DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
TEZPUR UNIVERSITY

Mapping of Course Outcomes with Program Outcomes

B. Tech in Computer Science and Engineering

Semester VIII

Course Code	Course Name	L-T-P-C
CO403	**Project III**	**0-0-4-4**

Course Outcomes:

COs	Statements	Blooms Level
CO1	Conduct a background study of the topic of interest.	L2
CO2	Apply the basic computer science and engineering knowledge acquired.	L3
CO3	Communicate and present their work orally and in written form.	L3
CO4	Conceive, design, and implement projects using the inherent tools of engineering.	L5
CO5	Organize, plan, and distribute the project-related works amongst the members of a group in a coherent manner.	L4

Mapping of Programme and Course Outcome:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	2	3	2	2	3	3	1	2	2	2	3	-
CO2	2	3	2	3	-	2	2	-	3	-	2	2	2	2	1
CO3	3	3	3	2	2	2	2	-	3	-	2	2	2	2	2
CO4	1	1	1	1	-	-	-	3	3	3	3	2	1	1	-
CO5	1	-	1	2	3	2	2	-	3	-	2	3	2	2	-

Semester VII

Course Code	Course Name	L-T-P-C
CO401	**Artificial Intelligence**	**3-0-0-3**

Course Outcomes

COs	Statements	Blooms Level
CO1	Understand the basic concepts and ethical issues in the design of Artificial Intelligence systems.	L2
CO2	Analyze and apply intelligent search-based techniques for problem solving.	L4
CO3	Formulate and solve problems using appropriate representation and reasoning frameworks.	L6
CO4	Apply techniques for handling uncertainty in episodic and sequential environments.	L3

Mapping of Programme and Course Outcome:

Mapping	PO1	PO2	PO3	PO4	PO5	PO 6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	-	-	1	1	1	3	-	-	-	-	-	-	-
CO2	1	3	2	2	3	-	-	-	-	1	-	-	1	1	-
CO3	1	3	2	2	3	-	-	-	-	1	-	2	1	1	-
CO4	1	2	2	1	3	-	-	-	-	-	-	-	1	1	-

Course Code	Course Name	L-T-P-C
CO402	**Project II**	**0-0-4-4**

Course Outcomes:

COs	Statements	Blooms Level
CO1	Conduct a background study of the topic of interest.	L2
CO2	Apply the basic computer science and engineering knowledge acquired.	L3
CO3	Communicate and present their work orally and in written form.	L3
CO4	Conceive, design, and implement projects using the inherent tools of engineering.	L5
CO5	Organize, plan, and distribute the project-related works amongst the members of a group in a coherent manner.	L4

Mapping of Programme and Course Outcome:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	2	3	2	2	3	3	1	2	2	2	3	-
CO2	2	3	2	3	-	2	2	-	3	-	2	2	2	2	1
CO3	3	3	3	2	2	2	2	-	3	-	2	2	2	2	1
CO4	3	1	1	1	-	-	-	3	3	3	3	2	2	1	-
CO5	1	-	1	2	3	2	2	-	3	-	2	2	2	2	-

Semester VI

Course Code	Course Name	L-T-P-C
CO314	**System Software and Compiler Design**	**3-0-0-3**

Course Outcomes:

COs	Statements	Blooms Level
CO1	Understand the process of translation of assembly language and high-level language programs into machine language programs,	L2
CO2	Apply formal grammars to describe languages and use tools for recognition of input strings.	L2
CO3	Automate the task of parser construction, translation of input and construction of symbols tables.	L3
CO4	Demonstrate understanding of run-time memory management, code optimization and code generation techniques and various types of linking of program modules.	L4
CO5	Use tools for program debugging, version control, building large executable programs, text search and simple editing.	L4

Mapping of Programme and Course Outcome:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	2	1	1	-	1	-	-	-	-	-	-	-	-	1	-
CO3	2	1	1	1	1	-	-	-	-	-	-	-	-	1	-
CO4	1	1	-	1	-	-	1	-	-	-	-	1	-	-	1
CO5	1	1	1	1	2	-	-	-	-	-	-	1	-	1	-

Course Code	Course Name	L-T-P-C
CO315	**Computer Networks**	**3-0-0-3**

Course Outcomes:

COs	Statements	Blooms Level
CO1	**Demonstrate understanding** of the principle and the design of layered Computer Network Architecture.	L2
CO2	**Demonstrate understanding** of the various networking devices, mechanisms and protocols used in different layers.	L2
CO3	**Choose** appropriate protocol and parameters for given use cases and network conditions.	L4
CO4	**Apply** different cryptographic algorithms and authentication mechanisms in network security.	L3

Mapping of Programme and Course Outcome:

Course Outcomes	Programme Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	2	2	1	-	2	1	-	-	-	-	-	1	-	-	-
CO3	1	2	2	2	-	-	1	1	-	-	-	-	-	2	-
CO4	2	-	-	2	2	1	-	-	-	-	-	-	-	2	-

Course Code	Course Name	L-T-P-C
CO 316	**Computer Networks Lab**	**0-0-1-1**

Course Outcomes:

COs	Statements	Blooms Level
CO1	**Apply** packet sniffing tools to capture packets and analyse.	L3
CO2	**Apply** TCP, UDP and RAW sockets for client server communication.	L3
CO3	**Use** different OS tools to configure network and network protocols.	L3
CO4	**Set up** LAN using networking devices.	L4
CO5	**Use** network simulators to study behaviour of different protocols.	L3

Mapping of Programme and Course Outcome:

Course Outcomes	Programme Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	-	-	1	1	-	-	-	-	-	-	-	-	-
CO2	2	-	-	-	1	-	-	-	-	-	-	-	1	1	-
CO3	1	-	-	-	2	1	-	-	-	-	-	-	1	1	-
CO4	-	-	-	2	-	-	-	-	-	-	-	-	-	1	-
CO5	1	-	-	-	2	-	-	-	-	-	-	-	-	-	-

Course Code	Course Name	L-T-P-C
CO 317	**Project I(Using SE perspective)**	**0-0-2-2**

Course Outcomes:

COs	Statements	Blooms Level
CO1	Apply the software engineering concepts in a real-life software project.	L2
CO2	Use technology frameworks and tools for software development.	L3
CO3	Develop test suites based on software testing principles, test and debug software modules	L3
CO4	Use appropriate CASE and other tools in the software life cycle	L4
CO5	Prepare relevant project documents and make effective presentations.	L3

Mapping of Programme and Course Outcome:

Course Outcomes	Programme Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	1	1	2	1	-	-	-	-	-	-	1	1	-	-
CO2	1	1	2	2	1	1	-	1	-	-	-	2	1	1	-
CO3	-	-	1	1	2	-	-	-	-	-	-	-	1	1	-
CO4	-	1	1	1	2	-	-	-	-	-	-	-	1	1	-
CO5	-	-	-	1	1	-	-	-	-	-	-	1	-	-	-

Course Code	Course Name	L-T-P-C
IC 361	**Accounting and Financial Management**	**3-0-0-3**

Course Outcomes:

COs	Statements	Blooms Level
CO1	The students will be able to acquire knowledge about the accounting process and preparation of final accounts.	L2
CO2	The students will be familiarized with the emerging issues in accounting including computerized accounting systems..	L3
CO3	The students will acquire the ability to read, analyse and interpret the annual reports.	L4

Mapping of Programme and Course Outcome:

Course Outcomes	Programme Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1															
CO2															
CO3															
CO4															
CO5															

Semester V

Course Code	Course Name	L-T-P-C
CO309	**Operating System**	**3-0-0-3**

Course Outcomes

COs	Statements	Blooms Level
CO1	Demonstrate understanding of the roles of OS, its modular organization and possible structures, concepts related to processes, threads, inter-process communication (IPC), and process synchronization	L2
CO2	Analyse performance of scheduling algorithms, memory management schemes, I/O handling techniques, file/ directory organization and access methods.	L4
CO3	Device solutions for IPC, process synchronization, resource allocation and handling deadlock conditions and memory management.	L3
CO4	Demonstrate exposure to the implementations of the key components/ aspects through Case Studies of Linux, iOS, Android Operating Systems	L3

Mapping of Programme and Course Outcome:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	2	1	-	-	-	-	-	-	-	-	-	1	-
CO2	2	-	1	2	-	-	-	-	-	-	-	1	-	2	1
CO3	1	1	2	-	1	-	-	-	-	-	1	-	-	2	1
CO4	1	1	2	1	-	-	-	-	-	-	-	1	1	1	-

Course Code	Course Name	L-T-P-C
CO310	**Operating System Lab**	**0-0-1-1**

Course Outcomes

COs	Statements	Blooms Level
CO1	Demonstrate knowledge for implementation of operating system software modules and the kernel	L2
CO2	Use system calls to write programs for process management and inter-process communication	L3
CO3	Develop algorithm for operating system modules	L4
CO4	Use OS simulation tools, system utilities	L4

Mapping of Programme and Course Outcome:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	2	-	-	-	-	-	-	-	-	-	-	-
CO2	2	2	-	2	-	-	-	-	-	-	-	-	-	-	-
CO3	1	1	1	2	-	-	-	-	-	-	-	-	-	1	-
CO4	2	2	1	1	-	-	–	-	-	-	-	-	-	1	-

Course Code	Course Name	L-T-P-C
CO311	**Software Engineering**	**3-0-0-3**

Course Outcomes

COs	Statements	Blooms Level
CO1	Demonstrate understanding of the software development process including current scenarios prevailing in the software industry.	L2
CO2	Carry out project planning and cost estimation.	L3
CO3	Analyze feasibility of projects and prepare software requirement specification (SRS).	L4
CO4	Develop a software architecture using software design approaches.	L6
CO5	Adopt appropriate coding standards, validation and verification techniques in software implementation.	L3

Mapping of Programme and Course Outcome:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	2	1	1	1	-	-	-	-	-	-	-
CO2	1	2	-	2	1	-	1	-	1	-	1	-	1	1	-
CO3	1	3	-	-	1	1	-	-	1	2	1	1	1	1	-
CO4	1	2	3	2	1	1	-	-	1	1	1	1	1	1	-
CO5	1	2	1	2	2	-	-	-	1	1	1	1	1	1	-

Course Code	Course Name	L-T-P-C
CO312	**Database Systems**	**3-0-0-3**

Course Outcomes

COs	Statements	Blooms Level
CO1	Demonstrate understanding of the concepts of database systems including various database models, abstraction levels, description and query languages, physical design, transactions, query processing security and recovery.	L2
CO2	Develop ER/EER models for a given mini-world and convert the same to relational model and apply concepts of functional dependency and normalization in database design.	L4
CO3	Formulate Queries using SQL and Formal relational Query languages.	L3
CO4	Explain the architecture of distributed Database and other emerging database systems.	L2

Mapping of Programme and Course Outcome:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	-	-	-	-	-	-	-	-	-	1	1	1	-
CO2	2	3	2	1	1	-	-	-	1	2	-	1	1	2	-
CO3	2	2	-	-	-	-	-	-	-	-	-	1	1	2	-
CO4	2	1	1	-	-	-	-	-	-	1	-	1	1	1	-

Course Code	Course Name	L-T-P-C
CO313	**Database Systems Lab**	**1-0-0-1**

Course Outcomes

COs	Statements	Blooms Level
CO1	Create and manage a database using RDBMS like Oracle.	L4
CO2	Perform queries on the database.	L3
CO3	Build user-defined functions and procedures using PL/SQL.	L3
CO4	Develop database applications.	L5

Mapping of Programme and Course Outcome:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	1	1	-	-	-	-	-	-	1	-
CO2	-	-	1	1	-	-	-	-	-	-	-	-
CO3	-	-	2	1	-	-	-	-	-	-	1	-
CO4	-	1	2	2	1	-	-	-	-	-	1	-

Course Code	Course Name	L-T-P-C
CO303	**Computer Graphics**	**3-0-0-3**

Course Outcomes

COs	Statements	Blooms Level
CO1	Demonstrate understanding of the basic concepts used in computer graphics.	L2
CO2	Apply various concepts used in geometrical primitives, area filling, clipping, transformation techniques and viewing.	L3
CO3	Analyze various graphical models and their outputs.	L4
CO4	Design and implement various object representations along with animation.	L6

Mapping of Programme and Course Outcome:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	3	-	-	-	-	1	-	2	-	3	2	2	3
CO2	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Semester IV

Course Code	Course Name	L-T-P-C
CO218	**Data Communication**	**3-0-0-3**

Course Outcomes

COs	Statements	Blooms Level
CO1	***Understand*** and ***Contrast*** the concept of Signals, OSI & TCP/IP reference models and ***discuss*** the functionalities of each layer in these models.	L2
CO2	**Discuss** and **Analyse** flow control and error control mechanisms and apply them using standard data link layer protocols.	L3
CO3	***Analyze*** and ***apply*** various routing algorithms to find shortest paths for packet delivery.	L4
CO4	***Explain*** the details of Transport Layer Protocols (UDP, TCP) and suggest appropriate protocol in reliable/unreliable communication.	L2
CO5	***Analyze*** the features and operations of various application layer protocols such as HTTP, DNS and SMTP.	L3

Mapping of Programme and Course Outcome:

Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	**-**	**2**	**1**	**-**	**2**	**3**	**-**	**-**	**-**	**2**	**2**	**2**			
CO2	**2**	**2**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**2**	**2**	**2**		**1**	
CO3	**2**	**2**	**-**	**2**	**2**	**-**	**-**	**-**	**-**	**1**	**2**	**2**		**1**	
CO4	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**	**-**	**2**	**-**	**-**			**1**
CO5	**2**	**2**	**2**	**2**	**2**	**-**	**-**	**-**	**2**	**1**		**1**			**1**

Course Code	Course Name	L-T-P-C
CO214	**Computer Architecture and Organization**	**3-1-0-3**

Course Outcomes

COs	Statements	Blooms Level
CO1	Demonstrate **understandin**g of the various architectural and organizational aspects of computer systems at the machine level;	L2
CO2	**Analyze** performance and **Choose** among the various design options based on the trade-offs and quantitative performance analysis for the various functional modules in a machine;	L4
CO3	**Write** machine and assembly language programs for a given instruction set architecture and **analyse** their performance;	L4
CO4	Demonstrate **understanding** of the mechanisms built into the machines to support the design of advanced digital systems, operating systems etc.	L2

Mapping of Programme and Course Outcome:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	1	1	-	1	-	-	-
CO2	3	2	-	-	-	-	1	-	-	-	-	-	-	2	-
CO3	3	1	2	-	-	-	1	-	-	-	-	-	-	2	-
CO4	3	1	-	-	-	-	-	-	-	-	-	-	-	1	-

Course Code	Course Name	L-T-P-C
CO215	**Computer Organization Lab**	**0-0-1-1**

Course Outcomes

COs	Statements	Blooms Level
CO1	Develop functional modules for digital systems from logic devices	L3
CO2	Write assembly language programs	L3
CO3	Test digital circuits and assembly level programs.	L4

Mapping of Programme and Course Outcome:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	2	-	1	-	-	-	1	-	-	-	-	1	-
CO2	2	1	2	-	-	-	-	-	1	-	-	-	-	1	-
CO3	2	1	-	-	-	-	-	-	1	-	-	-	-	-	-

Course Code	Course Name	L-T-P-C
CO216	**Formal Language and Automata**	**3-0-0-3**

Course Outcomes

COs	Statements	Blooms Level
CO1	Demonstrate understanding of the core concepts in automata theory and formal languages.	L2
CO2	Identify different formal languages and their relationships.	L2
CO3	Classify and construct grammars for different languages and vice-versa.	L4
CO4	Apply concepts to build finite automata, push down automata and Turing machine.	L3
CO5	Analyse various concepts of undecidability and computation functions for problem solving situations.	L4

Mapping of Programme and Course Outcome:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	-	-	-	-	-	-	-	-	-	1	-	-	1
CO2	2	3	2	1	-	-	-	-	-	-	-	1	-	-	1
CO3	2	2	2	1	1	-	-	-	1	-	-	1	-	-	1
CO4	2	2	2	3	2	-	-	-	-	-	-	1	-	-	1
CO5	1	2	-	3	2	-	-	-	-	-	-	1	-	-	1

Course Code	Course Name	L-T-P-C
CO206	**Design and Analysis of Algorithms**	**3-0-1-4**

Course Outcomes

COs	Statements	Blooms Level
CO1	**Argue** the correctness of algorithms rigorously using appropriate proof techniques like invariants, induction etc.	L5
CO2	**Analyze** asymptotic worst-case performance of algorithms in terms of space and time.	L4
CO3	Identify and apply appropriate algorithm design paradigms like divide-and-conquer, greedy, dynamic programming for different problem situations.	L4
CO4	Analyze hardness of problems and use high level ideas of randomized and approximation algorithms to solve hard problems	L2
CO5	Design and implement an effective combination of algorithms and data structures to solve practical problems.	L6

Mapping of Programme and Course Outcome:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	2	-	-	-	-	-	-	1	-	-	1

CO2	3	3	2	3	3	-	1	-	-	-	-	1	-	-	1
CO3	2	3	1	3	3	-	1	-	-	-	1	1	-	1	1
CO4	3	3	2	3	3	-	-	-	-	-	1	-	-	1	1
CO5	3	3	2	3	3	-	-	-	-	-	1	-	-	1	1

Course Code	Course Name	L-T-P-C
CO217	**Graph Theory**	**3-0-0-3**

Course Outcomes

COs	Statements	Blooms Level
CO1	**Understand** the basic concepts of Graph Theory	L2
CO2	**Develop** reasoning to construct mathematical proofs of fundamental theorems on graphs	L4
CO3	**Demonstrate ideas** of matching, connectivity, coloring, planarity, flows and Hamiltonicity.	L3
CO4	**Use** graphs to model engineering problems and apply efficient algorithms to solve them.	L3

Mapping of Programme and Course Outcome:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	-	-	-	-	-	-	-	-	-	1	-	-	1
CO2	3	1	1	1	-	-	-	-	-	-	-	1	-	-	1
CO3	3	1	1	1	-	-	-	-	-	-	-	1	-	2	1
CO4	-	3	2	2	-	1	-	-	1	-	1	-	-	2	1

Semester III

Course Code	Course Name	L-T-P-C
MS205	**Mathematics – III**	**3-0-0-3**

Course Outcomes

COs	Statements	Blooms Level
CO1	**Apply** the knowledge of binomial, poisson and normal distribution for engineering application.	L3
CO2	**Recall** different problems related to moments, skewness, kurtosis and correlation, regression	
CO3	**Measure** various physical models through discreet and continuous distributions.	
CO4	**Identify** the use of different test of significance to various engineering problems.	
CO5	**Analyse** the techniques of partial differential equations to solve physical and other problems involving functions of several variables	
CO6	**Determine** heat and sound equations, fluid flow, elasticity, electrostatics, electrodynamics, etc., problems using partial differential equation techniques.	

Mapping of Programme and Course Outcome:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	1	1	-	-	-	-	-	-	-
CO2	1	1	-	1	-	-	-	-	-	-	-	-

CO3	1	1	1	1	-	-	-	-	-	-	-	-
CO4	1	1	-	1	-	-	-	-	-	-	-	-
CO5	1	1	1	1	-	-	-	-	-	-	-	-
CO6	1	1	1	1	-	-	-	-	-	-	-	-

Course Code	Course Name	L-T-P-C
CO202	**Digital Logic Design**	**3-0-1-4**

Course Outcomes

COs	Statements	Blooms Level
CO1	Apply Boolean Algebra and various minimization techniques to model signals and demonstrate understanding of number systems.	L3
CO2	Demonstrate understanding of the construction, operation and performance characteristics of different digital logic devices.	L2
CO3	Apply the existing techniques to design various combinational and sequential functional circuit modules and systems.	L3
CO4	Demonstrate understanding of the various kinds of hazards in digital circuits and methods to eliminate these.	L2
CO5	Demonstrate understanding of the basic techniques used for detection and location of faults in a digital system.	L2

Mapping of Programme and Course Outcome:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	1	-	-	-	-	-	-	-		1	-
CO2	2	1	1	-	1	-	-	-	-	-	-	-	-	-	-
CO3	2	2	2	-	1	-	-	-	1	-	-	1		1	-
CO4	2	1	1	-	-	-	-	1	-	-	-	-	-	-	-
CO5	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Course Code	Course Name	L-T-P-C
CO 209	**Computing Workshop**	**0-0-2-2**

Course Outcomes

COs	Statements	Blooms Level
CO1	**Understand** the main features of the MATLAB and Python development environment.	L2
CO2	**Interpret** the fundamental MATLAB and Python syntax and semantics and be fluent in the use of control flow statements.	L2
CO3	**Design and simulate** any real time environment using MATLAB and Python.	L4
CO4	**Apply** MATLAB and Python as a tool in technical numerical computations and visualisation.	L3

Mapping of Programme and Course Outcome:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	2	1	1	1	-	-	-	-	-	-	-	-	-	-	-
CO3	2	2	2	2	1	1	1	-	-	1	-	1	-	-	1
CO4	2	2	2	1	2	1	1	-	-	1	-	1	-	1	1

Course Code	Course Name	L-T-P-C
BA201	**Economics**	**3-0-0-3**

Course Outcomes

COs	Statements	Blooms Level
CO1		
CO2		
CO3		
CO4		

Mapping of Programme and Course Outcome:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-

Course Code	Course Name	L-T-P-C
CO210	**Data structures**	**3-1-0-4**

Course Outcomes

COs	Statements	Blooms Level
CO1	**Design and develop** ensemble data structures like Graph, Hash table, queue, stack, heap, binary tree etc.	L5
CO2	**Select** appropriate data structures/ algorithms for solving the problem at hand according to the pre-defined restrictions on space and time.	L4
CO3	**Identify** the characteristics of a given problem including inherent limits for the problem, limits due to data types, Special situations seeking special treatment etc.	L4
CO4	**Use** basic data structures with contiguous or non-contiguous containers to solve operations like sorting, searching.	L3
CO5	**Understand** the strength and weakness of contiguous (Array) and Non-contiguous (Pointer based) containers from both space and time perspective.	L2

Mapping of Programme and Course Outcome:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	1	2	-	-	-	2	1	-	-	3	2	-
CO2	2	3	2	2	-	2	-	1	1	-	-	2	2	2	-
CO3	2	3	2	2	-	-	1	1	-	-	-	2	1	2	-
CO4	2	1	3	3	2	3	-	-	2	-	-	2	2	2	-

CO5	2	2	2	3	-	2	-	-	-	1	-	-	1	2	-

Course Code	**Course Name**	**L-T-P-C**
CO211	**Data structures using Object Oriented Programming Lab**	**3-1-0-4**

Course Outcomes

COs	**Statements**	**Blooms Level**
CO1	**Evaluate** efficient representations of data structures in real life applications.	L5
CO2	**Analyse** the complexity of the usage of data structures in sorting, and searching.	L4
CO3	**Apply** linear and non-linear data structures in real-life problem-solving applications.	L3
CO4	**Understand** the utility of OOPs concepts in the design of data structures.	L2

Mapping of Programme and Course Outcome:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	3	2	2	-	1	1	-	1	2	3	2	-
CO2	2	3	2	3	-	2	-	1	2	-	2	2	2	2	-
CO3	2	3	3	2	-	3	1	1	2	-	2	2	2	2	-
CO4	2	2	3	1	1	1	2	2	3	2	3	3	1	2	-

Course Code	Course Name	L-T-P-C
EC205	**Signals and Systems**	**2-1-0-3**

Course Outcomes

COs	Statements	Blooms Level
CO1	**Understand** the fundamental concepts of Signals and systems	L2
CO2	**Represent** the continuous and discrete systems in time and frequency domain using different transforms	L3
CO3	**Apply** the mathematical concepts like Fourier series, Laplace transform, Fourier Transform, Z-Transform etc. to characterise and understand both continuous time and discrete time LTI systems	L3

Mapping of Programme and Course Outcome:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	-	-	-	-	-	1	-	-	2	-	-	-
CO2	3	1	1	-	1	-	-	-	1	-	-	2	-	-	-
CO3	3	1	1	-	1	-	-	-	1	-	-	2	-	-	-

Course Code	Course Name	L-T-P-C
ES201	**Environmental Science**	**2-0-1-0**

Course Outcomes

COs	Statements	Blooms Level
CO1		
CO2		
CO3		
CO4		

Mapping of Programme and Course Outcome:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	–	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	–	-	-	-	-	-	-

Semester II

Course Code	Course Name	L-T-P-C
PH104	Physics-II	**2-0-0-2**

Course Outcomes

COs	Statements	Blooms Level
CO1	**Apply** the most basic principles of quantum mechanics, waves and solid-state physics and solid-state devices.	
CO2	**Solve** one dimensional quantum mechanical problems and have the ability to see how quantum mechanics is at the heart of solid-state devices.	
CO3	**Determine** why some materials are metals, some are insulators, and some are semiconductors, based on their electronic band structure.	
CO4	**Analyz**e problems of carrier generation and transport phenomena in intrinsic and extrinsic semiconductors – which is essential to understand all electronic devices.	
CO5	**Solve** engineering problems dealing with simple, damped or forced harmonic oscillation and perform Fourier analysis of wave phenomenon.	

Mapping of Programme and Course Outcome:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												

Course Code	Course Name	L-T-P-C
MS105	**Mathematics-II**	**3-1-0-4**

Course Outcomes

COs	Statements	Blooms Level
CO1	**Create** the required mathematical foundation. He/she will be confident enough to solve various mathematical problems arising in their engineering problems and apply as per their requirement.	
CO2	**Identify** the use of matrix theory to solve the system of linear equations and apply in various engineering problems.	
CO3	**Recall** the concepts of eigenvalues and eigenvectors in future engineering applications.	
CO4	**Apply** the knowledge of complex analysis for analyzing engineering problems and develop solution techniques for complex problems	
CO5	**Measure** the techniques of integral equations to solve physical and other engineering problems	

Mapping of Programme and Course Outcome:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												

Course Code	Course Name	L-T-P-C
CO105	**Discrete Mathematics**	**3-1-0-4**

Course Outcomes

COs	Statements	Blooms Level
CO1	**Explain** the strengths and limitations of the different discrete structures	L2
CO2	Identify appropriate discrete structure to be used for solving a real-world problem	L3
CO3	**Discover** the relations among the discrete objects in a complex system	L3
CO4	**Determine** an optimum way to store information of a complex system	L3
CO5	**Analyse** the complexity of an algorithm	L4

Mapping of Programme and Course Outcome:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	3	-	3	3	-	-	-	-	-	-	1	-	-	1

CO2	3	3	3	3	-	-	-	-	1	-	-	1	1	1	1
CO3	3	-	3	3	-	-	-	-	1	-	-	1	-	-	2
CO4	3	-	3	3	-	-	-	-	1	-	-	-	-	-	2
CO5	2	-	3	3	-	-	-	-	-	-	-	-	1	-	2

Course Code	Course Name	L-T-P-C
EC102	**Basic Electronics**	**2-1-1-4**

Course Outcomes

COs	Statements	Blooms Level
CO1	**Understand** semiconductor materials in details	**L2**
CO2	**Appreciate** its importance and wide usage	**L2**
CO3	**Analyze** the working of different semiconductor devices	**L4**
CO4	**Apply** their applications in building analog circuits	**L3**
CO5	**Understand**, analyze and build digital circuits.	**L2**
CO6	**Build** digital circuits with minimum hardware components	**L4**

Mapping of Programme and Course Outcome:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	1	1	1	-	2	1	1	-	-	-	-	-
CO2	2	1	1	1	1	1	1	2	1	1	-	-	-	-	-
CO3	3	2	1	1	1	1	1	2	1	1	-	-	-	-	-

CO4	3	2	1	1	1	3	1	2	1	1	-	2	-	-	-
CO5	3	3	3	3	3	3	2	2	3	1	2	2	-	-	-
CO6	3	3	3	3	3	3	2	2	3	1	2	2	-	-	-

Course Code	Course Name	L-T-P-C
ME102	**Workshop Practice**	**0-0-2-2**

Course Outcomes

COs	Statements	Blooms Level
CO1	**Perform** machining operations using various manufacturing techniques.	L3
CO2	**Perform** fitting practices using various types of hand tool and fitting techniques.	L3
CO3	**Perform** Oxy-acetylene gas welding and manual metal arc welding on jobs.	L3
CO4	**Select** appropriate electrical hand tools and circuits for the required application and making jobs (such as House Wiring, Switch Board etc.) as per specification.	L4

Mapping of Programme and Course Outcome:

Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	1	-	-	-	2	-	-	-	-	1	-	-			
CO2	1	-	-	-	2	-	-	-	1	1	-	-			
CO3	1	1	-	-	2	-	-	-	1	1	-	-			
CO4	1	1	-	-	2	-	-	-	1	1	-	-			

Course Code	Course Name	L-T-P-C
CO103	**Introductory Computing**	**2-1-0-3**

Course Outcomes

COs	Statements	Blooms Level
CO1	Basic **understanding** of computer hardware, software, and representation of information in computer's memory	L2
CO2	**Grasp problem-solving techniques** using concepts such as algorithms, data structures, and memory management.	L2
CO3	**Demonstrate proficiency** in the C programming language, including its syntax, data structures, and programming constructs.	L3

CO4	Demonstrate ability to write, run and debug programs in C, as well as **design and implement** simple algorithms and data structures to solve simple computational problems.	L3

Mapping of Programme and Course Outcome:

Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2			1						1	1	1		1
CO2	2	3	2	1	1					1		1	1		1
CO3	1	1	2		1	1		1				1	2	1	1
CO4	1	1	2	1	1	1		1		1	1	1	2	1	1

Course Code	Course Name	L-T-P-C
CO104	**Computing Lab**	**2-1-0-3**

Course Outcomes

COs	Statements	Blooms Level
CO1		
CO2		
CO3		
CO4		
CO5		

Mapping of Programme and Course Outcome:

Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12			
CO1	**3**	**3**	**2**	**2**	**2**	**1**	**1**	**1**	**2**	**1**	**2**	**2**	**3**	**2**	**-**
CO2	**3**	**3**	**3**	**3**	**2**		**1**				**2**	**1**	**2**	**2**	**-**
CO3	**3**	**3**	**3**	**3**	**2**	**1**	**1**	**1**	**2**	**1**	**2**	**2**	**2**	**2**	**-**
CO4	**3**	**3**	**3**	**2**	**3**		**1**					**1**	**2**	**2**	**-**
CO5	**2**	**2**	**2**	**2**	**3**	**1**	**1**	**1**	**2**	**1**		**1**	**1**	**2**	

Course Code	Course Name	L-T-P-C
CE103	**Engineering Graphics**	**1-0-2-3**

Course Outcomes

COs	Statements	Blooms Level
CO1	Interpret the dimensions and other miscellaneous details from various engineering drawings.	L2
CO2	Comprehend the usage of engineering curves in tracing the paths of simple machine components	L2

CO3	Analyse a three-dimensional object and represent it in two-dimension.	L4
CO4	Understand the concept of projection and acquire skills for visualizing complex objects	L2

Mapping of Programme and Course Outcome:

Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1															
CO2															
CO3															
CO4															
CO5															
CO6															

Course Code	Course Name	L-T-P-C
EE103	**Basic Electrical Engineering**	**2-1-0-3**

Course Outcomes

COs	Statements	Blooms Level
CO1	To understand and analyse basic electric and magnetic circuits.	L2

CO2	To study the working principles of electrical machines and power converters.	L2
CO3	To introduce the components of low-voltage electrical installations	L3

Mapping of Programme and Course Outcome:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**1**	**2**	-	-	-	-	-	-	-	-	-
CO2	**3**	**1**	**2**	-	-	-	-	-	-	-	-	-
CO3	**3**	**1**	**2**	-	-	-	-	-	-	-	-	-

Course Code	Course Name	L-T-P-C
CH103	**Chemistry**	3-0-1-4-5

Course Outcomes

COs	Statements	Blooms Level
CO1	Solve problems of chemistry with the knowledge of fundamental principles.	L3

CO2	Connect the basic chemistry knowledge with the daily experiences.	L3
CO3	Utilize the knowledge of chemistry in their future studies.	L3

Mapping of Programme and Course Outcome:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	1	-	1	-	-	-	1	-	1	-	-	-
CO2	1	1	-	-	-	1	-	-	-	-	-	1	-	-	-
CO3	1	1	1	1	-	1	1	-	-	1	-	1	-	-	-

Course Code	Course Name	L-T-P-C
MS104	**Mathematics I**	**3-1-0-4-4**

Course Outcomes

COs	Statements	Blooms Level

CO1	Analyze the concepts of real analysis and its use in Power series, Taylor's series, series for exponential, trigonometric and logarithmic functions which will appear in several multidisciplinary problems.	L4
CO2	Evaluate multivariable calculus and its use involving limit, continuity and differentiability of functions of several variables, applied in various engineering problems.	L3
CO3	Identify applications of Green, Gauss and Stokes theorems to evaluate line, surface and volume integrals in an easier way.	L4
CO4	Determine some advanced knowledge of integration such as improper integrals which will help the use of Beta-Gamma functions in several engineering problems.	L3
CO5	Recall the theory of Ordinary Differential Equations, which is an inseparable tool for any engineering discipline.	L2

Mapping of Programme and Course Outcome:

Mapping	PO1	PO 2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO9	PO 10	PO 11	PO1 2	**PS O1**	**PSO 2**	**PSO3**
CO1	3	2	1	1	-	1	-	-	-	-	-	1	-	-	1
CO2	3	2	1	1	-	1	-	-	-	-	-	1	-	-	1
CO3	3	2	1	1	-	1	-	-	-	-	-	1	-	-	1
CO4	3	2	1	1	-	1	-	-	-	-	-	1	-	-	1
CO5	3	2	1	1	-	1	-	-	-	-	-	1	-	-	1

Course Code	**Course Name**	**L-T-P-C**
PH105	**Physics I**	**2-0-1-3-4**

Course Outcomes

COs	**Statements**	**Blooms Level**
CO1	Solve numerical problems of mechanics by application of Newton's laws of motion.	L3

CO2	Analyze the application of Newton's laws of motion in non-inertial frames of reference.	L4
CO3	Recall the wave nature of light and interpret the intensity variation of light due to interference and diffraction.	L2
CO4	Describe experimental arrangements for observing interference and diffraction pattern	L2
CO5	Formulate and solve engineering problems on electromagnetics and electromagnetic plane wave equations.	L3

Mapping of Programme and Course Outcome:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-

P.23 Mapping of Course Outcomes with Program Outcomes

B. Tech in Computer Science and Engineering

ELECTIVE COURSES

Course Code	Course Name	L-T-P-C
CO318	**Cryptography**	

Course Outcomes:

COs	Statements	Blooms Level
CO1	Identify, conceptualize, and rigorously formalize the concept of secure communication	
CO2	Design and analyze security protocols including asymptotic efficiency and provable security	
CO3	Recognize and explain aspects of number theory which are relevant to cryptography	
CO4	Identify, explain, and apply cryptographic techniques like key management, digital signatures, digital certificates, and a Public-Key Infrastructure (PKI) to various disciplines in information science.	
CO5		

Mapping of Programme and Course Outcome:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2			1						1	1	1		1
CO2	2	3	2	1	1					1		1	1		1
CO3	1	1	2		1	1		1				1	2	1	1
CO4	1	1	2	1	1	1		1		1	1	1	2	1	1

CO5															

Course Code	Course Name	L-T-P-C
CO434	**Image Processing**	

Course Outcomes:

COs	Statements	Blooms Level
CO1	Interpret fundamental operations for image processing.	L2
CO2	Apply mathematical and graphical concepts for image processing operations.	L3
CO3	Execute processing operations on sample images.	L3
CO4	Analyze image processing problems for developing possible solutions.	L4
CO5	Recommend a processing technique for a particular job.	L6

Mapping of Programme and Course Outcome:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1		1							1	1		
CO2	3	2	1	1	1							1	1		

CO3	1	2	3	2	2							1			
CO4	2	3	1		1	1	1	1				1	2		
CO5	1	2	3	2	2	1	1	1				1	2	2	

Course Code	Course Name	L-T-P-C
IT509	**DMDW**	**3-0-1-4**

Course Outcomes:

COs	Statements	Blooms Level
CO1	Evaluate the performance of different data analysis methods in light of a given dataset.	L5 (Evaluate)
CO2	Derive the hidden challenges of a given dataset for deciding suitability of algorithm for a targeted data analysis task.	L4 (Analyze)
CO3	Identify the issues and challenges related to pre-processing and data analysis algorithms on a given dataset.	L3 (Apply)
CO4	Interpret the issues and challenges related to storage and analysis of vast volume of data.	L2 (Understand)

Mapping of Programme and Course Outcome:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	3	3		1					2	2	1	1

CO2	3	3	2	2	3	2		1				2	2		1
CO3	3	3	2	2	3	1						2	1		1
CO4	3	3	1	2	2	2						2	1	2	1

Course Code	Course Name	L-T-P-C
CO513	**FUNDAMENTALS OF SPEECH PROCESSING**	

Course Outcomes:

COs	Statements	Blooms Level
CO1	Understand the mechanism of the human speech production system and clearly describe how speech sounds are produced.	L2
CO2	Apply the basic techniques of speech signal processing, feature extraction and preprocessing, to contemporary speech technology.	L3
CO3	Apply various modeling techniques in developing speech processing applications.	L3
CO4	Use speech processing tools to analyze and model speech data to design speech systems.	**L4**
CO5	Design, develop and evaluate simple speech recognition, speaker identification, speech synthesis systems.	**L6**

Mapping of Programme and Course Outcome:

Mapping	PO1	PO2	PO3	PO4	PO5	PO 6	PO7	PO8	PO9	PO10	PO11	PO12	PS O1	PS O2	PS O3
CO1	**2**	-	-	-	**1**	-	-	-	-	-	-	-	-	-	-
CO2	**2**	**1**	**2-**	-	**2**	-	-	-	-	-	-	-	1	-	-
CO3	**2**	**2**	-	-	**1**	-	-	-	-	-	-	-	-	-	-
CO4	**2**	**1**	**3**	-	**2**	-	-	**1**	**1**	**1**	-	**1**	1	-	-
CO5	**2**	**2**	-	**1-**	-	-	-	-	-	-	-	-	1	-	-

Course Code	Course Name	L-T-P-C
IT510	**ADVANCE OPERATING SYSTEM**	

COs	Statements	Blooms Level
CO1	Understand and Contrast the concept of concurrent Execution and Synchronization	L2 (Understand)
CO2	Discuss and Analyze Memory management, Scalability, Concurrency	L4 (Analyze)
CO3	Analyze OS architecture, Mobile OS architecture and virtualization and Apply for design	L4 (Analyze)
CO4	Interpret and Apply concepts of File Systems and Disk, Big Data System, Reliability Computing, Security	L3 (Apply)
CO5	Evaluate Case study, Recent OS topics: Research paper discussion.	L5 (Evaluate)

Mapping of Programme and Course Outcome:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS O1	PS O2	PS O3
CO1	3	2			1							1	-	-	-

CO2	3	3	2	2									-	1	-
CO3	2	3	1	2	1						1		-	1	-
CO4	3	3	2	1									-	-	1
CO5	3	3	2	1									-	-	1

Course Code	Course Name	L-T-P-C
CO504	**NATURAL LANGUAGE PROCESSING**	

Course Outcomes:

COs	Statements	Blooms Level
CO1	Understand the characteristics of human languages (natural language), representation of speech and text in computers, and the challenges in making a computer deal with information represented using a natural language.	L2
CO2	Analysis natural language expressions using formal approaches and carry out simple tasks such as morphological analysis, syntax analysis and semantic analysis.	L4
CO3	Apply various computational techniques and tools for natural language processing tasks overcoming the challenges, understanding the resources required and preparation of such resources.	L3
CO4	Understand the approaches employed in some end user applications of natural language processing, such as, text summarization, information retrieval, and machine translation.	L2

Mapping of Programme and Course Outcome:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	3					1		2		3	2	2	3
CO2	2	2													
CO3	2														
CO4															
CO5															

Course Code	Course Name	L-T-P-C
CO522	**BIOINFORMATICS**	**3-0-0-3**

Course Outcomes:

COs	Statements	Blooms Level
CO1	Understand flow of information in biological system at molecular level	L2
CO2	**Understand mechanism of storage and retrieval of biological data in public databases**	L2
CO3	**Analyse biological sequences available in public databases**	L4
CO4	Develop computational algorithms for genome sequence analysis	L6

CO5	**Analyse biological sequences to understand molecular evolution**	L4

Mapping of Programme and Course Outcome:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1					1							1	2	2	1
CO2	1	2		1	1				1			1	2	2	1
CO3	1	3	1	2	1				1	1		1	2	2	1
CO4	1	2	3	2	1				1	1		1	2	2	1
CO5	1	2	2	2	2				1	1		1	2	2	12

Course Code	**Course Name**	**L-T-P-C**
CO519	**INTERNET OF THINGS**	**2-0-1-3l**

Course Outcomes:

COs	**Statements**	**Blooms Level**
CO1	Understand the Internet of Things and its hardware and software components	L2
CO2	Interfacing I/O devices, sensors & communication modules	L3

CO3	Remotely monitor data and control devices	L3
CO4	Develop real-life IoT-based projects	L4

Mapping of Programme and Course Outcome:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1			2							2			
CO2	2	2		3	3					2		2			
CO3	2	2		3	3					2		2			
CO4	3	3	3	3	3	2	2	2	1	2	2	2	3	3	3

Course Code	Course Name	L-T-P-C
CO306	**EMBEDDED SYSTEMS**	

Course Outcomes:

COs	Statements	Blooms Level

CO1	***Understand*** the basic concepts and design issues of an embedded system, and *identify* applications to real word systems.	**L2**
CO2	***Acquire knowledge*** about various types of peripherals, memory, processors, buses, sensors, etc. used in embedded systems and learn how ***to use*** them to build ES systems.	**L3**
CO3	***Compare and analyze*** different design implementations of an embedded system and ***identify*** ways to optimize design metrics.	**L4**
CO4	***Acquire knowledge about microcontrollers and Design, simulate and develop*** microcontroller based intelligent products and systems.	**L6**
CO5	***Analyze and Identify*** **the unique characteristics, design problems and challenges of real-time (RT) embedded systems and get familiarized with RTOS.**	**L4**

Mapping of Programme and Course Outcome:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**2**	**-**	**-**	**-**	1	-	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	**2**	**1**	**2**	**-**	2	**-**	-	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
CO3	**2**	**2**	**-**	**-**	1	**-**	**-**	**-**	**-**	**-**	**-**	-	-	-	-
CO4	**2**	1	3	**-**	**2**	**-**	**-**	1	**1**	**1**	**-**	**1**	1	-	-
CO5	**2**	**2**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**

Course Code	Course Name	L-T-P-C

CO423	WEB TECHNOLOGY	

Course Outcomes:

COs	Statements	Blooms Level
CO1	Understand key Internet technologies supporting the Internet applications	L2
CO2	Implement web-based applications using suitable client-side and server-side web technologies such as HTML, CSS, XML, Javascript, JSP, PHP, etc.	L3
CO3	Differentiate between various methods, tools, frameworks, and web services used in web technologies	L4

Mapping of Programme and Course Outcome:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3				2							2			
CO2	3	2	3	3	3	1	2	2	2	3	2	2	3	3	3
CO3	3	3		2		2									

Course Code	Course Name	L-T-P-C
CO525	DATA MINING	3-0-1-4

Course Outcomes:

COs	Statements	Blooms Level
CO1	**Identify** the issues and challenges related to pre-processing and analysis of data to provide suitable input for data mining algorithms.	L2

CO2	**Analyze** various classification and clustering techniques and identify interesting patterns**.**	L4
CO3	**Use** pattern mining techniques to solve various market/sales correlations in large databases.	L3
CO4	Evaluate the performance of different data mining methods to **design** relevant applications considering a given dataset.	L6

Mapping of Programme and Course Outcome:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2			2							1			1
CO2	3	3	1	2	2							1			1
CO3	3	3	1	2	2							1			1
CO4	1	3	3	3	2				1			2		1	2

Course Code	Course Name	L-T-P-C
CO503	**Fuzzy Logic and Neural Networks**	

Course Outcomes:

COs	Statements	Blooms Level
CO1	Understand representation and manipulation of uncertain quantities using fuzzy sets.	2
CO2	Understand basics of neural networks and deep learning.	2
CO3	Apply fuzzy sets, neural networks and deep learning for solving **problems.**	3
CO4	Differentiate between multivalued logic and fuzzy logic.	4
CO5	Design fuzzy rule-based systems for solving problems.	6

Mapping of Programme and Course Outcome:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**3**	**2**	**1**		**1**							**1**			
CO2	**3**	**2**	**1**		**1**							**1**	**1**		
CO3	**1**	**2**	**3**	**2**	**2**	**1**	**1**	**1**		**1**		**1**	**3**		
CO4	**2**	**3**	**1**		**1**							**1**			
CO5	**1**	**2**	**3**	**2**	**2**	**1**	**1**	**1**		**1**		**1**		**3**	

Course Code	Course Name	L-T-P-C
CO520/CS638	*Software-Defined Networking and Network Function Virtualization*	3-0-0: 3

Course Outcomes:

CO1	**Understanding** the knowledge of software centric networks, network function virtualization and network programming skills.	L2
CO2	**Demonstrate understanding** the scope of innovation in networking.	L3
CO3	**Discuss** the applications of SDN and NFV in the present world of networking.	L6

Mapping of Programme and Course Outcome:

Course Outcomes	Programme Outcomes														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2	2	-	-	2	-	-	-	1	1	-	2	1	2	1
CO2	2	-	-	-	2	2	-	1	2	2	2	2	2	2	2
CO3	-	2	3	3	3	2	3	1	3	2	3	2	3	3	2