B. E. 5th Semester

Course: Database Management System **Course Code: (5IT01)**

At the end of Database Management System course the student will be able to:

CO 1	Describe the database terminology, design entity relationship and convert entity relationship diagrams into RDBMS	L2
CO 2	Describe Relational algebra, relational databases and formulate SQL queries on the database	L2
CO 3	Apply Constraints and normalization on databases	L3
CO 4	Apply ACID properties for transaction management and concurrency control	L3
CO 5	Explain the concept of concurrency control and study of various database protocol	L4
CO 6	Discuss Database Security	L2

Course: Theory of Computation **Course Code: (5IT02)**

At the end of Theory of Computation course, the students will be able to:

CO 1	Construct finite state machines to solve problems in computing	L6
CO 2	Write regular expressions for the formal languages	L3
CO 3	Construct and apply well defined rules for parsing techniques in compiler	L6
CO 4	Construct and analyze Push Down, Turing Machine for formal languages	L6
CO 5	Express the understanding of the Chomsky Hierarchy	L2
CO 6	Express the understanding of the decidability and un-decidability problems	L2

Course: Software Engineering **Course Code: (5IT03)**

At the end of Software Engineering course, the student will be able to:

CO 1	Identify unique features of various software application domains and classify software applications	L2
CO 2	Analyze software requirements by applying various modeling techniques	L4
CO 3	Choose and apply appropriate lifecycle model of software development	L3
CO 4	Describe principles of agile development, discuss the SCRUM process and distinguish agile process model from other process models	L2
CO 5	Analyze effectively about software architecture and user interface design	L4
CO 6	Design test cases of a software system	L6

Course: PE-I(Data Science and Statistics) **Course Code: (5IT04)**

At the end of PE-I(Data Science and Statistics) course, the student will be able to:

CO 1	Gain knowledge about basic concepts of Data Science & Statistics	L2
CO 2	Demonstrate proficiency with statistical analysis of data	L3
CO 3	Analyze statistical data graphically using frequency distributions and cumulative frequency distributions	L4
CO 4	Develop the ability to build and assess data-based models	L6
CO 5	Evaluate models generated from data	L5
CO 6	Acquire knowledge of regression methods and classification methods using decision tree and random forest	L2

Lab Outcomes (LO)

Course: Database Management System – Lab **Course Code: (5IT06)**

At the end of Database Management System – Lab course the student will be able to:

LO 1	Explain database terminology, design Entity–Relationship (ER) diagrams, and convert ER models into relational database schemas using appropriate keys and relationships.	L3
LO 2	Formulate and execute relational algebra expressions and SQL queries, apply integrity constraints and normalization techniques, and analyze database structures for redundancy and data consistency.	L4
LO 3	Apply ACID properties, implement concurrency control mechanisms and database protocols, and evaluate database security measures to ensure reliable, consistent, and secure database systems.	L5

Course: Software Engineering – Lab **Course Code: (5IT07)**

At the end of Software Engineering – Lab course the student will be able:

LO 1	Prepare Software Requirements Specification (SRS) documents**,** identify domain classes from problem statements**,** and model fundamental system representations using UML use case, class, and sequence diagrams**.**	L3
LO 2	Model system behavior and data flow using E-R diagrams, State chart diagrams, Activity diagrams, and Data Flow Diagrams (DFDs**)**, and analyze system structure and interactions to ensure requirement completeness and consistency.	L4
LO 3	Estimate project metrics, test coverage metrics, and structural complexity**,** design effective test suites**,** and create a comprehensive final project report demonstrating systematic software development practices.	L6

Course: PE-I(Data Science and Statistics) – Lab **Course Code: (5IT08)**

At the end of PE-I(Data Science and Statistics) – Lab course the student will be able to:

LO 1	Set up the Python environment for data science**,** explain the role of Pandas, NumPy, SciPy, and Matplotlib, and apply these libraries to perform basic data manipulation and visualization tasks such as plotting sine waves and 3D graphs.	L2
LO 2	Write Python programs **to** tokenize text data**,** handle data using Series and DataFrames**,** read and filter CSV files**,** and analyze data through appropriate graphical representations.	L3
LO 3	Implement and analyze machine learning techniques such as Linear Regression and Naïve Bayes algorithms**,** and create data-driven visualizations and models to interpret patterns and trends in datasets.	L4

Course: Computer Skill Lab-III **Course Code: (5IT09)**

At the end of Computer Skill Lab-III course the student will be able to:

LO 1	Explain the fundamentals of Angular and TypeScript, set up Angular projects, and apply TypeScript compilation concepts to develop basic Angular applications using components, templates, services, and directives.	L3
LO 2	Design and implement reusable Angular components, handle data binding and events, control HTML rendering, and analyze form behaviors using Template-Driven and Model-Driven (Reactive) Forms.	L4
LO 3	Build a complete Single Page Application (SPA) by integrating routing, observables, server communication using APIs, and performing CRUD operations with Firebase, thereby creating scalable and interactive web applications.	L6

B. E. 6th Semester

Course: Compiler Design **Course Code: (6IT01)**

At the end of Compiler Design course the student will be able to:

CO 1	Describe the fundamentals of compiler and various phases of compilers	L2
CO 2	Design and implement LL and LR parser	L6
CO 3	Solve the various parsing techniques like SLR, CLR, LALR	L3
CO 4	Examine the concept of Syntax-Directed Definition and translation	L3
CO 5	Assess the concept of Intermediate Code Generation and run-time environment	L5
CO 6	Explain the concept code generation and code optimization	L4

Course: Design and Analysis of Algorithm **Course Code: (6IT02)**

At the end of Design and Analysis of Algorithm course the student will be able to:

CO 1	Understand different algorithmic design strategies	L2
CO 2	Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it.	L1
CO 3	Describe the greedy paradigm and explain when an algorithmic design situation calls for it.	L2
CO 4	Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it.	L2
CO 5	Understand the concept of Backtracking	L4
CO 6	Understand the concept of Polynomial Time & Non Polynomial Time Algorithms.	L4

Course: Artificial Intelligence **Course Code: (6IT03)**

At the end of Artificial Intelligence course the student will be able to:

CO 1	Explain concepts of Artificial Intelligence and different types of intelligent agents and their architecture	L2
CO 2	Evaluate different uninformed search algorithms on well formulate problems along with stating valid conclusions that the evaluation supports	L5
CO 3	Design and analyze informed search algorithms on well formulated problems	L6
CO 4	Formulate and solve given problem using Propositional and First order logic	L3
CO 5	Apply reasoning for non-monotonic AI problems	L3
CO 6	Understand more advanced topics of AI such as learning, understanding, Natural Language Processing	L2

Course: PE-II(Big Data Analytics) **Course Code: (6IT04)**

At the end of PE-II(Big Data Analytics) course the student will be able to:

CO 1	Understand the key issues in big data management and its associated applications in intelligent business and scientific computing	L2
CO 2	Acquire fundamental enabling techniques like Hadoop, and NO SQL in big data analytics	L2
CO 3	Achieve basic knowledge and operations of Map-Reduce	L2
CO 4	Interpret business models and scientific computing paradigms, and apply software tools for big data analytics	L3
CO 5	Implement algorithms for Clustering, Classifying and finding associations in Big Data	L4
CO 6	Achieve adequate perspectives of big data analytics in various applications like recommender systems, social media applications	L2

Lab Outcomes (LO)

Course: Compiler Design – Lab **Course Code: (6IT06)**

At the end of Compiler Design – Lab course the student will be able to:

LO 1	Explain the concepts of lexical analysis**,** design and implement lexical analyzers using C and Lex/Flex/JLex, and recognize tokens such as identifiers, keywords, operators, comments, vowels, and consonants while ignoring redundant spaces, tabs, and new lines.	L2
LO 2	Develop programs to recognize regular expressions**,** validate identifiers and operators scan reserved words, and analyze grammar structures by designing predictive parsers and implementing SLR(1) parsing algorithms**.**	L4
LO 3	Design and implement bottom-up parsers such as LALR**,** generate three-addres intermediate code**,** and create complete compiler components that demonstrate th integration of lexical analysis, syntax analysis, and intermediate code generation.	L6

Course: Design and Analysis of Algorithms – Lab **Course Code: (6IT07)**

At the end of Design and Analysis of Algorithms – Lab course the student will be able:

LO 1	Explain various algorithm design strategies and implement fundamental algorithms such as divide-and-conquer multiplication and greedy-based Knapsack problems**,** demonstrating correct logic and basic performance understanding.	L2
LO 2	Implement and analyze graph algorithms including Dijkstra's shortest path algorithm and Prim's minimum spanning tree algorithm**,** and analyze time complexity to evaluate algorithm efficiency.	L4
LO 3	Design and implement advanced algorithms using dynamic programming (Travelling Salesman Problem) and backtracking techniques, and differentiate between polynomial-time and non-polynomial-time algorithms based on computational complexity.	L5

Course: PE-II(Big Data Analytics) – Lab **Course Code: (6IT08)**

At the end of PE-I(Big Data Analytics) – Lab course the student will be able to:

LO 1	Install and configure Hadoop and R**,** explain core R programming constructs **(**variables, expressions, functions, lists, matrices, and data frames), and execute basic R scripts for data handling and visualization.	L3
LO 2	Develop Hadoop MapReduce applications for word/phrase frequency counting, manipulate and process datasets in R through merging, sorting, and plotting, and analyze textual datasets using statistical and graphical techniques.	L4
LO 3	Perform real-world data analytics tasks such as Twitter data analysis**,** WhatsApp sentiment analysis, and K-Means clustering**,** and create meaningful visualizations (pie charts and bar charts) to derive insights from large and unstructured data**.**	L6

Course: Computer Skill Lab-IV **Course Code: (6IT09)**

At the end of Computer Skill Lab-IV course the student will be able to:

LO 1	Apply and analyze different uninformed and informed search algorithm**s** (such as BFS, DFS, Greedy, and A*****) on well-formulated AI problems, and compare their performance in terms of completeness, optimality, time, and space complexity.	L4
LO 2	Formulate and **solve** AI problems using Propositional Logic and First-Order Logic**,** and evaluate the correctness of logical inference using appropriate reasoning techniques.	L5
LO 3	Design and implement simple AI applications demonstrating non-monotonic reasoning, learning, or Natural Language Processing concepts, and interpret the outcomes of the implemented models.	L6