Mappings of revised Course Outomes (w.e.f 31.08.2023) with Program Outcomes for Scheme-2018 B.Tech (CSE)

Sem	Course Code	Course Name	CO #	CO (Course Outcomes)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
3rd	PCCS-101	Object Oriented Programming	CO1	Explain the principles of object oriented programming and procedure oriented programming.		1		1	1									
3rd			CO2	Design the object-oriented programs using classes and objects to enhance code reusability.		2		2									2	
3rd			CO3	Apply the concept of control structures, functions, arrays and strings to develop object- oriented programs.	3		3	2	1									
3rd			CO4	Implement polymorphism and inheritance in object-oriented programming paradigm.	2		3	2	1									
3rd			CO5	Develop programs based on the dynamic memory management and exception handling.		2		2										
3rd			CO6	Make use of file handling in the development of programs.	1		1	1	1									
3rd			CO1	Explain the concepts of network types, topologies, Bandwidth utilization, OSI and TCP/IP reference models.		3		2	1							2		
3rd			CO2	Apply data rate limit methods and switching techniques for utilization of transmission media	**1**		1	**2**	**3**									

Sem	Course Code	Course Name	CO	CO Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
3rd	PCCS-102	*Computer Networks*	CO3	Utilize error detection and correction techniques, flow control, error control and multiple access protocols for reliable transmission of frames over network.		2		**3**										
3rd			CO4	Make use of functions of network layer i.e. logical addressing, routing and congestion control mechanisms for transmission of packets from source to destination	**2**		3	**2**	**3**									**2**
3rd			CO5	Analyze network design issues,services of transport protocols and connection management for process to process delivery of entire message.		2		**3**										
3rd			CO6	Interpret the functions offered by session layer, presentation layer and use of application layer protocols.		2		2	3									2
3rd	ESCS-101	Digital Electronics	CO1	Apply the structure of number systems in digital design.	2		2	1	2									
3rd			CO2	Minimize the Boolean expressions in SOP and POS form using K-maps.	1		2	2	2		1							2
3rd			CO3	Use basic principles of digital logic gates to design digital circuits.		2		1	2	1							2	
3rd			CO4	Implement combinational logic circuits using Boolean algebra and logic gates.	3		3	3	2									

Sem	Course Code	Course Name	CO	Course Outcome	1	2	3	4	5	6	7	8	9	10	11	12
3rd			CO5	Analyze Synchronous and Asynchronous sequential circuits using Flip Flops, registers and Counters.		3		3					2			
3rd			CO6	Apply the knowledge of real-world applications of PLDs in industries	2		1	2	1							
3rd			CO1	Apply the concept of matrices to solve the system of linear equations.												
3rd			CO2	Understand the basic functions of complex variables , analytic functions and find the derivative of functions of complex variable												
3rd	BSCS-101	Mathematics-III	CO3	Acquire the basic knowledge, essential to evaluate integration of functions of complex variables.												
3rd			CO4	Analyze probability spaces, random variables and different probability distribution.												
3rd			CO5	Determine the best fit curve for the given statistical data.												
3rd			CO6	Apply statistical methods for analyzing experimental data.												
3rd			CO1	Discriminate between valuable and superficial in the life.				2		3			1			
3rd			CO2	Encourages students to discover what they consider valuable.				3		2						

Semester	Course Code	Course Name	CO	Course Outcome														
3rd	HSMCS-101	Human values and Professional Ethics	CO3	Understand the value required to be a good human being and apply these values in real life.						2		2						
3rd			CO4	Evaluate and modify the behavior.										1	1			
3rd			CO5	Understand fundamental and organizational duties and protect individual and social rights.							2							
3rd			CO6	Know about professional behavior, values and guiding principles.									3	2	2			
3rd	LPCCS-101	Object Oriented Programming Laboratory	CO1	Apply control structures, arrays and strings to develop programs.	3		3	2	1									
3rd			CO2	Design object-oriented programs using classes, objects, constructors, destructors along with various types of functions.	3		3	2	2									
3rd			CO3	Develop programs using overloading and virtual functions in polymorphism.	2		2	2	1									
3rd			CO4	Demonstrate the reusability aspect of object-oriented programming using Inheritance.		2		2										
3rd			CO5	Create programs using exception handling and file handling.	2		2	2	1									
3rd			CO6	Develop projects using object oriented programming for real time requirements.		3	3	1	1				3	2	2	1	2	

Sem	Code	Course	CO	CO Statement	1	2	3	4	5	6	7	8	9	10	11	12	13
3rd	LPCCS-102	Computer Networks Laboratory	CO1	Configure protocols concerning various network technologies over different mediums and layers.	1		2	2	3							2	
3rd			CO2	Apply the knowledge of different network components, transmission mediums and tools to solve various problems of communication.	2		2	2	3					2			
3rd			CO3	Design and develop different network design and logical models of networking to solve network related problems		1	3	2	2								
3rd			CO4	Utilize knowledge of modern network simulation tools to propose solution for efficient working of networks for real world problems					3								
3rd			CO5	Make use of various troubleshooting methods to overcome networking problems.					1								
3rd			CO6	Function in multidisciplinary teams through groups while working in different network environments with the help of resource sharing	1		2	2	3		3						
3rd			CO1	Implement logic gates using integrated circuits and verify their truth tables.	3		3	2	2					2	2		

Sem	Code	Course	CO	Course Outcome															
3rd	LESCS-101	Digital Electronics Laboratory	CO2	Inspect arithmetic operations through integrated circuits using combinational circuits.		3		3		1									
3rd			CO3	Construct basic combinational circuits to verify their functionalities.		2	3	3	2		1								
3rd			CO4	Apply the design procedures to design basic combinational circuits.	2			2	3	3							2		2
3rd			CO5	Perform the functionalities of Flip Flops on ICs.	1			1	1	1									
3rd			CO6	Implement Synchronous and Asynchronous counters using IC's.	3			2	3	2	2								
3rd			CO1	To acquire knowledge and skills related to different coding skills and to manage projects on globally acceptable platforms.	2			2	3	3								2	
3rd			CO2	To provide students with opportunities for practical and hands-on learning to work in teams		3	2	2	2										
3rd			CO3	To expose students to a work environment, common practices, cognitive abilities and work ethics in the field of computer science and engineering.		2		3											
3rd	TR-101	Training-1	CO4	To demonstrate and practice good working ethics and to internalize excellence.		2		3											3

Sem	Course Code	Course	CO	Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
3rd			CO5	To demonstrate pleasant interpersonal skills in developing understanding and appreciation of individual differences in building self-confidence.		2		3	2										
3rd			CO6	To demonstrate presentation skills, report writing, good management, team spirit, managerial skills and quality delivery of projects undertaken.				3											
3rd	PRCS-101	Seminar and Technical Report Writing For Engineers	CO1	Illustrate the basic components of technical report writing.		1		1	1						2		1		
3rd			CO2	Utilize various communication skills to present the technical work.	1		1	1	2						2		1		
3rd			CO3	Make use of Latex concepts to prepare technical reports and documents.	1		1	1	3						3		2	1	
3rd			CO4	Adapt the ethics of copyrights and infringement.		1	1	1	1			1					1		
3rd			CO5	Implement the unique qualities of technical reference and citation styles.	1		1	1	2						1		2		
3rd			CO6	Follow the stages of the writing process (prewriting/writing/rewriting) and apply them to technical and workplace writing tasks.		2	1	1	3				1		3		3	2	

Sem	Course Code	Course Name	CO	Description																
4th	PCCS-103	Discrete Mathematics	CO1	Apply sets, relations and functions to solve problems.	3		1	2	1											
4th			CO2	Construct mathematical proofs to verify the correctness of an argument using propositional logic, predicate logic and truth tables.				1												
4th			CO3	Apply counting techniques and combinatorics to determine discrete probability.	1		1	1	1											
4th			CO4	Solve problems involving recurrence relations and generating functions.	2		2	2	1											
4th			CO5	Prove elementary properties of algebraic structures in analysis and interpretation of data to provide valid conclusions.				3												
4th			CO6	Make use of graphs and trees to model real world problems.		3		2									1		2
4th	PCCS-104	Computer Architecture and	CO1	Explain the binary number system and its representations in computer system.		2		1	1									1	
4th			CO2	Implement Arithmetic, Logical and Shift micro operations using Register Transfer Language.	2		1	2	1											
4th			CO3	Describe the structure and organization of basic computer using instruction set architecture.		1		3	1											

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4th	PCCS-104	Architecture and Microprocessor	CO4	Elaborate instruction formats, RISC and CISC architectures and addressing modes.		1		2	1									
4th			CO5	Solve basic binary math operations through programming of 8085 microprocessor.	3		1	2	3								1	
4th			CO6	Make use of memory mapped and I/O mapped interfacing in microprocessor applications.	2		3	1	1									
4th	PCCS-105	Operating Systems	CO1	Explain the types and functions of operating systems		2		2	1							**1**		
4th			CO2	Evaluate different scheduling Techniques and list resources involved in process creation and management	3		2	3	2									
4th			CO3	Discuss inter-process communication , deadlock prevention, avoidance, detection and recovery techniques.		3		2	1									
4th			CO4	Comprehend the mechanisms used in memory management	3		2	3	2									
4th			CO5	Apply file management mechanisms for efficiency and performance.	1		2	1	2								1	
4th			CO6	Make use of disk scheduling algorithms		2		2	2									
4th			CO1	Identify the appropriate data structure to provide solution with reduced space and time complexity.		1		2								1		

Sem	Course Code	Course	CO	Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
4th	PCCS-106	Data Structures	CO2	Implement the storage of linear data in arrays, linked list and hashing technique.	3		3	3	3									2	
4th			CO3	Utilize stacks for solving problems that works on the principle of recursion.	2		2	2	1									2	
4th			CO4	Make use of queues in solving problems having sequential processing.	2		2	2	2									2	
4th			CO5	Implement the concept of non-linear data structures-tree and graph in real world problems.		3		2										3	
4th			CO6	Analyse efficiency of different algorithms for searching and sorting.		3		3										3	3
4th	PCCS-107	Software Engineering	CO1	Explain software process models and fundamentals of software engineering to use suitable process model for a given scenario.		3		2	1	1							1	1	
4th			CO2	Analyse software requirements for designing SRS documents			2	2	1	1							1	2	
4th			CO3	Discuss project management including planning, cost estimation, scheduling and risk management		2			1	3							1	1	3
4th			CO4	Apply software design strategies to translate SRS to software design.	3		2	2	1								2	2	
4th			CO5	Apply coding standards and testing techniques for a given software design.	3		2	2	3								2	2	

Semester	Course Code	Course Name	CO	Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
4th			CO6	Recognize the importance of software maintenance , PSP, Six Sigma and re-engineering		2		1	1								1		
4th	LPCCS-103	Computer Architecture and Microprocessor Laboratory	CO1	Design half adder and full adder combinational circuits		1		1	3	1									
4th			CO2	Apply binary multiplication and mapping techniques of cache memory through simulation using GNUsim8085	2		1	1	3								1		
4th			CO3	Analyze the architecture of ALU, GNUsim8085 simulator and 8085 microprocessor		1		2									3		
4th			CO4	Implement data transfer and arithmetic instructions using GNUsim8085 simulator	3		1	2	3									2	
4th			CO5	Implement logical, stack and branch instructions using GNUsim8085 simulator	3		2	1	3	1									2
4th			CO6	Examine the fundamentals of assembly language programming using GNUsim8085 simulator		2		3									1		
4th			CO1	Utilize the concept of virtualization for creating a virtual machine and installing operating system on virtual machine		3		2	1								1		
4th			CO2	Create simulation of CPU scheduling algorithms, producer-consumer problem and deadlock avoidance algorithms.	2		3	2	3										2

Sem	Code	Course	CO	Course Outcome	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13
4th	LPCCS-104	Operating Systems Laboratory	CO3	Implement memory management schemes and page replacement schemes, disk scheduling and file management techniques				3									
4th			CO4	Explain features of windows and Linux operating system.		1		1									
4th			CO5	Execute Linux commands for performing operations				2									
4th			CO6	Write programs using different shells and shell programming.		2	1	3	3								
4th	LPCCS-105	Data Structures Laboratory	CO1	Implement arrays and perform different operations on one dimensional and multidimensional arrays.	2		1	3	1							2	
4th			CO2	Implement basic operations of stacks and use them to solve problems.	1		3	2	1								
4th			CO3	Implement basic operations of Queue and their applications.	1		3	1	2								
4th			CO4	Apply the concept of Linked list to solve given problem.	1		2	1	3								1
4th			CO5	Represent trees and graphs using appropriate data structures and perform traversal operations on trees and graphs.		1		1									
4th			CO6	Implement different searching and sorting algorithms using relevant data structures	1		2	3	2							1	

Sem	Course Code	Course Name	CO	Course Outcome												
4th	MCCS-101	Environmental Sciences	CO1	Measure environmental variables and interpret results.				2		2						
4th			CO2	Evaluate local, regional and global environment topics related to resource use and management.				2		2					2	
4th			CO3	Propose solutions to environmental problems related to resource use and management		2	2	1	1	2						2
4th			CO4	Interpret the results of scientific studies of environmental problems		3		3	2	3				2		
4th			CO5	Describe threats to global biodiversity, their implications and potential solutions.		2		3	3	3				1		
5th	PCCS-108	Artificial Intelligence	CO1	Demonstrate the foundation of Artificial Intelligence and Agents.		1		1	1							
5th			CO2	Apply the principles of search strategies and game playing to solve problems.	3		3	2	1					2	3	
5th			CO3	Provide solution to complex problems using concept of knowledge representation, inference and planning.				3								
5th			CO4	Formulate valid solutions for problems involving uncertain inputs or outcomes by using decision making techniques.				2							1	
5th			CO5	Apply inductive learning algorithms for providing solution to prediction based problems.	2		2	2	1							

5th	Code	Subject	CO	Course Outcome	1	2	3	4	5	6	7	8	9	10	11	12	13	14
5th			CO6	Demonstrate and enrich knowledge of AI to understand existing systems.		2		2	1									2
5th	PCCS-109	Database Management Systems	CO1	Elaborate the basic principles of database management systems and NoSql Databases		1		1	1						1	2		
5th			CO2	Identify the data models for relevant problems to design its Entity-Relationship diagrams		1		1	1						1	1		
5th			CO3	Formulate Queries using Relational Formal Query Languages and SQL		1	3	1	2						2	2		
5th			CO4	Apply different normal forms to design the Database and describe file structure.	2			2	2	2					2	2		
5th			CO5	Discuss transaction management and concurrency control in database management system.		1		1	1						1	1		
5th			CO6	Apply the principles of database recovery and security to the database.	3			2	1	1					1	1		
5th			CO1	Illustrate the usage of different types of finite machines and apply their transformation for different automata problems.	3		3	1	1									
5th			CO2	Explain the relationship among formal languages, classes and grammars with the help of Chomsky hierarchy.		2		1	1									

Sem	Code	Course	CO	Outcome												
5th	PCCS-110	Formal Language and Automata Theory	CO3	Applying the concepts of regular grammars, context free grammars and finite automata for language recognition and its simplification.	3		2	1	1							
5th			CO4	Design pushdown automata based on its computational capabilities to recognize and generate context-free languages.		1	3	2	1							
5th			CO5	Apply the principles of Turing machines to design computational model for solving complex engineering problems.		1	3	2	2							
5th			CO6	Make use of capabilities of linear bounded automata in contrast to applicability Turing machines.		1		2	1							
5th	PCCS-111	Design and Analysis of Algorithms	CO1	Explain divide and conquer techniques for designing algorithms		1		2	1							
5th			CO2	Analyze the resource utilization of an algorithm in terms of time and space for a given problem.		2		3								
5th			CO3	Apply greedy and dynamic programming approach for finding optimal solution of a given problem.	1		2	1	3							1
5th			CO4	Use string matching algorithms for pattern matching.	1		2	2	1							
5th			CO5	Apply graph traversal techniques to search a node and find optimal path.	1		2	2	1							

Sem	Code	Course	CO	Description														
5th			CO6	Use backtracking and NP completeness strategy to find solution.	1		2	1	3							1	
5th	LPCCS-106	Artificial Intelligence Laboratory	CO1	Write basic programs using fundamental python programming constructs.	3		1	2	3								
5th			CO2	Implement efficient uninformed search techniques to solve problems.	3		3	2	1								
5th			CO3	Implement informed search strategies by designing appropriate heuristic function.		2	1	3	2								
5th			CO4	Develop two player tic-tac-toe game by choosing appropriate game playing strategies.		1		1									
5th			CO5	Design Bayesian network to infer from the given data.	3		2	3	2								
5th			CO6	Develop systems to solve real-world problems using artificial intelligence frameworks and platforms.		3	1	2	3			3	3	3		2	3
5th	LPCCS-107	Database Management Systems Laboratory	CO1	Construct a database by using DDL, DML with SQL constraints.	1		1	1	1						1	1	1
5th			CO2	Formulate SQL queries using logical operators and SQL operators.	1		1	1	1						1	1	1
5th			CO3	Write SQL queries for Relational Algebra.	1		1	1	1						1	1	1
5th			CO4	Create views using group by ,having clause and SQL functions.	1		3	2	3						2	2	1

Sem	Code	Course	CO	Outcome	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
5th			CO5	Design SQL queries while using joins, sub queries, nested queries and SQL operations.	1		3	2	3	Create (L6)							2	2	1
5th			CO6	Develop solutions using database concepts for real time requirements.		3	3	2	3	1			3	3	3	3	3	3	1
5th	LPCCS-108	Design and Analysis of Algorithms Laboratory	CO1	Analyze the performance of Binary search,merge sort and quick sort algorithms using divide and conquer technique.		2		3											
5th			CO2	Solve and analyze the problems using greedy methods.		3		2											
5th			CO3	Apply the dynamic programming technique to solve real world problems such as knapsack and TSP.	1		3	2	1									1	
5th			CO4	Apply backtracking method to solve various problems. .	2		3	2	1										1
5th			CO5	Apply graph traversal techniques to search a node and find optimal path.	1		1	3	2										
5th			CO6	Implement string matching algorithms for pattern matching.				1											
5th			CO1	Participate in the industrial projects in challenging environment of industry.		3	3	3	2									2	
5th			CO2	Describe use of advanced tools and techniques encountered in industrial environment.		3		3											

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5th	TR-102	Training-II	CO3	Interact with professional and follow engineering practices and discipline required for real time projects.		3	3						2					
5th			CO4	Develop awareness about general workplace behaviour and build interpersonal and team skills.	3		3	2		2								1
5th			CO5	Prepare project modules, professional work reports and presentations.		3	3	2		3								
5th			CO6	Design and develop software solutions as per requirements and satisfaction of clients.		3	2	3		2								
5th	PECS-101	Software Project Management	CO1	Apply project management activities involved in software projects.	2		2	1		1								
5th			CO2	Estimate project cost, plan project and evaluate software project.			3											
5th			CO3	Analyse risks during project scheduling activities.		3	3											
5th			CO4	Design key strategies to monitor, control and quality assurance of software projects.			3											
5th			CO5	Develop effective organisational, leadership and change skills for managing projects, teams and stakeholders.	1		1	1		1	1		1	1	1		3	2
5th			CO6	Utilize software project management tools to model real-world problems.	1		1	1		2							2	

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5th	PECS-106	Advanced Computer Networks	CO1	Implement switching and routing techniques to ease the communication problems over different geographical areas	3		3	2	3		1								
5th			CO2	Analyze network architectures to ensure the optimal network performance		2		2											
5th			CO3	Explain the evolution of Ethernet networks from half-duplex with CSMA/CD to full-duplex		1		2	2							2			
5th			CO4	Identify the challenges of Mobile Ad hoc Networks and vehicular ad hoc networks		1		2	2							1			
5th			CO5	Apply communication protocols to ensure the dependable, sequentially arranged, and error-checked transmission of a sequence of bytes	3		2	2	3										2
5th			CO6	Analyze the functions and operations of the Medium Access Control (MAC) sublayer within the context of IEEE 802.11		2		2											
5th	PECS-111	Statistics for Data Science	CO1	Analyze the need and usage of various facets of data.		2		3											
5th			CO2	Examine the steps for Data collection and Data Science process		1		2	3										
5th			CO3	Identify and apply various forms of representing data	1		1	2	2										
5th			CO4	Perform exploratory data analysis.	1		1	3	3										

Sem	Course Code	Course Name	CO	Course Outcome															
5th			CO5	Understand and apply various visualization techniques	1		1	1	1									1	
5th			CO6	Demonstrate and enrich knowledge for various model validation techniques.	1		1	1	1										1
5th	PECS-116	Information Retrieval	CO1	Explain Information Retrieval (IR) systems and its role in web search		2		3	1								2		
5th			CO2	Compare the performance of simple and cross language Information retrieval models.		1		3											
5th			CO3	Evaluate information retrieval algorithms and give an account of the difficulties of evaluation				3											
5th			CO4	Explain the concept of Parallel Retrieval		1		1	2										
5th			CO5	Analyze the various aspects of distributed information retrieval and integration.		2		2											
5th			CO6	Develop the ability to design a complete IR system from scratch.		1	2	1	2									2	1
5th	PECS-125	System Programming	CO1	Explain system software, operating systems and components of programming system.		2		1	2										
5th			CO2	Elaborate language processors and elements of assembly language programming.		3		2	1									2	
5th			CO3	Design of macro processor, linkers and loaders.		2		3											
5th			CO4	Determine the process of scanning and parsing .	1		1	1	1										

Sem	Code	Course	CO	Description	1	2	3	4	5	6	7	8	9	10	11	12	13	14
5th			CO5	Discuss the phases of compiler.		3		2	1								2	
5th			CO6	Use interpreters and debuggers.	1		1	1	1							1		
6th	PCCS-112	Compiler Design	CO1	Explain the fundamental principles and phases of compiler.		1		1	1									
6th			CO2	Make use of lexical analysers to identify tokens.	1		2	2	1							1		
6th			CO3	Implement top down and bottom up parsers using syntax directed translation methods	3		1	2	3	1								
6th			CO4	Generate intermediate code representation using syntax trees and DAG.	3		3	2	3								2	
6th			CO5	Deduce machine code from the source code using code generator.				3										
6th			CO6	Apply optimization techniques to intermediate code using data flow analysis.	3		3	2	1									2
6th			CO1	Apply the concepts of mathematical foundations and programming to solve diverse problems related to computer graphics	2		1	2	1									
6th			CO2	Compare and contrast various computer graphic algorithms and their suitability to real world problems.		3		2	2	1								
6th	PCCS-113	Computer	CO3	Utilize models for transformation of 2D and 3D objects.	2		1	1	2									

Sem	Code	Course	CO	Course Outcome	1	2	3	4	5	6	7	8	9	10	11	12	13
6th	PCCS-115	Graphics	CO4	Identify the areas of computer graphics to apply advance algorithmic techniques for changing the formations of geometrical objects.		3		2									2
6th			CO5	Apply algorithmic techniques for visualizing objects.	3		2	1	2								
6th			CO6	To use computer graphics concepts in the development of real world graphical applications.	1		1	1	1	2						3	
6th	PCCS-114	Machine Learning	CO1	Explain well defined learning problems with hypothesis and version spaces.		2		1	1								
6th			CO2	Apply supervised and unsupervised machine learning techniques for practical implication.	3		2	2	1								
6th			CO3	Use decision trees to generalize patterns from the training data to make predictions on unseen data.	2		1	1	1								1
6th			CO4	Elaborate the fundamental concepts of Artificial Neural Networks (ANNs) and their applications in machine learning.		2		1	1								
6th			CO5	Apply the concepts of Bayesian analysis from probability models and methods.	3		2	1	1								
6th			CO6	Explain the concept of genetic algorithm and learning the methodology to evaluate algorithm performance.				3								1	

Sem	Code	Course	CO	Course Outcome	1	2	3	4	5	6	7	8	9	10	11	12	13	14
6th	PCCS-115	Cyber Security	CO1	Apply cyber security policies to implement security features.	3		2	2	1									
6th			CO2	Analyse the defences against network and system attacks in social media.		3		2			3							
6th			CO3	Discuss vulnerabilities critical to E-commerce security.		3		2	2									
6th			CO4	Highlight the security aspects of online payment systems.		2		2									2	
6th			CO5	Diagnose cyber security threats in context with social engineering.		3		2			1						2	
6th			CO6	Analyse information recovery and assurance issues.		3		1										
6th	LPCCS-109	Computer Graphics Laboratory	CO1	Develop computer programs for elementary graphic operations.	1		1	1	1									
6th			CO2	Implement scan conversion algorithms for line drawing	2		2	1	2									
6th			CO3	Write programs to implement circle and ellipse drawing algorithms.	2		3	2	2									
6th			CO4	Design programs to demonstrate geometric transformations on 2D and 3D objects.	2		3	2	2									
6th			CO5	Develop programs to demonstrate clipping and filling techniques for modifying an object.	3		3	2	2							2		

Sem	Course Code	Course Name	CO	Description														
6th			CO6	Create interactive graphics applications using one or more graphics application programming interfaces.	1	2	1	2				1						
6th	LPCCS-110	Machine Learning Laboratory	CO1	Create programs for fundamental machine learning algorithms, including FIND-S and Candidate Elimination	3		1	2	1									
6th			CO2	Implement neural networks and their applications in real-world problems.	3		3	1	2									2
6th			CO3	Apply the Naïve Bayesian Classifier and Bayesian network to real-world scenarios.		3		3										
6th			CO4	Design experiments to test and evaluate supervised and unsupervised learning algorithms .				3									1	
6th			CO5	Develop skills in selecting appropriate datasets for experiments related to Locally Weighted Regression and patient risk prediction.	2	3	2	2										
6th			CO6	Build programming proficiency to implement genetic algorithms for hyperparameter optimization	1		1	1	1								1	
6th			CO1	Choose an appropriate software process models according to the given users requirements.		1		1									1	

Sem	Code	Course	CO	Description	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
6th	PECS-102	Software Testing and Quality Assurance	CO2	Apply various testing techniques to deliver a product free from bugs.	3		2	3	1									3	
6th			CO3	Apply testing methodologies, debugging tools and maintenance models to ensure accountability of software.	2		2	2	2										
6th			CO4	Explore the test automation concepts and tools and estimation of cost, schedule based on standard metrics.		1		1											
6th			CO5	Design software reliability measures to ensure quality of software in case of various faults and failure.		2		3						2	2				
6th			CO6	Conduct formal inspections, record and evaluate results of inspections.		3		1					2		2			3	
6th			CO1	Identify and classify computer and security threats and develop a security model to prevent, detect and recover from attacks		1		2											
6th			CO2	Apply modern algebra and number theory to understanding of cryptographic algorithms	1		1	2	1									1	
6th	PECS-108	Network Security and	CO3	Evaluate security mechanisms using rigorous approaches by key ciphers and Hash functions.				3										1	

Sem	Code	Course	CO	Description	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
6th	PECS-108	Security and Cryptography	CO4	Understand and analyze public-key cryptography, RSA and other public-key cryptosystems		1		2	1							
6th			CO5	Encryption and analyze the various symmetric encryption algorithms and asymmetric algorithms		2		1	1							
6th			CO6	Apply the knowledge of existing authentication protocols and key management techniques to provide security solutions.	2		2	3	1						1	
6th	PECS-114	Advanced Database Management Systems	CO1	Implement PL/SQL programming to classify mechanisms related to Cursor Management, Error Handling, Package and Triggers.				2								
6th			CO2	Illustrate the concept of object oriented database and have experience with object oriented modeling, design and implementation.		1		2	1							
6th			CO3	Administering a database by recommending and implementing procedures including database tuning, backup, query processing, query optimization and recovery.				3								
6th			CO4	Assess and apply database functions of distributed database.	1		3	1	2						1	

Sem	Code	Course	CO	CO Description	1	2	3	4	5	6	7	8	9	10	11	12	13
6th			CO5	Elaborate the basic principles of warehousing techniques by explaining its functionality.		1	2	1	2								1
6th			CO6	Identify approaches of data mining tools and its associated problems.	2		3	1	2								
6th	PECS-120	Natural Language Processing	CO1	Apply the knowledge of mathematics and engineering to understand the computational properties of natural languages and the commonly used algorithms for processing linguistic information.	2	1										1	
6th			CO2	Examine natural language processing models and algorithms using both the traditional symbolic and the more recent statistical approaches.	1	2		1	2								
6th			CO3	Discuss the key concepts from natural language processing and to describe and analyze language, POS tagging and context free grammar for English language.			1	2	3								
6th			CO4	Discover the capabilities and limitations of current natural language technologies, and some of the algorithms and techniques that underlie these technologies.		1		1	1								

Sem	Course Code	Course Name	CO	Description													
6th			CO5	Recognize the significance of models and methods of statistical natural language processing for common NLP tasks.		3	2		1								
6th			CO6	Illustrate the concepts of morphology, syntactic analysis, semantic interpretation and pragmatics of the language, demonstrating them with different approaches.			3	2	3								2
6th			CO1	Understanding of Java's core features, its object-oriented principles, and the significance of Java bytecode		1		1	1								
6th			CO2	Identify the various aspects of a specific problem and apply the concepts of classes and objects to develop object oriented model.		2		2									
6th	PECS-126	Java Programming	CO3	Develop reusable programs using the concepts of inheritance , polymorphism, interfaces and packages to formulate a solution for complex analytical problem.	3		3	3	3							3	
6th			CO4	Design event driven GUI based and web based applications by implementing concepts like event handling and applets		3	3	3	3							3	

Sem	Course Code	Course	CO	Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
6th			CO5	Examine the errors in the developed system and resolve them by applying the knowledge of exception handling		1		1									1		
6th			CO6	Apply multithreading and Synchronization concepts to develop high-performance, responsive software solutions for modern computing environments.		1	1	1	1								1		1
6th			CO1	Develop testing methodologies, debugging tools and maintenance models to ensure accountability of software.		3		2						3	3		3		2
6th			CO2	Execute white box testing methods to test the individual units or components of the software system.	2		2	1	2										
6th	LPECS-101	Software Testing and Quality Assurance Laboratory	CO3	Implement white box testing to test data flow in every path through program's control flow.	2		1	1	2										
6th			CO4	Execute white box testing using code mutation testing technique.	2		1	1	2										
6th			CO5	Test the software by applying Black box testing techniques to deliver a product free from bugs.	3		1	3	2										
6th			CO6	Perform integration and regression testing using appropriate testing tools.		3		2						1	2				

Sem	Code	Course	CO	Course Outcome	1	2	3	4	5	6	7	8	9	10	11	12	13	14
6th	LPECS-104	Network Security and Cryptography Laboratory	CO1	Implement encryption and decryption techniques for providing security solutions.	1		2	3	1								1	
6th			CO2	Analyze the impact of public key cryptosystems for secure exchange of information		3		2										
6th			CO3	Design Network Security protocols for information exchange over unsecure network		1	3	1	2									
6th			CO4	Apply security principles for implementing authentication applications.	2		3	1	2									
6th			CO5	Testing and verification of cryptography aspects by integrating people, processes and technologies.				3										1
6th			CO6	Develop secure network using cryptography and network security concepts.		3	2	2	1									
6th	LPECS-107	Advanced Database Management Systems Laboratory	CO1	Implement PL/SQL techniques for providing solutions for arrays and strings.	1		3	1	1								1	
6th			CO2	Analyze the impact of PL/SQL loops and arrays for implementing solutions.		3		1										
6th			CO3	Design procedure oriented PL/SQL programs for relational operators.	1		3	1	2									
6th			CO4	Apply PL/SQL function principles for implementing programs.	2		1	3	1									

Sem	Course Code	Course Name	CO	Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
6th			CO5	Illustrate the use of records, cursors, triggers, exceptions and triggers for implementing programs.		1		2	3									
6th			CO6	Develop a project by applying various PL/SQL concepts.		1	3	2	1									2
6th	LPECS-110	Natural Language Processing Laboratory	CO1	Apply the knowledge of engineering to understand the computational properties of natural languages and to implement the algorithms for processing linguistic information.	3			2	3	1								
6th			CO2	Utilize the models and methods of statistical natural language processing for common NLP tasks such as speech recognition, machine translation, text classification, spell checking etc.	1			1	1	1							2	
6th			CO3	Understand the key concepts of morphology, syntactic analysis for implementing pos tagging algorithms and context free grammar for English language.			3		2	1								
6th			CO4	Identify and apply natural language processing algorithms to solve real world problems.	2			2	3	1								
6th			CO5	Understanding semantics and pragmatics of English language for processing.			1		1	1								

Sem	Code	Course	CO	Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
6th			CO6	Implement, and apply state-of-the-art techniques to novel problems involving natural language data.	1		1	1	1										
6th			CO1	Apply the knowledge of JAVA language syntax and semantics to write and execute Java programs.	1		1	1	1										
6th			CO2	Develop reusable programs using the concepts of inheritance , polymorphism, interfaces and packages to formulate a solution for complex analytical problem		1		3											3
6th	LPECS-113	Java Programming Laboratory	CO3	Design event driven GUI based java program which mimic the real world scenarios.		1	3	2	2								1		3
6th			CO4	Create interactive and visually appealing web-based applications using Java applets		1	3	1	3										3
6th			CO5	Implement exception handling techniques to make the system bug free.		1		1											1
6th			CO6	Develop effective java applications by applying the concepts of multithreading and Synchronization for solving real world problems		1	1	1	1										1
6th			CO1	Apply engineering, ethical and mathematical principles to achieve objectives of a project.	3		1	1	1	2		2							

Sem	Code	Course	CO	Course Outcome	1	2	3	4	5	6	7	8	9	10	11	12
6th	PRCS-102	Minor Project	CO2	Analyze, formulate and review the literature and develop solutions for framed problem statement.	3		2									
6th			CO3	Design and construct hardware and/or software system, component, or process to meet desired needs.	1	2	2	1							2	
6th			CO4	Choose and apply emerging trends and contemporary project management methodologies in context of computer science and engineering.	2		1	2					2			2
6th			CO5	Test and validate various modules of planned project.	2		3									
6th			CO6	Demonstrate the ability to work, communicate effectively as a team and to write and present technical reports.	1		2	2			3	3	2	2		
7th	PECS-103	Agile Software Development	CO1	Interpret the concept of agile software engineering and its advantages in software development.	2		1	3							1	
7th			CO2	Analyze the core practices behind several specific agile methodologies	3		2								2	
7th			CO3	Determine the role of design principles in agile software design	3		2	1								
7th			CO4	Explain design methodologies of agile software development.	3		2	1								

Sem	Course Code	Course	CO	Course Outcome	1	2	3	4	5	6	7	8	9	10	11	12	13	14
7th			CO5	Assess implications of functional testing, unit testing, and continuous integration.				2									2	
7th			CO6	Apply testing strategies in agile software testing.	2		2	1	2					1			2	2
7th	PECS-109	Software Defined Networks	CO1	Explain the concepts of software defined networks and compare it with traditional networks.		2		2										
7th			CO2	Analyse the functions and components of the SDN architecture.		2		2										
7th			CO3	Describe Network Functions Virtualization components and their roles in SDN.		2		2	1									
7th			CO4	Evaluate the pros and cons of applying SDN controllers in data centers.				3										2
7th			CO5	Explain Open Flow Specifications of SDN using separation of data, control plane and application plane.		3		2	2									
7th			CO6	Make use of different technologies available in SDN data centre as per need.	2		2	2	2								2	
7th			CO1	Elaborate the basics of data warehousing and data mining.		2		1	1									
7th			CO2	Describe building blocks of data warehouse and design data marts		1		2	3									
7th			CO3	Apply OLAP operations to multi dimensional data.	2		1	1	2									

Sem	Code	Course	CO	Course Outcome	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13
7th	PECS-115	Data Warehouse and Data Mining	CO4	Identify appropriate data mining classification algorithms to solve real world problems		2		2									
7th			CO5	Examine clustering algorithms and find patterns by applying association rule mining.		2		3									
7th			CO6	Use data mining tools for applications and case studies of data warehouse, web mining and data mining.	2		3	1	2							2	
7th	PECS-121	Computer Vision	CO1	Explain basic terminologies and models for digital image formation.		2		1	3								
7th			CO2	Apply edge detection, blobs detection and corner detection techniques to represent visual features.	3		1	2	2						3		
7th			CO3	Make use of feature descriptors and matching techniques to identify objects.	3		3	3	3						2		
7th			CO4	Analyse the characteristics by segmenting the image into different regions.		1		1									
7th			CO5	Determine objects by identifying regularities in pattern analysis.				1									
7th			CO6	Design a computer vision system for a real-world problem.		2		2								2	
7th			CO1	Explain the principles of dynamic programming for solving optimization problems efficiently.	3	2	2										

Sem	Code	Course	CO	CO Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
7th	PECS-132	Design and Analysis of Advanced Algorithms	CO2	Apply Greedy algorithms design techniques for problem solving.	3	3	3												2
7th			CO3	Analyze the complexity of advanced algorithms using Amortized techniques.	1		2		2										
7th			CO4	Apply randomized algorithms in problem solving with probabilistic and approximation guarantees.	2		2		2										
7th			CO5	Implement network flow algorithms in engineering problems to reduce complexity.	2	2	2									2			
7th			CO6	Elaborate multithreaded algorithmic principles in the modeling of computer based systems.		2	2		2										
7th	PECS-104	Object Oriented Design using UML	CO1	Explain the fundamentals of OOD, system models and their usage.		2			2							2			
7th			CO2	Design UML diagrams and their relationships.	2		2												
7th			CO3	Define structural modeling and software requirement specification document.			2		2										3
7th			CO4	Determine behavioral modeling and architectural modeling using use cases.	3		3												
7th			CO5	Discuss object oriented methodologies, System testing and maintenance.		2			2										
7th			CO6	Use open source UML design tools for real world problems.	3		3												

Sem	Course Code	Course Name	CO	Course Outcome															
7th	PECS-110	Wireless Sensor Networks	CO1	Outline the basics of wireless sensor networks and its emerging technologies.		3		2	2									1	
7th			CO2	Apply the design principles of WSN architectures and operating systems for simulating environment situations.	3		2	2	2										
7th			CO3	Identify the issues pertaining to sensor networks and the challenges involved in managing sensor networks.		3		3											
7th			CO4	Recognize appropriate infrastructure, topology, joint routing and information aggregation for wireless sensor networks.		3		3											
7th			CO5	Analyse the sensor network platform and tools for programming.		2		3											2
7th			CO6	Design suitable routing algorithms based on the network and user requirement.		1	2	1	2										
7th			CO1	Discuss cloud computing fundamentals, computing paradigms and NIST model of cloud computing.		2		1	1										1
7th			CO2	Make use of core technologies of cloud computing in building cloud platforms.	3		2	1	1										2

Sem	Course Code	Course Name	CO	CO Description	1	2	3	4	5	6	7	8	9	10	11	12	13
7th	PECS-117	Cloud Computing	CO3	Classify cloud service models and their applications in business and industry perspectives.	2		2	2	2								
7th			CO4	Explain cloud deployment models and their implementation.		2		1	2								1
7th			CO5	Assess issues and challenges in cloud security.		3		1									
7th			CO6	Compare and contrast open cloud platforms with commercial cloud platforms.		2		2									2
7th			CO1	Illustrate soft computing techniques and their role in problem solving.		2		3	2								
7th			CO2	Apply different ANN training models to solve classification problems.	3		3	2	2							3	
7th			CO3	Make use of fuzzy set theory to interpret fuzzy inference systems.	3		3	3	1							3	
7th	PECS-122	Soft Computing	CO4	Explain the concept of genetic algorithms to develop various genetic applications.		3		3	2								
7th			CO5	Select appropriate nature inspired algorithm to solve optimization problems.		2		1								2	
7th			CO6	Identify and select a suitable soft computing technology to solve real-world problem.		1		2									2
7th			CO1	Provide an insight on the basics of internet technology.		3		1	1								

Sem	Code	Course	CO	Course Outcome	1	2	3	4	5	6	7	8	9	10	11	12	13	14
7th	PECS-128	Web Technologies	CO2	Design web applications using HTML and CSS	3		3	2	3								3	
7th			CO3	Build dynamic web pages using javascript for real world problems	3		2	1	2								2	
7th			CO4	Design responsive web applications using Twitter Bootstrap, AngularJS and NodeJS.	1		1	1	1								1	
7th			CO5	Create dynamic and server-side web applications, using PHP and MYSQL.	3		3	2	3								3	
7th			CO6	Optimize websites for better search engine rankings and organic traffic growth		2		1										2
7th	LPECS-102	Object Oriented Design using UML Laboratory	CO1	Identify various models to plan correct software.		2		2									3	
7th			CO2	Illustrate suitable project organization structure by using suitable tool.			3		3									
7th			CO3	Apply the usage of various class modeling.			3		3									
7th			CO4	Outline the phases of software projects and practice the state modeling.	2				2									
7th			CO5	Extend the interacting modeling techniques for project.	2				2									2
7th			CO6	Apply knowledge to create various diagrams.				2	2									
7th			CO1	Design wireless network environment for any application using latest wireless protocols and standards.		2	3	2	2									2

Sem	Course Code	Course Name	CO	Description													
7th	LPECS-105	Wireless Sensor Networks Laboratory	CO2	Implement different type of applications with latest network topologies.				2									
7th			CO3	Examine the network security issues in Mobile and ad hoc networks.		1		1									
7th			CO4	Apply the knowledge to identify the suitable routing algorithm based on the network and user requirement.	1		1	1	1								
7th			CO5	Simulate and experiment with sensor network software and hardware.	2		3	3	2								
7th			CO6	Be familiar with WSN standards.		2		3	2								
7th	LPECS-108	Cloud Computing Laboratory	CO1	Make use of CloudSim Toolkit to simulate different scenarios of Cloud Computing Paradigm.	1		2	2	2						1		
7th			CO2	Simulate the role of Network Topology on Data centre using CloudSim	1		2	2	2								
7th			CO3	Apply Cloud Analyst tool to visualize Data Centres and User Bases.	1		2	2	3						1		
7th			CO4	Implement broker policy and load balancing techniques using simulation tool.	2		2	2	2						1		
7th			CO5	Examine architecture constructs of different Cloud platforms.		1		2									1
7th			CO6	Assess the services offered by Cloud Platforms.		2		2									1

Sem	Code	Course	CO	Description	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
7th	LPECS-111	Soft Computing Laboratory	CO1	Construct an inference system by making use of Fuzzy set theory.	2		2	2	1								2	2
7th			CO2	Develop an application using concepts of genetic algorithm.	2		2	1	2									
7th			CO3	Implement neural network concepts using perceptron,hebb's rule, delta rule etc.	1		3	2	2									
7th			CO4	Analyse back propagation algorithms by changing weights.		3		3									2	3
7th			CO5	Create a neural network to solve real world classification problems.		2	2	2	2									2
7th			CO6	Develop projects using soft computing tools and techniques while working in multidisciplinary teams.		3	3	2	2				3	2				2
7th			CO1	Create well-structured, accessible, and responsive web content using HTML, which is foundational to web development and design.	3		3	2	3									
7th			CO2	Create Scripts to manipulate the Document Object Model (DOM), enabling them to create dynamic and interactive web pages and enhance user experiences on websites		1		1									1	

Sem	Code	Course	CO	Outcome	1	2	3	4	5	6	7	8	9	10	11	12	13
7th	LPECS-114	Web Technologies Laboratory	CO3	Design responsive and visually appealing web applications using Twitter Bootstrap, create dynamic and interactive front-end interfaces with AngularJS, and build server-side applications and APIs with Node.js, providing them with a comprehensive understanding of modern web development technologies and frameworks	3		3	2	3								3	
7th			CO4	Build dynamic and interactive web applications, including form processing, user authentication, and session management using PHP	3		3	2	3								3	
7th			CO5	Create interactive websites that store, retrieve, and manipulate data from relational databases	3		3	2	3								3	
7th			CO6	Integrate PHP, MySQL, and JavaScript to develop complete full-stack web applications, bridging the gap between front-end and back-end development.		2	3	2	3								3	
8th			CO1	Demonstrate software metrics used for measurements in software engineering.		1		1	1									

Sem	Code	Course Name	CO	Description	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
8th	PECS-105	Software Metrics	CO2	Apply quality management system models for quality control and reliability assessment.	3		2	3	1										
8th			CO3	Make use of internal and external product attributes to check quality of software products.	2		2	3	2										
8th			CO4	Inspect component based systems through use of MOOD metrics.		2		3											
8th			CO5	Evaluate the quality level of software at run-time using dynamic metrics.				2											
8th			CO6	Control software quality through software quality control and assurance.	2		2	2	1										
8th	PECS-113	Blockchain Technology	CO1	Explain the emerging concept of Blockchain Technology.		3		1	1								2		
8th			CO2	Describe the secure interaction mechanism within a blockchain system.	2		3	1	1										
8th			CO3	Evaluate various consensus algorithms used in blockchain system.				2											
8th			CO4	Demonstrate Ethereum network and understand smart contracts	1		3	2	1										
8th			CO5	Outline the hyperledger fabric and deal with digital ledger		2		1	3										
8th			CO6	Identify various research areas in blockchain technology.				2										2	1

Sem	Code	Course	CO	Outcome	1	2	3	4	5	6	7	8	9	10	11	12	13	14
8th	PECS-118	Big Data	CO1	Explain the structural concepts, analytics tools and drivers of big data ecosystem.		2		1	1									
8th			CO2	Apply Hadoop and MapReduce commands in big data distributed environment of Clusters.	3		2	1	2							1		
8th			CO3	Evaluate Hadoop distributed file system with Mapper and Reducer for big data management.				2										
8th			CO4	Compare different types of databases for big data application management		2		2										
8th			CO5	Classify business analytics and analytical methods in practice for helping decision making in businesses.		1		2								2		
8th			CO6	Utilize different analytical methods and case studies for the analysis of big data applications	1	2		2	2									1
8th			CO1	Examine the capabilities of both humans and computers from the viewpoint of human information processing		3		2	3				2					
8th			CO2	Understand the concept of computational theory and the classification of Ubiquitous Computing, Virtual Reality and Augmented Reality, Speech Recognition and Translation based on their efficiency		2		2	1						2			

Sem	Course Code	Course Name	CO	CO Description															
8th	PECS-123	Human Computer Interaction	CO3	Apply an interactive design process and universal design principles to design HCI systems	3		3	3	2										
8th			CO4	Make use of HCI standards and guidelines for Model based evaluation		1		1	1								1		
8th			CO5	Analyze user models, user support, socio-organizational issues, and stakeholder requirements of HCI systems		2		3				2		2					
8th			CO6	Explain the HCI implications for designing multimedia/ ecommerce/ e-learning Websites and Mobile Application Development environment	3			3	2						2				2
8th		Parallel and Distributed Algorithms	CO1	Demonstrate parallel algorithms models, development techniques and algorithms.															
8th			CO2	Explain the PRAM model, various parallel algorithms and cost of communication.															
8th			CO3	Analyze the pipeline performance, stages, hazards and dynamic instruction scheduling.															
8th	PECS-129		CO4	Apply techniques and methods for data mapping and scheduling in SIMD parallel algorithms															
8th			CO5	Determine the concepts and issues related to distributed systems.															

8th			CO	Course Outcome												
8th			CO6	Evaluate performance, reliability and other issues while designing token based and non token based algorithms in distributed environment												
8th	PECS-107	Component Based Development	CO1	Explain Component Based Systems along with their Purpose and Scope		2			2	2						
8th			CO2	Apply Software Engineering Practices in Component Based Development.	1				1	1						
8th			CO3	Apply catalysis techniques for Defining Component Infrastructures.	2				2							1	
8th			CO4	Apply software metrics to measure the performance of Software Components.	2				2							
8th			CO5	Explain Software Component Project Management Processes and issues in its testing.		1				1						
8th			CO6	Explain the use of Component Technologies in Next Generation Software Components.		3				3						1
8th	PECS-112	Internet of Things	CO1	Understand general concepts of internet of things (IoT).		3			2	1				2		
8th			CO2	Discriminate the functionality of ip and mac addresses along-with the application layer protocols.	3		3		2	2						
8th			CO3	Illustration of the design principles for connected devices and web connectivity.		3			3					2		

Sem	Code	Course	CO	Course Outcome														
8th			CO4	Analyze various M2M and IoT architectures.		2		3										
8th			CO5	Apply design concepts to IoT solutions.	2		3	2	2						2			3
8th			CO6	Create IoT solutions using sensors, actuators, and devices.	3		2	2	2						1			
8th	PECS-119	Data Science	CO1	Analyze the need and usage of various facets of data.		3		1	1									
8th			CO2	Examine the steps for Data collection and Data Science process		1		3	2									1
8th			CO3	Identify and apply various forms of representing data	3		2	1	1									
8th			CO4	Perform exploratory data analysis.		3		3										
8th			CO5	Understand and apply various visualization techniques	2		1	1	1									
8th			CO6	Demonstrate and enrich knowledge for various model validation techniques.				2										2
8th	PECS-124	Deep Learning	CO1	Explain key concepts and terminologies related to deep learning.		2		1	2						2			
8th			CO2	Implement feedforward, Convolutional and Recurrent Neural Network architectures.	3		2	2	3									
8th			CO3	Apply techniques to optimize hyperparameters for improving model performance and efficiency.	2		3	3	3						2			
8th			CO4	Explain the usage of CNN architecture to extract features from input data.		2		3	3									

Sem	Code	Course	CO	Course Outcome											
8th			CO5	Understand the functioning and training algorithm for RBMs and their application in Generative Modelling.		2		2	1						
8th			CO6	Develop skills to evaluate various advanced learning approaches and select suitable technique for use cases.				3						2	
8th			CO1	Demonstrate the android features and develop application using Android.		3		2	1					2	
8th			CO2	Utilize rapid prototyping techniques to design and develop sophisticated mobile Interfaces.	3		3	2	2						
8th			CO3	Design and develop mobile application that accommodates user specific requirements and constraints analysis.		3		3						2	
8th	PECS-130	Mobile Application Development	CO4	Illustrate android basic principles and common APIs to manage data for mobile application development.		2		3							
8th			CO5	Apply mobile applications for Android and iOS based operating system that uses basic and advanced phone features.	2		3	2	2					2	3
8th			CO6	Make use of the concept React Native for creating Hybrid Mobile Application.	3		2	2	2					1	

Sem	Code	Course	CO	Course Outcome															
8th	LPECS-103	Component Based Development Laboratory	CO1	Model the documentation of software configuration management and risk management.	2		2												
8th			CO2	Explain the design process of software component infrastructure.		2		2										2	
8th			CO3	Analyze the cost effectiveness of COTS software.		2		2											
8th			CO4	Discover Test cases, Test scripts/procedures and Test incident of a system.		2		2											
8th			CO5	Apply knowledge of C++ server, CORBA and Javabeans to develop a component based model.				3	3										3
8th			CO6	Develop any component based system.			3	3											
8th	LPECS-106	Internet of Things Laboratory	CO1	Understand internet of things along-with its hardware and software components.				2	3			2			1	1			
8th			CO2	Interface I/O devices, sensors & communication modules.	2		3	2	3						2				
8th			CO3	Use wireless peripherals for exchange of data.	2		2	2	3						2				
8th			CO4	Understand the key features of ad hoc and sensor networks					1										
8th			CO5	Analyze and evaluate protocols used in iot and data received through sensors in IoT.		2	2	3	3			2			2				
8th			CO6	Develop real-time IoT based automation systems.		2	2	3	3			2			2				2
7th			CO1	Understand concepts of R programming.		1		1	1										2

Sem	Course Code	Course Name	CO	Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1
7th	LPECS-109	Data Science Laboratory	CO2	Make use of and demonstrate variables, data types and operations using R.	3		2	1	1								
7th			CO3	Explain and Perform mathematical constructs for better analysis of data.	3		3	2	1								
7th			CO4	Implement various visualization techniques for gaining more data insights.		2		3									
7th			CO5	Apply data science concepts and methods to solve problems in real-world contexts and will communicate these solutions effectively.	3		1	2	1								
7th			CO6	Design and develop projects using Data Science tools and techniques.		3	3	2	2			1	1	1	1		3
7th	PECS-133	Preparation and Analysis of Data	CO1	Apply the process of preparing data for analysis, including data cleaning, integration, preprocessing and validation	1		2	2	2								
7th			CO2	Assess the effectiveness of data integration techniques in addressing data inconsistencies and redundancies.				3									
7th			CO3	Assess the effectiveness of data integration techniques in addressing data inconsistencies and redundancies.	2		3	3	2								

Sem	Code	Course	CO	Course Outcome	1	2	3	4	5	6	7	8	9	10	11	12	13	14
7th			CO4	Analyze the results obtained after applying advanced data analysis techniques to datasets.		2		2								2		
7th			CO5	Design visualizations that adhere to principles of clarity, simplicity, and accuracy.	1		2	2	1									
7th			CO6	Evaluate the ethical and practical implications of proposed solutions and recommendations				3			2							2
7th			CO1	Familiarization the Market trends of IoT in smart sensing		2		2	2									
7th			CO2	Understand the working of smart sensors and its types in IOT context.		2		2	2							2		
7th			CO3	Explain the physical design of IoT and its enabled technologies		2		2	2									2
7th	PECS-134	Smart sensors of IoT	CO4	Analyze the Architecture o--f Smart Sensors and its functions for IoT design concepts		3		3										
7th			CO5	Apply knowledge in usage of smart devices and communications Protocols in IoT	2		2		2									
7th			CO6	Create IoT solutions using sensors, actuators, and Devices.	2	2		2	2									
7th/8th			CO1	Make use of Amazon Web Services (AWS) console for different cloud services and understand the structure of AWS cloud.	3		2	1	2									

Year/Sem	Code	Course	CO	Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
7th/8th	PECS-135	Applied Cloud Computing	CO2	Implement Amazon Elastic Compute Cloud (Amazon EC2), Amazon Simple Storage Service (S3), and Amazon CloudFront service on AWS cloud	3			2	2	2										
7th/8th			CO3	Apply cloud security and monitor the working of AWS cloud.	2			3	2	1										
7th/8th			CO4	Utilize database and load balancing service on AWS cloud.	2			3	1	2									1	
7th/8th			CO5	Make use of AWS simple monthly calculator and Elastic Beanstalk.	2			2	2	1									1	
7th/8th			CO6	Use Artificial intelligence, Machine learning, and Blockchain technology services on AWS cloud	2			1	1	2	2		2							2
7th/8th	LPECS-135	Applied Cloud Computing Laboratory	CO1	Deploy a website on Amazon Elastic Compute Cloud (EC2) instance and Amazon Simple Storage Service (S3).	2			3	1	2			1						2	
7th/8th			CO2	Implement Content Distribution Network (CDN) and AWS Identity and Access Management (IAM) service.	2			3	2	1										
7th/8th			CO3	Monitor the cloud using CloudWatch and Amazon Simple Notification Service (SNS).		3				1										
7th/8th			CO4	Use Amazon Relational Database Service (RDS) and Load balancing service.	3			2	1	1										

Sem	Course Code	Course Name	CO	Course Outcome	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
7th/8th			CO5	Utilize AWS Elastic Beanstalk service and Cloud Formation service.	2		2	1	2										
7th/8th			CO6	Estimate the cost of cloud architectures using AWS simple monthly calculator.		2		1									3		1
8th	LPECS-112	Deep Learning Laboratory	CO1	Evaluate the performance of neural network using various metrics.		1		1											
8th			CO2	Implement LSTM-based sentiment analysis on their own datasets to reinforce the learned concepts.	2		1	2	1									2	
8th			CO3	Implement real-world applications of ResNet and AlexNet.	3		2	2	2										2
8th			CO4	Inspect CNN and hybrid CNN for speech data analysis.		3		2										2	
8th			CO5	Implement deep neural networks in simulated environment.	2		1	2	1									1	
8th			CO6	Implement the generator network architecture to generate realistic faces.	1		2	2	2										
8th	LPECS-115	Mobile Application Development Laboratory	CO1	Demonstrate the basic principles of Mobile application development		3		3	2										
8th			CO2	Build a native application using GUI components, Layouts and Mobile application development framework	3		2	3	2										
8th			CO3	Develop an application using basic graphical primitives and databases	3		2	3	2										
8th			CO4	Make use of location identification using GPS in an application	3		2	3	3										

Sem	Code	Course	CO	Course Outcome	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
8th			CO5	Construct an application using multi-threading and RSS feed	3		2	3	2										
8th			CO6	Model new applications to handheld devices	3		2	3	2										
7th/8th	TR-103	Training-III	CO1	Acquire the basic skills about project development, organization and implementation to provide solution for a problem.	2		3	2	2									2	
7th/8th			CO2	Gain first-hand experience of working as an engineering professional and technical application of engineering knowledge.		3	3	2	2										
7th/8th			CO3	Attain new skills and be aware of the state-of-art in engineering disciplines of their own interest.		2		3											
7th/8th			CO4	Learn modern tools and contemporary ideas by practicing self-learning.		2		3											
7th/8th			CO5	Learn work ethics by interacting with engineers and other professional groups thereby, increasing technical, interpersonal and communication skills		3		1											
7th/8th			CO6	Writing technical reports, demonstrate and presenting their projects.				2											2
7th/8th			CO1	Improve their ability to solve problems utilizing the tools and available industrial environment.				2	3									2	

Semester	Course Code	Course Name	CO	Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
7th/8th			CO2	Understand the professional responsibility, duty and ethics of an engineer.						2		3	3			2
7th/8th	TR-104	Industrial Training	CO3	Get familiar with real-world working conditions and procedures, to develop professionalism and team-work capabilities.			2							3	2	2
7th/8th			CO4	Learn the fundamentals of project creation, feasibility analysis, and implementation in order to create a cost-effective solution for interdisciplinary domains.	1	3						2			3	3
7th/8th			CO5	Understand the many difficulties encountered in the actual world and the important issues calling for more research considering the societal needs.			3		1	3					2	2
7th/8th			CO6	Develop engineering communication skills, such as those for technical writing and speaking up in the workplace.										3		3
7th/8th			CO1	Apply engineering, ethical and mathematical principles to achieve objectives of a project.	3		1	1	1	2		2				
7th/8th			CO2	Analyze, formulate and review the literature and develop solutions for framed problem statement.		3	2									

Sem	Code	Subject	CO	Description	1	2	3	4	5	6	7	8	9	10	11
7th/8th	PRCS-103	Major Project	CO3	Design and construct hardware and/or software system, component, or process to meet desired needs.		1	2	2	1						2
7th/8th			CO4	Choose and apply emerging trends and contemporary project management methodologies in context of computer science and engineering.	2		1	1	2				2		2
7th/8th			CO5	Test and validate various modules of planned project.		2		3							
7th/8th			CO6	Demonstrate the ability to work, communicate effectively as a team and to write and present technical reports.		1		2	2		3	3	2	2	
7th/8th	PRCS-107	Software Management Tools	CO1	Apply knowledge for the management of various software.	3		3	2	3						2
7th/8th			CO2	Recognize the benefits of software planning and configuration management tools.		3		3	2	2					2
7th/8th			CO3	Explore various software management tools for throughout evaluation of the software projects.	3		3	3	3		1				
7th/8th			CO4	Analyze various software management tools along with their components for project planning and designing purpose.		2		3							

Sem	Course Code	Course Name	CO	Course Outcome	1	2	3	4	5	6	7	8	9	10	11
7th/8th			CO5	Implement various CICD tools and techniques for effective application of relevant standards for project management.		2	2	3	3		2				
7th/8th			CO6	Identify the benefits of various tools for software debugging, UML Diagrams and various project charts.		2		3	3	1					
7th/8th	PRCS-106	Technical Aptitude	CO1	Apply technical expertise in design, coding and testing principles in software systems development projects	2		2	2	2			1	1	1	
7th/8th			CO2	Identify and use technical and analytical thinking to model the research based problems and solve them.		2		2					1	1	
7th/8th			CO3	Understand the use of technical aptitude in all the aspects of career and prepare for them accordingly.		1		1	2				2	2	
7th/8th			CO4	Solve different types of questions based on Core areas of Computer Science and Engineering.	2		2	2	2				2	2	
7th/8th			CO5	Speak fluently and confidently to demonstrate various techniques during presentations.	2		2	2	2		2	1	2	2	
7th/8th			CO6	Demonstrate corporate readiness in terms of attitude, communication, team work and emotional balance	2		2	2	2		2	2	2	2	