming Lab	CO1	Comprehend how software easily to be build right out of the box
	CO2	Demonstrate the use of an interpreted language for problem solving through control statements including loops and conditionals.
	CO3	Practice with data structures for quick programming solutions
	CO4	Demonstrate software building for real needs by breaking out code into reusable functions and modules
	CO5	Comprehend the software reliability through exception handling
	CO6	Use of python standard library for problem solving and identifies the necessity of testing software

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	-	1	-	-	-	-	-	-	-
CO2	2	3	-	-	-	-	-	-	-	-	-
CO3	-	2	1	-	-	-	-	-	-	-	-
CO4	3	-	-	-	-	-	-	-	-	-	-
CO5	2	3	-	3	-	-	-	-	-	-	-
CO6	2	3	-	3	-	-	-	-	-	-	-

CO1	Operate optical instruments like microscope and spectrometer.
CO2	Determine thickness of a paper with the concept of interference.
CO3	Estimate the wavelength of different colors using diffraction grating and resolving power.
CO4	Plot the intensity of the magnetic field of circular coil carrying current with distance.
CO5	Determine magnetic susceptibility of the material and its losses by B-H curve.
CO6	Determine the resistivity of the given semiconductor using four probe method.

Applied Physics Lab

	CO7	Identify the type of semiconductor i.e., n-type or p-type using hall effect.
	CO8	Calculate the band gap of a given semiconductor.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	3	2	-	-	1	2	-	-	2	-
CO2	-	2	3	-	-	1	3	-	-	1	-
CO3	-	1	2	-	-	1	2	-	-	1	-
CO4	-	1	2	-	-	-	-	-	-	2	-
CO5	-	1	3	-	-	3	2	-	-	1	-
CO6	-	1	2	-	-	2	3	-	-	1	-
CO7	-	3	3	-	-	1	2	-	-	-	-
CO8	-	2	2	-	-	-	-	-	-	-	-

Communicative English Lab-2

	CO1	Prioritize information from reading texts after selecting relevant and useful points.
	CO2	Paraphrase short academic texts using suitable strategies and conventions.
	CO3	Make formal structured presentations on academic topics using PPT slides with relevant graphical elements.
	CO4	Participate in group discussions using appropriate conventions and language strategies.
	CO5	Prepare a CV with a cover letter to seek internship/ job and collaborate with a partner to make presentations and Project Reports.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	-	-	-	-	-	-	-	2	3	-
CO2	-	-	-	-	-	-	-	-	2	3	-
CO3	-	-	-	-	-	-	-	-	2	3	-
CO4	-	-	-	-	-	-	-	-	2	3	-
CO5	-	-	-	-	-	-	-	-	2	3	-

M F C S	CO1	Apply mathematical logic to solve problems.
	CO2	Summarize sets, relations and discrete structures.
	CO3	Apply number theory to perform modulo arithmetic and computer arithmetic.
	CO4	Solve problems on recurrence relations and counting principles.
	CO5	Analyze and solve real world problems using graphs and trees.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2	1	-	-	-	-	-	-	-	-
CO2	1	2	2	-	-	-	-	-	-	-	-
CO3	1	-	2	2	-	-	-	-	-	-	-
CO4	2	-	2	1	-	-	-	-	-	-	-
CO5	-	2	1	2	-	-	-	-	-	-	-

Data Structures	CO1	Implement various operations on linear lists .
	CO2	Apply data structure strategies like stacks and queues for exploring complex data structures.
	CO3	Identify performance and trade-offs of static and dynamic data structures.
	CO4	Incorporate data structures into the applications such as binary trees, binary search trees.
	CO5	Identify appropriate data structure algorithms for graphs.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2	1	-	-	-	-	-	-	-	-
CO2	1	2	2	-	-	-	-	-	-	-	-
CO3	1	-	2	2	-	-	-	-	-	-	-

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO4	2	-	2	1	-	-	-	-	-	-	-
CO5	1	2	1	2	-	-	-	-	-	-	-

	CO1	Distinguish the analog and digital systems, apply positional notations, number systems and computer codes in digital systems.
	CO2	Apply the Boolean algebra theorems, simplify and design logic circuits.
	CO3	Implement combinational logic circuit design and modular combinational circuits using encoders, decoders, multiplexers and demultiplexers
Digital Circuits & Logic Design	CO4	Summarize the basic elements of sequential logic circuits.
	CO5	Design and analyze the registers and counters.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2	1	-	-	-	-	-	-	-	-
CO2	1	2	2	-	-	-	-	-	-	-	-
CO3	1	-	2	2	-	-	-	-	-	-	-
CO4	2	-	2	1	-	-	-	-	-	-	-
CO5	1	2	1	2	-	-	-	-	-	-	-

	CO1	Summarize object-oriented programming concepts for problem solving.
	CO2	Build class hierarchy and packages for real world problems.
	CO3	Develop thread safe Java programs with appropriate Exception handling.
	CO4	Implement various data structures using java collections.
Java Programming	CO5	Design GUI and network-based applications using swings and multithreading.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2	1	-	-	-	-	-	-	-	-
CO2	1	2	2	-	-	-	-	-	-	-	-

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
	CO3	1	-	2	2	-	-	-	-	-	-	-
	CO4	2	-	2	1	-	-	-	-	-	-	-
	CO5	1	2	1	2	-	-	-	-	-	-	-

Probability & Statistics	CO1	Classify the concepts of data science and its importance.
	CO2	Summarize the concepts of probability and their applications, & apply discrete and continuous probability distributions.
	CO3	Interpret the association of characteristics and through correlation and regression tools.
	CO4	Design the components of a classical hypothesis test.
	CO5	Infer the statistical inferential methods based on small and large sampling tests.

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
	CO1	2	2	-	-	-	-	-	-	-	-	-
	CO2	2	3	-	-	-	-	-	-	-	-	-
	CO3	2	2	-	-	-	-	-	-	-	-	-
	CO4	2	2	-	-	-	-	-	-	-	-	-
	CO5	2	3	-	-	-	-	-	-	-	-	-

Data Structures Lab	CO1	Identify appropriate list for solving general data structure problems.
	CO2	Incorporate data structures into the applications such as binary trees, binary search trees.
	CO3	Choose appropriate algorithm for solving graph related problems.

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
	CO1	2	2	1	-	-	-	-	-	-	-	-
	CO2	2	-	2	1	-	-	-	-	-	-	-
	CO3	-	2	1	2	-	-	-	-	-	-	-

Java Programming Lab

	CO1	Develop programs for solving real world problems using java collection frame work.
	CO2	Develop and apply multithreaded programs in network applications.
	CO3	Develop GUI programs using swing controls in Java.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2	1	-	-	-	-	-	-	-	-
CO2	2	-	2	1	-	-	-	-	-	-	-
CO3	-	2	1	2	-	-	-	-	-	-	-

II – II

Software Engineering

CO1	Define and develop s/w projects from requirement gathering to implementation.
CO2	Obtain knowledge about principles and practices of software engineering.
CO3	Focus on the fundamentals of modelling a software project.
CO4	Obtain knowledge about estimation and maintenance of software systems.
CO5	Design test cases, schedules and perform testing for SQA.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	1	2	1	-	-	-	3	-	2	3	2
CO2	-	2	3	1	2	2	2	-	1	2	1
CO3	-	-	2	-	3	3	1	-	2	1	3
CO4	1	3	2	2	2	2	3	-	-	2	2
CO5	-	-	2	-	3	2	-	2	2	-	2

CO1	Analyze various hashing techniques.

Advanced Data Structures

CO2	Identify the trade-offs of implementation of priority queues.	
CO3	Implement efficient search trees.	
CO4	Appreciate the importance and significance of graph algorithms in building and solving real world applications.	
CO5	Use algorithms for pattern matching in a text.	

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	2	2	2	1	-	-	-	2	-	-
CO2	-	2	2	2	1	-	-	-	2	-	-
CO3	-	2	2	2	1	-	-	-	2	-	-
CO4	-	2	2	2	1	-	-	-	2	-	-
CO5	-	2	2	2	1	-	-	-	2	-	-

Operating Systems

CO1	Summerize the structure and functionalities of Operating System.
CO2	Demonstrate the concept of Process, Threads and CPU Scheduling Algorithms.
CO3	Use the principles of Concurrency to solve Synchronization problems.
CO4	Infer various Memory Management Techniques.
CO5	Illustrate File System Implementation.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	1	2	3	2	1	-	-	-	3	3	1
CO2	2	3	3	2	-	-	-	-	1	1	2
CO3	3	3	3	2	-	-	-	-	2	1	2
CO4	2	2	2	2	-	-	-	-	2	1	2
CO5	2	2	2	2	-	-	-	-	2	1	2

Database Management Systems

CO1	Summarize the basics of database systems and applications.
CO2	Construct logical design of database and information retrieval.
CO3	Demonstrate relational model practically (Structured Query Language).
CO4	Demonstrate and relate normalization for database design.
CO5	Outline the necessity of transaction management, recovery management, file organization & indexing.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	-	-	-	-	-	3	-	-	-	-
CO2	3	2	2	-	-	-	-	-	-	-	-
CO3	3	2	1	-	3	-	-	-	-	-	-
CO4	3	2	1	-	-	-	-	-	-	-	-
CO5	1	-	-	-	-	-	-	-	-	-	-

Computer Organization

CO1	Summarize basic structures of computers and to summarize various machine Instructions.
CO2	Learn and use the addressing modes and types of instructions.
CO3	Analyze I/O organization of a computer.
CO4	Summarize various memory systems.
CO5	Analyze functionalities done by processing unit and also learn micro programmed control.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	1	-	-	-	-	-	-	-	-	-
CO2	2	1	1	-	-	-	-	-	-	-	-
CO3	2	1	1	-	-	-	-	-	-	-	-
CO4	2	1	1	-	-	-	-	-	-	-	-
CO5	2	1	1	-	-	-	-	-	-	-	-

Database Management Systems Lab

	CO1	Create database for user (Creation of Database).
	CO2	Solve various SQL queries for user defined schemas.
	CO3	Generalize PL/ SQL blocks.
	CO4	Illustrate the usage of user defined packages.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	1	3	-	-	-	-	-	-	-	-	-
CO2	3	2	1	1	-	-	-	-	-	-	-
CO3	2	1	-	-	-	-	-	-	-	-	-
CO4	2	-	-	-	-	-	-	-	-	-	-

Advanced Data Strctures Lab

	CO1	Select the most appropriate data structure and defend the selection.
	CO2	Solve a variety of computational problems.
	CO3	Communicate their results and describe an algorithm.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	1	3	-	-	-	-	-	-	-	-	-
CO2	3	2	1	1	-	-	-	-	-	-	-
CO3	2	1	-	-	-	-	-	-	-	-	-

III – I

CO1	Summarize the behaviour of finite automata and designs finite automata for problems.
CO2	Discover and demonstrates the classification of languages and design of regular grammar.
CO3	Infer about context free grammars and their capabilities.

Formal Languages and Automata Theory

	CO4	Differentiate deterministic and non-deterministic machines.
	CO5	Infer about computation functions with Turing machines.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	1	2	3	-	-	-	-	-	-	-	-
CO2	1	1	2	-	-	-	-	-	-	-	-
CO3	1	2	3	-	-	-	-	-	-	-	-
CO4	-	1	2	-	-	-	-	-	-	-	-
CO5	1	1	2	-	2	-	-	-	-	-	-

Design and Analysis of Algorithms

CO1	Infer the divide-and-conquer paradigm and its context. Recite algorithms that employ this paradigm. Apply this paradigm to design algorithms for apt problems.
CO2	Infer the greedy paradigm and its context. Recite algorithms that employ this paradigm. Apply this paradigm to design algorithms for apt problems.
CO3	Infer the dynamic-programming paradigm and its context. Recite algorithms that employ this paradigm. Apply this paradigm to design algorithms for apt problems.
CO4	Infer the backtracking paradigm and its context. Recite algorithms that employ this paradigm. Apply this paradigm to design algorithms for apt problems.
CO5	Infer the branch and bound paradigm and its context. Recite algorithms that employ this paradigm. Apply this paradigm to design algorithms for apt problems.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	3	2	-	-	-	-	-	-	-
CO2	3	3	3	2	-	-	-	-	-	-	-
CO3	3	3	3	2	-	-	-	-	-	-	-
CO4	3	3	3	2	-	-	-	-	-	-	-
CO5	3	3	3	2	-	-	-	-	-	-	-

CO1	Equipped with the knowledge of estimating the Demand and demand elasticities for a product.
CO2	Summarize the Input-Output-Cost relationships and estimation of the least cost combination of inputs.

Managerial Economic and Financial Analysis

CO3	Summarize the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business	
CO4	Prepare Financial Statements and the usage of various accounting tools for analysis.	
CO5	Evaluate various investment project proposals with the help of capital budgeting techniques for decision making.	

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	1	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-

Unix and Shell Programming

CO1	Infer the importance of UNIX operating system by learning salient features and using basic utilities.
CO2	Develop apt programming and non-programming filters.
CO3	Devise shell scripts using the syntactic constructs of shell for producing the desired effects.
CO4	Compose advanced shell scripts for string and array processing.
CO5	Construct functions using system calls related to file and process control.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	1	1	2	3	-	-	-	-	-	-	-
CO2	1	-	2	3	-	-	-	-	-	-	-
CO3	1	-	2	3	-	-	-	-	-	-	-
CO4	1	-	2	3	-	-	-	-	-	-	-
CO5	1	-	2	3	-	-	-	-	-	-	-

CO1	Summarize different JDBC drivers and their connectivity.

		Advanced Java and Web Technologies
	CO2	Quote different built-in and user defined tags used in HTML & XML.
	CO3	Classify server side and client-side application development through Servlets.
	CO4	Relate JSP tags with server sides codes.
	CO5	Use client-side application development through Java Script.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	2	2	2	1	-	-	-	2	-	-
CO2	-	2	2	2	1	-	-	-	2	-	-
CO3	-	2	2	2	1	-	-	-	2	-	-
CO4	-	2	2	2	1	-	-	-	2	-	-
CO5	-	2	2	2	1	-	-	-	2	-	-

		Design and Analysis of Algorithms Lab
	CO1	Identify and apply the suitable algorithm for the given problem.
	CO2	Design and implement efficient algorithms for a specified application.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	3	2	-	-	-	-	-	-	-
CO2	3	3	3	2	-	-	-	-	-	-	-

		and Shell Programming Lab
	CO1	Develop scripts compatible with different shells available under UNIX environment.
	CO2	Develop scripts for automating the tasks of programmer during deployment and maintenance.
	CO3	Develop scripts to automate task using programmable filters.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2	1	-	-	-	-	-	-	-	-

Unix	CO2	1	2	2	-	-	-	-	-	-	-	-
	CO3	1	-	2	-	-	-	-	-	-	-	-

Advanced Java and Web Technologies Lab	CO1	Create static web pages using HTML, CSS, and JavaScript.
	CO2	Design dynamic Web Pages using client-side scripting.
	CO3	Create XML documents and work with web servers to create web applications
	CO4	Write server-side programs using Java Servlets and JSP.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	-	2	-	2	-	-	-	-	-	-
CO2	-	-	2	-	2	-	-	-	-	-	-
CO3	-	-	2	-	2	-	-	-	-	-	-
CO4	-	-	2	1	2	2	-	-	-	-	-

III – II

Data Warehousing & Data Mining	CO1	Infer about Data Warehousing & Data Mining.
	CO2	Demonstrate Pre-processing Techniques before Data Mining.
	CO3	Infer Classification & recite different approaches.
	CO4	Infer Association Analysis & recite different approaches.
	CO5	Infer Cluster Analysis & recite different approaches.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2	1	-	-	-	-	-	-	-	-
CO2	1	2	2	-	-	-	-	-	-	-	-
CO3	1	-	2	2	-	-	-	-	-	-	-
CO4	2	-	2	1	-	-	-	-	-	-	-

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO5	-	2	1	2	-	-	-	-	-	-	-

Computer Networks

CO1	Explain OSI and TCP/IP reference models and Example networks, characteristics of transmission media and classify multiplexing techniques.
CO2	Summarize various Error Control, Flow Control techniques and Medium Access Control Protocols.
CO3	Compute optimal path using Routing Algorithms.
CO4	Explain the concepts of reliable unreliable transmission.
CO5	Illustrate the working of various application layer protocols.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2	1	-	-	-	-	-	-	-	-
CO2	1	2	2	-	-	-	-	-	-	-	-
CO3	1	-	2	2	-	-	-	-	-	-	-
CO4	2	-	2	1	-	-	-	-	-	-	-
CO5	1	2	1	2	-	-	-	-	-	-	-

Artificial Intelligence

CO1	Summarize fundamental summarizeing of the history of artificial intelligence (AI) and its foundations.
CO2	Apply basic principles of AI in solutions that require problem solving, inference, perception and learning.
CO3	Analyze the Knowledge representation in problem solving
CO4	Demonstrate proficiency developing applications in an 'AI language', expert system shell.
CO5	Use proficiency in applying fuzzy sets and logic.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	1	1	-	-	2	1	-	-	-	-
CO2	2	2	2	-	-	1	-	-	1	1	2
CO3	2	-	-	-	-	-	-	-	-	-	-

	CO4	2	1	1	-	-	2	1	-	-	-	-
	CO5	2	1	1	-	-	1	-	-	-	-	-

	CO1	Annotate Compilers, Grammars, Scanners, Types & structures of Compilers.
	CO2	Infer and Articulate different Parsers - can generate language & recognize it.
	CO3	Exemplifying semantic analyzer without the aid of automatic generators translation schemes
Compiler Design	CO4	AAssociating storage allocation strategies, IR forms & Code generation form.
	CO5	Express how source code for a novel language converted into machine code for a novel computer.

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
	CO1	2	2	1	-	-	-	-	-	-	-	-
	CO2	1	2	2	-	-	-	-	-	-	-	-
	CO3	1	-	2	2	-	-	-	-	-	-	-
	CO4	2	-	2	1	-	-	-	-	-	-	-
	CO5	1	2	1	2	-	-	-	-	-	-	-

	CO1	Summarize Client-side design of the web.
	CO2	Explore different ES6 features in Java script.
	CO3	Implement components and props through React.
Fuul Stack Development	CO4	Comprehend React Hooks.
	CO5	Use NodeJs for data availability.

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
	CO1	-	2	2	2	1	-	-	-	-	-	-
	CO2	-	2	2	2	2	-	-	-	-	-	-

	CO3	-	2	2	2	2	-	-	-	-	-	-
	CO4	-	2	2	2	2	-	-	-	-	-	-
	CO5	-	2	2	2	2	-	-	-	-	-	-

Block chain TEchnologies concepts &Applications

CO1	Describe the concepts of Decentralization, Hashing and Digital Signatures.
CO2	Comprehend various elements of blockchain network.
CO3	Explain the architecture of Ethereum blockchain and its implementation.
CO4	Explain the architecture of Hyperledger and its implementation.
CO5	Interpret the concepts of blockchain applicable to various use cases.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-
CO4	2	3	2	1	-	-	-	-	-	-	-
CO5	2	-	2	2	-	-	-	-	-	-	-

Computer Networks LAB

CO1	Demonstrate the working of various Data link layer and Network layer protocols.
CO2	Experiment the working of client/server communication through Sockets API.
CO3	Experiment the usage of TCP and UDP based sockets and their differences.
CO4	Demonstrate the working of Unix system networking commands and Socket system calls.
CO5	Design reliable servers using both TCP and UDP sockets.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	-	3	-	-	-	-	-	-	-	-

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO2	3	-	2	1	1	-	-	-	-	-	-
CO3	2	1	1	-	-	-	-	-	-	-	-
CO4	2	-	-	-	-	-	-	-	-	-	-
CO5	2	-	-	-	-	-	-	-	-	-	-

Artificial Intelligence LAB

CO1	Identify problems that are amenable to solution by AI methods.	
CO2	Recognize appropriate AI methods to solve a given problem.	
CO3	Discuss a given problem in the language framework of different AI methods.	
CO4	Develop basic AI algorithms.	

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2	1	-	-	-	-	-	-	-	-
CO2	2	-	2	1	-	-	-	-	-	-	-
CO3	-	2	1	2	-	-	-	-	-	-	-
CO4	-	2	1	2	-	-	-	-	-	-	-

IV- I Sem

Cryptography and network security

CO1	Classify various security attacks, services mechanisms and classical cryptographic techniques.
CO2	Analyse the design principles of block ciphers and their implementation.
CO3	Compute and Analyse various Asymmetric Key Cryptographic techniques.
CO4	Evaluate Authentication, Hash Codes and verify the digital signatures.
CO5	Impart the knowledge on Network security concepts.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	-	2	-	-	-	2	-	-	2
CO2	2	2	1	-	2	-	1	-	-	2	2

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO3	3	2	1	-	1	-	-	3	-	-	-
CO4	2	1	-	-	1	-	-	2	1	1	2
CO5	-	-	-	-	-	-	-	-	-	-	2

Machine learning

CO1	Recognize the characteristics of machine learning.
CO2	Apply various supervised learning methods to appropriate problems.
CO3	Identify and integrate more than one technique to enhance the performance of learning and create probabilistic models for handling unknown pattern.
CO4	Apply unsupervised learning models e.g., clustering algorithms to handle the unknown data.
CO5	Apply Ensemble models to any real-world problem to analyse its performance effectively.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	1	1	1	2	-	-	-	-	-	-
CO2	3	2	2	2	3	-	-	-	-	-	-
CO3	3	2	2	2	3	-	-	-	-	-	-
CO4	3	2	2	2	3	-	-	-	-	-	-
CO5	3	2	2	2	3	-	-	-	-	-	-

UML & Design Patterns

CO1	Illustrate software design with UML diagrams.
CO2	Create software applications using OO concepts.
CO3	Develop various scenarios based on software requirements.
CO4	Apply UML based software design into pattern-based design using design patterns.
CO5	Design the various testing methodologies for OO software.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2	1	-	-	-	-	-	-	-	-

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
	CO2	1	2	2	-	-	-	-	-	-	-	-
	CO3	1	-	2	2	-	-	-	-	-	-	-
	CO4	2	-	2	1	-	-	-	-	-	-	-
	CO5	1	2	1	2	-	-	-	-	-	-	-

Big Data Analytics	CO1	Summarize the concepts of Big Data Analytics, Master the concepts of Hadoop Distributed File System and Hadoop Architecture.
	CO2	Acquire knowledge on Map Reduce Framework.
	CO3	Summarize the concepts of Hadoop IO formats and methods.
	CO4	Apply Pig concepts for Data Processing.
	CO5	Apply Hive concepts for Data Processing.

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
	CO1	2	2	-	-	-	-	-	-	-	-	-
	CO2	2	2	2	-	-	-	-	-	-	-	-
	CO3	2	2	2	-	-	-	-	-	-	-	-
	CO4	1	2	2	-	-	-	-	-	-	-	-
	CO5	2	2	2	-	-	-	-	-	-	-	-

IOT & Networking	CO1	Explore IOT architecture and layouts.
	CO2	Summarize various communication modules and protocols.
	CO3	Summarize all the four pillars of IOT paradigm.
	CO4	Explore System design of IOT.
	CO5	Implement various API development tools.

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	-	2	-	-	-	-	-	-	-
CO2	-	-	3	-	2	-	-	-	-	-	2
CO3	3	-	2	-	-	-	2	-	-	-	-
CO4	-	-	3	-	2	-	-	-	2	-	-
CO5	-	-	3	-	-	-	-	-	-	2	-

Machine Learning Lab

CO1	Explore various Machine learning algorithms.
CO2	Implement supervised algorithms through Python.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	2	2	2	2	-	-	-	-	-	-
CO2	-	2	2	2	2	-	-	-	-	-	-
Target	-	2	2	2	2	-	-	-	-	-	-

UML & DP LAB

CO1	Create use case documents that capture requirements for a software system & to create class diagrams that model both the domain model and design model of a
CO2	Create interaction diagrams that model the dynamic aspects of a software system.
CO3	Develop code that builds a software system & to develop simple applications.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2	1	-	-	-	-	-	-	-	-
CO2	2	-	2	1	-	-	-	-	-	-	-
CO3	-	2	1	2	-	-	-	-	-	-	-

IV – II

CO1	Develop a familiarity with distributed file systems.
CO2	Summarize the features of Distributed object model.
CO3	Describe important characteristics of distributed systems and the salient architectural features of such systems.

Distributed Systems

	CO4	Describe the features and applications of file system and architecture.
	CO5	Gaining better summarizeing on Transaction and replication.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2	-	3	-	-	-	-	2	-	-
CO2	2	3	-	3	-	-	-	-	2	-	-
CO3	2	2	-	2	-	-	-	-	3	-	-
CO4	2	2	-	3	-	-	-	-	2	-	-
CO5	2	2	-	1	-	-	-	-	2	-	-

Cloud computing

	CO1	Summarize various Cloud computing paradigms.
	CO2	Explore virtual machines and virtualization mechanisms.
	CO3	Enlist various cloud computing models.
	CO4	Infer various cloud resource management techniques.
	CO5	Apply cloud programming for various domains.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2	1	-	-	-	-	-	-	-	-
CO2	1	2	2	-	-	-	-	-	-	-	-
CO3	1	-	2	2	-	-	-	-	-	-	-
CO4	2	-	2	1	-	-	-	-	-	-	-
CO5	1	2	1	2	-	-	-	-	-	-	-

	CO1	Summarize features of .NET frame work.
	CO2	Extract various components in C#.NET.

.Net Eco Systems	CO3	Solve problems related to Web applications through ASP.NET.
	CO4	Articulate data binding through ADO.NET.
	CO5	Illustrate LINQ and entity frame work.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2	2	-	2	-	-	-	-	-	-
CO2	2	2	2	-	2	-	-	-	-	-	-
CO3	2	2	2	-	2	-	-	-	-	-	-
CO4	2	2	2	-	2	-	-	-	-	-	-
CO5	2	2	2	-	2	-	-	-	-	-	-

Management & Organization Behaviour	CO1	Summarize the conceptual framework of management and organizational behaviour and correlate them to manage 21st century organizations.
	CO2	Analyse the real-time problems and examples related to managerial functions and concepts of decentralization.
	CO3	Summarize how an organization behaves and motivates its employees effectively.
	CO4	Summarize how dynamics and teams will act in a company for optimal output.
	CO5	Summarize and overcome the Organizational Conflict and Negotiations for steady and stable development in the industry.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	-	-	-	-	-	-	-	2	2	2
CO2	-	-	-	-	-	-	-	-	-	2	2
CO3	-	-	-	-	-	-	-	-	2	3	2
CO4	-	-	2	-	-	-	-	-	-	2	3
CO5	-	-	-	-	-	-	-	-	-	2	2

	CO1	Articulate problem statement.

	CO2	Apply technial knowledge.										
	CO3	Acquire contemporaray tools & technologies.										
	CO4	Communicate and present the entire SDLC.										
	CO5	Perform the role of a team member or lead in SDLC.										

Project

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	1	2	1			2	2	3		2	
CO2	2	2	3	2	2		2	1	2	2	2
CO3		1	1	1	3						
CO4	1								3	3	
CO5		1						2	3	3	2