UG-B.E (CS)2021-Scheme COs

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING	
COURSE CODE	**21PSP23/13 -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
COURSE CODE	**21CS32-DATA STRUCTURES AND APPLICATIONS**
CO1	Identify different data structures and their applications
CO2	Apply stack and queues in solving problems.
CO3	Demonstrate applications of linked list.
CO4	Explore the applications of trees and graphs to model and solve the real-world problem
CO5	Make use of Hashing techniques and resolve collisions during mapping of key value pairs
COURSE CODE	**21CS33-ANALOG AND DIGITAL ELECTRONICS**
CO1	Design and analyze application of analog circuits using photo devices, timer IC, power supplyand regulator IC and op-amp
CO2	Explain the basic principles of A/D and D/A conversion circuits and develop the same
CO3	Simplify digital circuits using Karnaugh Map, and Quine-McClusky Methods
CO4	Explain Gates and flip flops and make us in designing different data processing circuits,registers and counters and compare the types.
CO5	Develop simple HDL programs
COURSE CODE	**21CS34 -COMPUTER ORGANIZATION AND ARCHITECTURE**
CO1	Explain the organization and architecture of computer systems with machine instructions andprograms
CO2	Analyze the input/output devices communicating with computer system
CO3	Demonstrate the functions of different types of memory devices
CO4	Apply different data types on simple arithmetic and logical unit
CO5	Analyze the functions of basic processing unit, Parallel processing and pipelining
COURSE CODE	**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 developrobust programs
CO5	Develop user friendly applications using File I/O and GUI concepts.

COURSE CODE	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
COURSE CODE	21CS382-PROGRAMMING IN C++
CO1	Able to understand and design the solution to a problem using object-oriented programming concepts
CO2	Able to reuse the code with extensible Class types, User-defined operators and function Overloading
CO3	Achieve code reusability and extensibility by means of Inheritance and Polymorphism
CO4	Identify and explore the Performance analysis of I/O Streams
CO5	Implement the features of C++ including templates,exceptions and file handling for providing programmed solutions to complex problems
COURSE CODE	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
COURSE CODE	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
COURSE CODE	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	Identify 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

COURSE CODE	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
COURSE CODE	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
CO3	Interpret CSS for dynamic documents
CO4	Evaluate different concepts of JavaScript & Construct dynamic documents
CO5	Design a small project with JavaScript and XHTML
COURSE CODE	21CS482-UNIX SHELL PROGRAMMING
CO1	Know the basics of Unix concepts and commands
CO2	Evaluate the UNIX file system
CO3	Apply Changes in file system
CO4	Understand scripts and programs
CO5	Analyze Facility with UNIX system process
COURSE CODE	21CSL483-R PROGRAMMING
CO1	To understand the fundamental syntax of R through readings, practice exercises, CO 2.
CO2	To demonstrations, and writing R code.
CO3	To apply critical programming language concepts such as data types, iteration
CO4	To understand control structures, functions, and Boolean operators by writing R programsand through examples
CO5	To import a variety of data formats into R using R-Studio
CO6	To prepare or tidy data for in preparation for analyze
COURSE CODE	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 the irrelative 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 modelin the field of compilers
COURSE CODE	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
COURSE CODE	21CS53-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 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

COURSE CODE	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
COURSE CODE	21CSL55-DATABASE MANAGEMENT SYSTEM 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.
COURSE CODE	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
COURSE CODE	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
COURSE CODE	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 modellingtechniques
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 developmentCO 5. Understand the importance of activity planning and different planning models
COURSE CODE	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 webapplications
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 webapplications

COURSE CODE	21CS63-COMPUTER GRAPHICS AND FUNDAMENTALS OF IMAGEPROCESSING
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 developingsimple applications
COURSE CODE	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
COURSE CODE	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
COURSE CODE	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
COURSE CODE	21CS644-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
COURSE CODE	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
COURSE CODE	21CS652-INTRODUCTION TO DATABASE MANAGEMENT SYSTEMS
CO1	Identify, analyze and define database objects, enforce integrity constraints on a database usingRDBMS
CO2	Use Structured Query Language (SQL) for database manipulation
CO3	Design and build simple database systems
CO4	Develop application to interact with databases
COURSE CODE	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 andprevention
CO3	Analyze the motive and causes for cybercrime, cybercriminals, and investigators
CO4	Apply the methods for understanding criminal case and evidence, detection standing criminalcase and evidence

COURSE CODE	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
COURSE CODE	21CSL66-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 geometrictransformation 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
COURSE CODE	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 Hadoop tools
CO5	Apply Machine Learning algorithms for real world big data, web contents and Social Networks to provide analytics with relevant visualization tools.
COURSE CODE	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
COURSE CODE	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.
COURSE CODE	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
COURSE CODE	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
COURSE CODE	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

COURSE CODE	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.
COURSE CODE	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 of comprehending a design presented using this vocabulary.
CO6	Be able to select and apply suitable patterns in specific contexts
COURSE CODE	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
COURSE CODE	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
COURSE CODE	21CS744-ROBOTIC PROCESS AUTOMATION DESIGN AND 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
COURSE CODE	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.
COURSE CODE	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
COURSE CODE	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 and fundamental issues 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.
COURSE CODE	**21CS753-INTRODUCTION TO BIG DATA**
CO1	Master the concepts of HDFS and MapReduce framework.
CO2	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.
COURSE CODE	**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 tools
CO4	Apply Data storage and processing with frameworks