Department of computer Science and Engineering

CO's 2021 Scheme

SEMESTER – I/II	
21PSP13/23	**PROBLEM-SOLVING THROUGH PROGRAMMING**
CO1:	Elucidate the basic architecture and functionalities of a computer and also recognize the hardware parts.
CO2:	Apply programming constructs of C language to solve the real world problem
CO3:	Explore user-defined data structures like arrays in implementing solutions to problems like searching and sorting
CO4:	Explore user-defined data structures like structures, unions and pointers in implementing solutions
CO5:	Design and Develop Solutions to problems using modular programming constructs using functions

SEMESTER – I/II	
21CPL17/27	**COMPUTER PROGRAMMING LABORATORY**
CO1:	Define the problem statement and identify the need for computer programming
CO2:	Make use of C compiler, IDE for programming, identify and correct the syntax and syntactic errors in programming
CO3:	Develop algorithm, flowchart and write programs to solve the given problem
CO4:	Demonstrate use of functions, recursive functions, arrays, strings, structures and pointers in problem solving.
CO5:	Document the inference and observations made from the implementation.

SEMESTER - III	
21MAT31	**TRANSFORM CALCULUS, FOURIER SERIES AND NUMERICAL TECHNIQUES**
CO1:	CO 1. To solve ordinary differential equations using Laplace transform.
CO2:	CO 2. Demonstrate Fourier series to study the behaviour of periodic functions and their applications in system communications, digital signal processing and field theory.
CO3:	CO 3. To use Fourier transforms to analyze problems involving continuous-time signals and to apply Z-Transform techniques to solve difference equations
CO4	CO 4. To solve mathematical models represented by initial or boundary value problems involving partial differential equations

CO5:	CO 5. Determine the extremals of functionals using calculus of variations and solve problems arising in dynamics of rigid bodies and vibrational analysis.

SEMESTER - III	
21CS32	**DATA STRUCTURES AND APPLICATIONS**
CO1:	CO 1. Identify different data structures and their applications. CO 2. Apply stack and queues in solving problems.
CO2:	CO 3. Demonstrate applications of linked list.
CO3:	CO 4. Explore the applications of trees and graphs to model and solve the real-world problem. CO 5. Make use of Hashing techniques and resolve collisions during mapping of key value pairs
CO4	CO 1. Identify different data structures and their applications. CO 2. Apply stack and queues in solving problems.

SEMESTER - III	
21CS33	**ANALOG AND DIGITAL ELECTRONICS**
CO1:	Design and analyze application of analog circuits using photo devices, timer IC, power supply and regulator IC and op-amp.
CO2:	Explain the basic principles of A/D and D/A conversion circuits and develop the same. CO 3. Simplify digital circuits using Karnaugh Map, and Quine-McClusky Methods
CO3:	Explain Gates and flip flops and make us in designing different data processing circuits, registers and counters and compare the types.
CO4:	Develop simple HDL programs
CO5:	. Design and analyze application of analog circuits using photo devices, timer IC, power supply and regulator IC and op-amp.
SEMESTER - III	
21CS34	**COMPUTER ORGANIZATION**
CO1:	CO 1. Explain the organization and architecture of computer systems with machine instructions and programs
CO2:	CO 2. Analyze the input/output devices communicating with computer system CO 3. Demonstrate the functions of different types of memory devices
CO3:	CO 4. Apply different data types on simple arithmetic and logical unit

CO4:	CO 5. Analyze the functions of basic processing unit, Parallel processing and pipelining

SEMESTER - III	
21CSL35	**OBJECT ORIENTED PROGRAMMING WITH JAVA LABORATORY**
CO1:	Use Eclipse/NetBeans IDE to design, develop, debug Java Projects.
CO2:	Analyze the necessity for Object Oriented Programming paradigm over structured programming and become familiar with the fundamental concepts in OOP.
CO3:	Demonstrate the ability to design and develop java programs, analyze, and interpret object-oriented data and document results.
CO4	Apply the concepts of multiprogramming, exception/event handling, abstraction to develop robust programs.
CO5:	Develop user friendly applications using File I/O and GUI concepts.

SEMESTER - III	
21CSL381	**MASTERING OFFICE**
CO1:	Know the basics of computers and prepare documents, spreadsheets, make small presentations with audio, video and graphs and would be acquainted with internet.
CO2:	Create, edit, save and print documents with list tables, header, footer, graphic, spellchecker, mail merge and grammar checker
CO3:	Attain the knowledge about spreadsheet with formula, macros spell checker etc.
CO4	Demonstrate the ability to apply application software in an office environment.
CO5:	Use Google Suite for office data management tasks

SEMESTER - III	
21CIP37	**CONSTITUTION OF INDIA, PROFESSIONAL ETHICS AND CYBER LAW (CPC)**
CO1:	Have constitutional knowledge and legal literacy.
CO2:	Understand Engineering and Professional ethics and responsibilities of Engineers.
CO3:	Understand the the cybercrimes and cyber laws for cyber safety measures.

SEMESTER - IV	
21MAT41	**COMPLEX ANALYSIS, PROBABILITY AND STATISTICAL METHODS**
CO1:	Use the concepts of analytic function and complex potentials to solve the problems arising in electromagnetic field theory.
CO2:	Utilize conformal transformation and complex integral arising in aerofoil theory, fluid flow visualization and image processing.
CO3:	Apply discrete and continuous probability distributions in analyzing the probability models arising in engineering field.
CO4	Make use of the correlation and regression analysis to fit a suitable mathematical model for the statistical data.
CO5:	Construct joint probability distributions and demonstrate the validity of testing the hypothesis.

SEMESTER - IV	
21CS42	**DESIGN AND ANALYSIS OF ALGORITHMS**
CO1:	Analyze the performance of the algorithms, state the efficiency using asymptotic notations andanalyze mathematically the complexity of the algorithm.
CO2:	Apply divide and conquer approaches and decrease and conquer approaches in solving theproblems analyze the same
CO3:	Apply the appropriate algorithmic design technique like greedy method, transform and conquer approaches and compare the efficiency of algorithms to solve the given problem.
Co4:	Apply and analyze dynamic programming approaches to solve some problems. and improve analgorithm time efficiency by sacrificing space.
CO5:	Apply and analyze backtracking, branch and bound methods and to describe P, NP and NP-complete problems.

SEMESTER - IV	
21CS43	**MICROCONTROLLER AND EMBEDDED SYSTEMS**
CO1:	Explain C-Compilers and optimization
CO2:	Describe the ARM microcontroller's architectural features and program module.
CO3:	Apply the knowledge gained from programming on ARM to different applications.
CO4	Program the basic hardware components and their application selection method.
CO5	Demonstrate the need for a real-time operating system for embedded system applications.

SEMESTER - IV	
21CS44	**OPERATING SYSTEMS**
CO1:	Identify the structure of an operating system and its scheduling mechanism.
CO2:	Demonstrate the allocation of resources for a process using scheduling algorithm..
CO3:	dentify root causes of deadlock and provide the solution for deadlock elimination
CO4	Explore about the storage structures and learn about the Linux Operating system.
CO5:	Analyze Storage Structures and Implement Customized Case study

SEMESTER - IV	
21CSL46	**PYTHON PROGRAMMING LABORATORY**
CO1:	Demonstrate proficiency in handling of loops and creation of functions.
CO2:	Identify the methods to create and manipulate lists, tuples and dictionaries.
CO3:	Discover the commonly used operations involving regular expressions and file system.
CO4:	Interpret the concepts of Object-Oriented Programming as used in Python.
CO5:	Determine the need for scraping websites and working with PDF, JSON and other file formats.

SEMESTER - IV	
21CSL481	**WEB PROGRAMMING**
CO1:	Describe the fundamentals of web and concept of HTML.
CO2:	Use the concepts of HTML, XHTML to construct the web pages. CO
CO3:	Interpret CSS for dynamic documents.
CO4:	Evaluate different concepts of JavaScript & Construct dynamic documents.
CO5:	Design a small project with JavaScript and XHTML.

SEMESTER – V	
21CS51	**AUTOMATA THEORY AND COMPILER DESIGN**
CO1:	Acquire fundamental understanding of the core concepts in automata theory and Theory of Computation
CO2:	Design and develop lexical analyzers, parsers and code generators
CO3:	Design Grammars and Automata (recognizers) for different language classes and become knowledgeable about restricted models of Computation (Regular, Context Free) and their relative powers.
CO4:	Acquire fundamental understanding of the structure of a Compiler and Apply concepts automata theory and Theory of Computation to design Compilers
CO5:	Design computations models for problems in Automata theory and adaptation of such model in the field of compilers

SEMESTER - V	
21CS52	**Computer Networks**
CO1:	Learn the basic needs of communication system.
CO2:	Interpret the communication challenges and its solution.
CO3:	Identify and organize the communication system network components
CO4	Design communication networks for user requirements.

SEMESTER - V	
21CS53	**DATABASE MANAGEMENT SYSTEM**
CO1:	Identify, analyze and define database objects, enforce integrity constraints on a database using RDBMS
CO2:	Use Structured Query Language (SQL) for database manipulation and also demonstrate the basic of query evaluation.
CO3:	Design and build simple database systems and *relate* the concept of transaction, concurrency control and recovery in database
CO4	Develop application to interact with databases, relational algebra expression.
CO5:	Develop applications using tuple and domain relation expression from queries.

SEMESTER - V	
21CS54	**ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING**
CO1:	Apply the knowledge of searching and reasoning techniques for different applications.

CO2:	Have a good understanding of machine leaning in relation to other fields and fundamentalissues and challenges of machine learning.
CO3:	Apply the knowledge of classification algorithms on various dataset and compare results
CO4	Model the neuron and Neural Network, and to analyze ANN learning and its applications.
CO5:	Identifying the suitable clustering algorithm for different pattern

SEMESTER - V	
21CSL55	**DBMS LABORATORY WITH MINI PROJECT**
CO1:	Create, Update and query on the database.
CO2:	Demonstrate the working of different concepts of DBMS
CO3:	Implement, analyze and evaluate the project developed for an application.
SEMESTER - V	
21CSL581	**ANGULAR JS AND NODE JS**
CO1:	Describe the features of Angular JS.
CO2:	Recognize the form validations and controls.
CO3:	Implement Directives and Controllers.
CO4:	Evaluate and create database for simple application.
CO5:	Plan and build webservers with node using Node .JS.

SEMESTER - V	
21CS582	**C# AND .NET FRAMEWORK**
CO1:	Able to explain how C# fits into the .NET platform.
CO2:	Describe the utilization of variables and constants of C#
CO3:	Use the implementation of object-oriented aspects in applications.
CO4	Analyze and Set up Environment of .NET Core.
CO5:	Evaluate and create a simple project application.

SEMESTER - VI	
21CS61	**SOFTWARE ENGINEERING & PROJECT MANAGEMENT**
CO1:	Understand the activities involved in software engineering and analyze the role of variousprocess models

CO2:	Explain the basics of object-oriented concepts and build a suitable class model using modelling techniques
CO3:	Describe various software testing methods and to understand the importance of agile methodology and DevOps
CO4	Illustrate the role of project planning and quality management in software development
CO5	Understand the importance of activity planning and different planning models

SEMESTER - VI	
21CS62	**FULLSTACK DEVELOPMENT**
CO1:	Understand the working of MVT based full stack web development with Django.
CO2:	Designing of Models and Forms for rapid development of web pages.
CO3:	Analyze the role of Template Inheritance and Generic views for developing full stack web applications.
CO4:	Apply the Django framework libraries to render nonHTML contents like CSV and PDF.
CO5:	Perform jQuery based AJAX integration to Django Apps to build responsive full stack web applications,

SEMESTER - VI	
21CS63	**COMPUTER GRAPHICS AND FUNDAMENTALS OF IMAGE PROCESSING**
CO1:	Construct geometric objects using Computer Graphics principles and OpenGL APIs.
CO2:	Use OpenGL APIs and related mathematics for 2D and 3D geometric Operations on the objects.
CO3:	Design GUI with necessary techniques required to animate the created objects
CO4:	Apply OpenCV for developing Image processing applications.
CO5:	Apply Image segmentation techniques along with programming, using OpenCV, for developing simple applications.

SEMESTER - VI	
21CS641	**AGILE TECHNOLOGIES**
CO1:	Understand the fundamentals of agile technologies
CO2:	Explain XP Lifecycle, XP Concepts and Adopting XP
CO3:	Apply different techniques on Practicing XP, Collaborating and Releasing
CO4	Analyze the Values and Principles of Mastering Agility
CO5:	Demonstrate the agility to deliver good values

SEMESTER - VI	
21CS642	**ADVANCED JAVA PROGRAMMING**
CO1:	Understanding the fundamental concepts of Enumerations and Annotations
CO2:	Apply the concepts of Generic classes in Java programs
CO3:	Demonstrate the concepts of String operations in Java
CO4	Develop web based applications using Java servlets and JSP
CO5	Illustrate database interaction and transaction processing in Java

SEMESTER - VI	
21CS643	**ADVANCED COMPUTER ARCHITECTURE**
CO1:	Explain the concepts of parallel computing
CO2:	Explain and identify the hardware technologies
CO3:	Compare and contrast the parallel architectures
CO4:	Illustrate parallel programming concepts

SEMESTER - VI	
18CS644	**DATA SCIENCE AND VISUALIZATION**
CO1:	Understand the data in different forms
CO2:	Apply different techniques to Explore Data Analysis and the Data Science Process
CO3:	Analyze feature selection algorithms & design a recommender system.
CO4:	Evaluate data visualization tools and libraries and plot graphs.
CO5:	Develop different charts and include mathematical expressions.

SEMESTER - VI	
21CS651	**INTRODUCTION TO DATA STRUCTURES**
CO1:	Express the fundamentals of static and dynamic data structure.
CO2:	Summarize the various types of data structure with their operations.;
CO3:	Interpret various searching and sorting techniques.
CO4:	Choose appropriate data structure in problem solving.
CO5:	Develop all data structures in a high level language for problem solving.

SEMESTER - VI

21CS652	INTRODUCTION TO DATABASE MANAGEMENT SYSTEMS
CO1:	Identify, analyze and define database objects, enforce integrity constraints on a database using RDBMS
CO2:	Use Structured Query Language (SQL) for database manipulation.
CO3:	Design and build simple database systems
CO4:	Develop application to interact with databases.

SEMESTER - VI	
21CS653	INTRODUCTION TO CYBER SECURITY
CO1:	Describe the cyber crime terminologies
CO2:	Analyze cybercrime in mobiles and wireless devices along with the tools for Cybercrime and prevention
CO3:	Analyze the motive and causes for cybercrime, cybercriminals, and investigators
CO4:	Apply the methods for understanding criminal case and evidence, detection standing criminal case and evidence.

SEMESTER - VI	
21CS654	PROGRAMMING IN JAVA
CO1:	Develop JAVA programs using OOP principles and proper program structuring.
CO2:	Develop JAVA program using packages, inheritance and interface.
CO3:	Develop JAVA programs to implement error handling techniques using exception handling
CO4:	Demonstrate string handling concepts using JAVA.

SEMESTER - VI	
18CSL66	COMPUTER GRAPHICS AND IMAGE PROCESSING LABORATORY
CO1:	Use openGL /OpenCV for the development of mini Projects.
CO2:	Analyze the necessity mathematics and design required to demonstrate basic geometric transformation techniques
CO3:	Demonstrate the ability to design and develop input interactive techniques.
CO4:	Apply the concepts to Develop user friendly applications using Graphics and IP concepts.

SEMESTER - VII	
21CS71	BIG DATA ANALYTICS
CO1:	Understand fundamentals and applications of Big Data analytics.

CO2:	Investigate Hadoop framework, Hadoop Distributed File system and essential Hadoop tools.
CO3:	Illustrate the concepts of NoSQL using MongoDB and Cassandra for Big Data.
CO4:	Demonstrate the MapReduce programming model to process the big data along with Hadooptools.
CO5:	Apply Machine Learning algorithms for real world big data, web contents and Social Networks to provide analytics with relevant visualization tools.

SEMESTER - VII	
21CS72	**CLOUD COMPUTING**
CO1:	Understand and analyze various cloud computing platforms and service provider.
CO2:	Illustrate various virtualization concepts.
CO3:	Identify the architecture, infrastructure and delivery models of cloud computing.
CO4:	Understand the Security aspects of CLOUD.
CO5:	Define platforms for development of cloud applications

SEMESTER - VII	
21CS731	**OBJECT ORIENTED MODELING AND DESIGN**
CO1:	Describe the concepts of object-oriented and basic class modelling.
CO2:	Draw class diagrams, sequence diagrams and interaction diagrams to solve problems.
CO3:	Choose and apply a befitting design pattern for the given problem.

SEMESTER - VII	
21CS732	**DIGITAL IMAGE PROCESSING**
CO1:	Understand the fundamentals of Digital Image Processing.
CO2:	Apply different Image transformation techniques
CO3:	Analyze various image restoration techniques
CO4:	Understand colour image and morphological processing
CO5:	Design image analysis and segmentation techniques

SEMESTER - VII	
21CS733	**CRYPTOGRAPHY AND NETWORK SECURITY**
CO1:	Understand Cryptography, Network Security theories, algorithms and systems
CO2:	Apply different Cryptography and Network Security operations on different applications

CO3:	Analyze different methods for authentication and access control
CO4:	Evaluate Public and Private key, Key management, distribution and certification
CO5:	Design necessary techniques to build protection mechanisms to secure computer networks

SEMESTER - VII	
21CS734	**BLOCKCHAIN TECHNOLOGY**
CO1:	Describe the concepts of Distrbuted computing and its role in Blockchain
CO2:	Describe the concepts of Cryptography and its role in Blockchain
CO3:	List the benefits, drawbacks and applications of Blockchain
CO4:	Appreciate the technologies involved in Bitcoin
CO5:	Appreciate and demonstrate the Ethereum platform to develop blockchain application.

SEMESTER - VII	
21CS735	**INTERNET OF THINGS**
CO1:	Understand the evolution of IoT, IoT networking components, and addressing strategies in IoT.
CO2:	Analyze various sensing devices and actuator types.
CO3:	Demonstrate the processing in IoT.
CO4:	Apply different connectivity technologies.
CO5:	Understand the communication technologies , protocols and interoperability in IoT.

SEMESTER - VII	
21CS741	**SOFTWARE ARCHITECTURE AND DESIGN PATTERNS**
CO1:	Design and implement codes with higher performance and lower complexity
CO2:	Be aware of code qualities needed to keep code flexible
CO3:	Experience core design principles and be able to assess the quality of a design with respect to these principles.
CO4:	Capable of applying these principles in the design of object oriented systems.
CO5:	Demonstrate an understanding of a range of design patterns. Be capable ofcomprehending a design presented using this vocabulary.
CO6:	Be able to select and apply suitable patterns in specific contexts

SEMESTER - VII	
21CS742	**MULTIAGENT SYSTEMS**
CO1:	Demonstrate the decision process with different constraints
CO2:	Analyze games in different forms

CO3:	Apply the cooperative learning in developing games
CO4:	Analyze different negotiation strategies of Multi-Agent System
CO5:	Design and develop solutions for voting problems

SEMESTER - VII	
21CS743	**DEEP LEARNING**
CO1:	Understand the fundamental issues and challenges of deep learning data, model selection, model complexity etc.,
CO2:	Describe various knowledge on deep learning and algorithms
CO3:	Apply CNN and RNN model for real time applications
CO4:	Identify various challenges involved in designing and implementing deep learning algorithms.
CO5:	Relate the deep learning algorithms for the given types of learning tasks in varied domain

SEMESTER - VII	
21CS744	**ROBOTIC PROCESS AUTOMATION DESIGN & DEVELOPMENT**
CO1:	To Understand the basic concepts of RPA
CO2:	To Describe various components and platforms of RPA
CO3:	To Describe the different types of variables, control flow and data manipulation techniques
CO4:	To Understand various control techniques and OCR in RPA
CO5:	To Describe various types and strategies to handle exceptions

SEMESTER - VII	
21CS745	**NOSQL DATABASE**
CO1:	Demonstrate an understanding of the detailed architecture of Column Oriented NoSQL databases, Document databases, Graph databases.
CO2:	Use the concepts pertaining to all the types of databases.
CO3:	Analyze the structural Models of NoSQL.
CO4:	Develop various applications using NoSQL databases.

SEMESTER - VII	
21CS751	**PROGRAMMING IN PYTHON**
CO1:	Understand Python syntax and semantics and be fluent in the use of Python flow control and functions.
CO2:	Demonstrate proficiency in handling Strings and File Systems.
CO3:	Represent compound data using Python lists, tuples, Strings, dictionaries.
CO4:	Read and write data from/to files in Python Programs

SEMESTER - VII	
21CS752	**INTRODUCTION TO AI AND ML**
CO1:	Design intelligent agents for solving simple gaming problems.
CO2:	Have a good understanding of machine leaning in relation to other fields andfundamentalissues and Challenges of machine learning
CO3:	Understand data and applying machine learning algorithms to predict the outputs.
CO4:	Model the neuron and Neural Network, and to analyze ANN learning and its applications.

SEMESTER - VII	
21CS753	**INTRODUCTION TO BIG DATA**
CO1:	Master the concepts of HDFS and MapReduce framework. Investigate Hadoop related tools for Big Data Analytics and perform basic
CO3:	Infer the importance of core data mining techniques for data analytics
CO4:	Use Machine Learning algorithms for real world big data.
CO5:	Illustrate the use of generics and collections in C#

SEMESTER - VII	
21CS754	**INTRODUCTION TO DATA SCIENCE**
CO1:	Describe the data science terminologies
CO2:	Apply the Data Science process on real time scenario.
CO3:	Analyze data visualization tool
	Apply Data storage and processing with frameworks