

**Adichunchanagiri Institute of Technology**  
**Department of Information Science & Engineering**

**Course Outcomes**

**2022**

**3<sup>rd</sup> SEMESTER**

**Subject: Mathematics for Computer Science**

**Subject Code: BCS301**

CO1. Explain the basic concepts of probability, random variables, probability distribution

CO 2. Apply suitable probability distribution models for the given scenario.

CO 3. Apply the notion of a discrete-time Markov chain and n-step transition probabilities to solve the given problem

CO 4. Use statistical methodology and tools in the engineering problem-solving process.

CO 5. Compute the confidence intervals for the mean of the population.

CO 6. Apply the ANOVA test related to engineering problems.

**Subject: Digital Design and Computer Organization**

**Subject code: BCS302**

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

CO1: Apply the K–Map techniques to simplify various Boolean expressions.

CO2: Design different types of combinational and sequential circuits along with Verilog programs.

CO3: Describe the fundamentals of machine instructions, addressing modes and Processor performance.

CO4: Explain the approaches involved in achieving communication between processor and I/O devices.

CO5: Analyze internal Organization of Memory and Impact of cache/Pipelining on Processor Performance.

**Subject: OPERATING SYSTEMS**

**Subject code: BCS303**

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

CO 1. Explain the structure and functionality of operating system

CO 2. Apply appropriate CPU scheduling algorithms for the given problem.

CO 3. Analyse the various techniques for process synchronization and deadlock handling.

CO 4. Apply the various techniques for memory management

CO 5. Explain file and secondary storage management strategies.

CO 6. Describe the need for information protection mechanisms

## **Subject: DATA STRUCTURES AND APPLICATIONS**

### **Subject code: BCS304**

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

- CO 1. Explain different data structures and their applications.
- CO 2. Apply Arrays, Stacks and Queue data structures to solve the given problems.
- CO 3. Use the concept of linked list in problem solving.
- CO 4. Develop solutions using trees and graphs to model the real-world problem.
- CO 5. Explain the advanced Data Structures concepts such as Hashing Techniques and Optimal Binary Search Trees.

## **Subject: DATA STRUCTURES LABORATORY**

### **Subject code: BCSL305**

The student should be able to:

- CO 1: Analyze various linear and non-linear data structures
- CO 2: Demonstrate the working nature of different types of data structures and their applications
- CO 3: Use appropriate searching and sorting algorithms for the give scenario.
- CO 4: Apply the appropriate data structure for solving real world problems

## **Subject: Object Oriented Programming with JAVA**

### **Subject code: BCS306A**

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

- CO 1. Demonstrate proficiency in writing simple programs involving branching and looping structures.
- CO 2. Design a class involving data members and methods for the given scenario.
- CO 3. Apply the concepts of inheritance and interfaces in solving real world problems.
- CO 4. Use the concept of packages and exception handling in solving complex problem
- CO 5. Apply concepts of multithreading, autoboxing and enumerations in program development

## **Subject: Social Connect & Responsibility**

### **Subject code: BSCK307**

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

- CO1: Communicate and connect to the surrounding.
- CO2: Create a responsible connection with the society.
- CO3: Involve in the community in general in which they work.
- CO4: Notice the needs and problems of the community and involve them in problem –solving.
- CO5: Develop among themselves a sense of social & civic responsibility & utilize their knowledge in finding practical solutions to individual and community problems.
- CO6: Develop competence required for group-living and sharing of responsibilities & gain skills in mobilizing community participation to acquire leadership qualities and democratic attitudes.

**Subject: Project Management with Git**

**Subject code: BCS358C**

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

CO 1: Use the basics commands related to git repository

CO 2: Create and manage the branches

CO 3: Apply commands related to Collaboration and Remote Repositories

CO 4: Use the commands related to Git Tags, Releases and advanced git operations

CO 5: Analyse and change the git history

## **4<sup>th</sup> SEMESTER**

### **Subject: Analysis & Design of Algorithms**

#### **Subject code: BCS401**

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

- CO 1. Apply asymptotic notational method to analyze the performance of the algorithms in terms of time complexity.
- CO 2. Demonstrate divide & conquer approaches and decrease & conquer approaches to solve computational problems.
- CO 3. Make use of transform & conquer and dynamic programming design approaches to solve the given real world or complex computational problems.
- CO 4. Apply greedy and input enhancement methods to solve graph & string based computational problems.
- CO 5. Analyse various classes (P, NP and NP Complete) of problems
- CO 6. Illustrate backtracking, branch & bound and approximation methods.

### **Subject: ADVANCED JAVA**

#### **Subject code: BIS402**

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

- CO 1. Apply appropriate collection class/interface to solve the given problem
- CO 2. Demonstrate the concepts of String operations in Java
- CO 3. Apply the concepts of Swings to build Java applications
- CO 4. Develop web based applications using Java servlets and JSP
- CO 5. Use JDBC to build database applications

### **Subject: DATABASE MANAGEMENT SYSTEM**

#### **Subject code: BCS403**

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

- CO1: Describe the basic elements of a relational database management system
- CO2: Design entity relationship for the given scenario.
- CO3: Apply various Structured Query Language (SQL) statements for database manipulation.
- CO4: Analyse various normalization forms for the given application.
- CO5: Develop database applications for the given real world problem.
- CO6: Understand the concepts related to NoSQL databases.

### **Subject: DISCRETE MATHEMATICAL STRUCTURES**

#### **Subject code: BCS405A**

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

- CO 1. Apply concepts of logical reasoning and mathematical proof techniques in proving theorems and statements.

CO 2. Demonstrate the application of discrete structures in different fields of computer science.

CO 3. Apply the basic concepts of relations, functions and partially ordered sets for computer representations.

CO 4. Solve problems involving recurrence relations and generating functions.

CO 5. Illustrate the fundamental principles of Algebraic structures with the problems related to computer science & engineering.

**Subject: Technical Writing using LaTeX**

**Subject code: BCSL456D**

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

CO 1: Apply basic LaTeX command to develop simple document

CO 2: Develop LaTeX script to present the tables and figures in the document

CO 3: Illustrate LaTeX script to present theorems and mathematical equations in the document

CO 4: Develop programs to generate the complete report with citations and a bibliography

CO 5: Illustrate the use of Tikz and algorithm libraries to design graphics and algorithms in the Document

## 5<sup>th</sup> SEMESTER

### **Subject: Software Engineering & Project Management**

**Subject Code: BCS501**

Course outcome:

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

CO 1: **Differentiate** process models to judge which process model has to be adopted for the given scenarios.

CO 2: **Derive** both functional and nonfunctional requirements from the case study.

CO 3: **Analyze** the importance of various software testing methods and agile methodology.

CO 4: **Illustrate** the role of project planning and quality management in software development.

CO 5: **Identify** appropriate techniques to enhance software quality.

### **Subject: COMPUTER NETWORKS**

**Subject Code: BCS502**

Course outcome:

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

CO 1: **Explain** the fundamentals of computer networks.

CO 2: **Apply** the concepts of computer networks to demonstrate the working of various layers and protocols in communication network.

CO 3: **Analyze** the principles of protocol layering in modern communication systems.

CO 4: **Demonstrate** various Routing protocols and their services using tools such as Cisco packet tracer.

### **Subject: THEORY OF COMPUTATION**

**Subject code: BCS503**

Course outcome:

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

CO 1. Apply the fundamentals of automata theory to write DFA, NFA, Epsilon-NFA and conversion between them.

CO 2. Prove the properties of regular languages using regular expressions.

CO 3. Design context-free grammars (CFGs) and pushdown automata (PDAs) for formal languages.

CO 4. Design Turing machines to solve the computational problems.

CO 5. Explain the concepts of decidability and undecidability.

### **Subject: ARTIFICIAL INTELLIGENCE**

**Subject code: BCS515B**

Course Outcome:

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

CO 1. Explain the architecture and components of intelligent agents, including their interaction with the AI environment.

CO 2. Apply problem-solving agents and various search strategies to solve a given problem.

CO 3. Illustrate logical reasoning and knowledge representation using propositional and first-order logic.

CO 4. Demonstrate proficiency in representing knowledge and solving problems using first-order logic.

CO 5. Describe classical planning in the context of artificial intelligence, including its goals, constraints, and applications in problem-solving.

**Subject: DATA VISUALIZATION LAB**

**Subject code: BAIL504**

Course outcome:

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

CO 1. Design the experiment to create basic charts and graphs using Tableau and Power BI.

CO 2. Develop the solution for the given real world problem.

CO 3. Analyze the results and produce substantial written documentation.

**Adichunchanagiri Institute of Technology**  
**Department of Information Science & Engineering**

**Course Outcomes**

**2018**

| <b>3<sup>rd</sup> Semester</b>                              |         |  |
|---|---------|--|
| Transform Calculus, Fourier Series And Numerical Techniques | 18MAT31 | <p><b>CO1:</b> Use Laplace transform and inverse Laplace transform in solving differential/ integral equation arising in network analysis, control systems and other fields of engineering.</p> <p><b>CO2:</b> Demonstrate Fourier series to study the behaviour of periodic functions and their applications in system communications, digital signal processing and field theory.</p> <p><b>CO3:</b> Make use of Fourier transform and Z-transform to illustrate discrete/continuous function arising in wave and heat propagation, signals and systems.</p> <p><b>CO4:</b> Solve first and second order ordinary differential equations arising in engineering problems using single step and multistep numerical methods.</p> <p><b>CO5:</b> Determine the external of functionals using calculus of variations and solve problems arising in dynamics of rigid bodies and vibrational analysis.</p> |
| Data Structures And Applications                            | 18CS32  | <p><b>CO1:</b> Use different types of data structures, operations and algorithms</p> <p><b>CO2:</b> Apply searching and sorting operations on files</p> <p><b>CO3:</b> Use stack, Queue, Lists, Trees and Graphs in problem solving</p> <p><b>CO4:</b> Implement all data structures in a high-level language for problem solving.</p>   |
| Analog And Digital Electronics                              | 18CS33  | <p><b>CO1:</b> Design and analyze application of analog circuits using photo devices, timer IC, power supply and regulator IC and op-amp.</p> <p><b>CO2:</b> Explain the basic principles of A/D and D/A conversion circuits and develop the same.</p> <p><b>CO3:</b> Simplify digital circuits using Karnaugh Map , and Quine-McClusky Methods</p> <p><b>CO4:</b> Explain Gates and flip flops and make us in designing different data processing circuits, registers and counters and compare the types.</p> <p><b>CO5:</b> Develop simple HDL programs</p>  |
| Computer Organization                                       | 18CS34  | <p><b>CO1:</b> Explain the basic organization of a computer system.</p> <p><b>CO2:</b> Demonstrate functioning of different sub systems, such as processor, Input/output, and memory.</p> <p><b>CO3:</b> Illustrate hardwired control and micro programmed control, pipelining, embedded and other computing systems.</p> <p><b>CO4:</b> Design and analyse simple arithmetic and logical units.</p>   |
| Software Engineering  | 18CS35  | <p><b>CO1:</b> Design a software system, component, or process to meet desired needs within realistic constraints.</p>   |



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|  |            | <p><b>CO2:</b>Assess professional and ethical responsibility</p> <p><b>CO3:</b>Function on multi-disciplinary teams</p> <p><b>CO4:</b> Use the techniques, skills, and modern engineering tools necessary for engineering practice</p> <p><b>CO5:</b>Analyze, design, implement, verify, validate, implement, apply, and maintain software systems or parts of software systems</p>  |
| Discrete Mathematical Structures                               | 18CS36     | <p><b>CO1:</b> Use propositional and predicate logic in knowledge representation and truth verification.</p> <p><b>CO2:</b>Demonstrate the application of discrete structures in different fields of computer science.</p> <p><b>CO3:</b> Solve problems using recurrence relations and generating functions.</p> <p><b>CO4:</b> Application of different mathematical proofs techniques in proving theorems in the courses.</p> <p><b>CO5:</b>Compare graphs, trees and their applications.</p>   |
| Analog And Digital Electronics Laboratory                      | 18CSL37    | <p><b>CO1:</b> Use appropriate design equations / methods to design the given circuit.</p> <p><b>CO2:</b> Examine and verify the design of both analog and digital circuits using simulators.</p> <p><b>CO3:</b> Make us of electronic components, ICs, instruments and tools for design and testing of circuits for the given the appropriate inputs.</p> <p><b>CO4:</b>Compile a laboratory journal which includes; aim, tool/instruments/software/components used, design equations used and designs, schematics, program listing, procedure followed, relevant theory, results as graphs and tables, interpreting and concluding the findings.</p> |
| Data Structures Laboratory                                     | 18CSL38    | <p><b>CO1:</b>Analyze and Compare various linear and non-linear data structures</p> <p><b>CO2:</b>Code, debug and demonstrate the working nature of different types of data structures and their applications</p> <p><b>CO3:</b>Implement, analyze and evaluate the searching and sorting algorithms</p> <p><b>CO4:</b> Choose the appropriate data structure for solving real world problems</p>  |
| Constitution Of India, Professional Ethics And Cyber Law (CPC) | 18CPC39/49 | <p><b>CO 1:</b> Have constitutional knowledge and legal literacy.</p> <p><b>CO 2:</b> Understand Engineering and Professional ethics and responsibilities of Engineers.</p> <p><b>CO 3:</b> Understand the the cybercrimes and cyber laws for cyber safety measures.</p>   |

| 4 <sup>th</sup> Semester                              |              |   |
|---|--------------|---|
| Subject   | Subject Code | Cos   |
| Complex Analysis, Probability And Statistical Methods | 18MAT41      | <p><b>CO1:</b> Use the concepts of analytic function and complex potentials to solve the problems arising in electromagnetic field theory.</p> <p><b>CO2:</b> Utilize conformal transformation and complex integral arising in aerofoil theory, fluid flow visualization and image processing.</p> <p><b>CO3:</b> Apply discrete and continuous probability distributions in analyzing the probability models arising in engineering field.</p> <p><b>CO4:</b> Make use of the correlation and regression analysis to fit a suitable mathematical model for the statistical data.</p> <p>Construct joint probability distributions and demonstrate the validity of testing the hypothesis</p> |
| Design And Analysis Of Algorithms                     | 18CS42       | <p><b>CO1:</b> Describe computational solution to well known problems like searching, sorting etc.</p> <p><b>CO2:</b> Estimate the computational complexity of different algorithms</p> <p><b>CO3:</b> Devise an algorithm using appropriate design strategies for problem solving.</p>   |
| Operating Systems                                     | 18CS43       | <p><b>CO1:</b> Demonstrate need for OS and different types of OS</p> <p><b>CO2:</b> Apply suitable techniques for management of different resources</p> <p><b>CO3:</b> Use processor, memory, storage and file system commands</p> <p><b>CO4:</b> Realize the different concepts of OS in platform of usage through case studies</p>  |
| Microcontroller and Embedded Systems                  | 18CS44       | <p><b>CO1:</b> Describe the architectural features and instructions of ARM microcontroller</p> <p><b>CO2:</b> Apply the knowledge gained for Programming ARM for different applications.</p> <p><b>CO3:</b> Interface external devices and I/O with ARM microcontroller.</p> <p><b>CO4:</b> Interpret the basic hardware components and their selection method based on the characteristics and attributes of an embedded system.</p> <p><b>CO5:</b> Develop the hardware /software co-design and firmware design approaches.</p> <p><b>CO6:</b> Demonstrate the need of real time operating system for embedded system applications</p>  |
| Object Oriented Concepts                              | 18CS45       | <p><b>CO1:</b> Explain the object-oriented concepts and JAVA.</p> <p><b>CO2:</b> Develop computer programs to solve real world problems in Java.</p> <p><b>CO3:</b> Develop simple GUI interfaces for a computer program to interact with users, and to understand the event-based GUI handling principles using swings.</p>  |
| Data Communicat                                       | 18CS46       | <p><b>CO1:</b> Explain the various components of data communication.</p> <p><b>CO2:</b> Explain the fundamentals of digital communication and</p>   |

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| ion   |         | switching.<br><b>CO3:</b> Compare and contrast data link layer protocols.<br><b>CO4:</b> Summarize IEEE 802.xx standards  |
| Design And Analysis Of Algorithms Laboratory    | 18CSL47 | <b>CO1:</b> Design algorithms using appropriate design techniques (brute-force, greedy, dynamic programming, etc.)<br><b>CO2:</b> Implement a variety of algorithms such as sorting, graph related, combinatorial, etc., in a high level language.<br><b>CO3:</b> Analyze and compare the performance of algorithms using language features.<br><b>CO4:</b> Apply and implement learned algorithm design techniques and data structures to solve real-world problems. |
| Microcontroller And Embedded Systems Laboratory | 18CSL48 | <b>CO1:</b> Develop and test program using ARM7TDMI/LPC2148<br><b>CO2:</b> Conduct the following experiments on an ARM7TDMI/LPC2148 evaluation board using evaluation version of Embedded 'C' & Keil Uvision-4 tool/compiler  |

| 5 <sup>th</sup> Semester                        |              |   |
|---|--------------|---|
| Subject Code                                    | Subject Code | Cos   |
| Management And Entrepreneurship For It Industry | 18CS51       | <b>CO1:</b> Define management, organization, entrepreneur, planning, staffing, ERP and outline their importance in entrepreneurship<br><b>CO2:</b> Utilize the resources available effectively through ERP<br><b>CO3:</b> Make use of IPRs and institutional support in entrepreneurship  |
| Computer Networks And Security                  | 18CS52       | <b>CO1:</b> Explain principles of application layer protocols<br><b>CO2:</b> Recognize transport layer services and infer UDP and TCP protocols<br><b>CO3:</b> Classify routers, IP and Routing Algorithms in network layer<br><b>CO4:</b> Understand the Wireless and Mobile Networks covering IEEE 802.11 Standard<br><b>CO5:</b> Describe Multimedia Networking and Network Management   |
| Database Management System                      | 18CS53       | <b>CO1:</b> Identify, analyze and define database objects, enforce integrity constraints on a database using RDBMS.<br><b>CO2:</b> Use Structured Query Language (SQL) for database manipulation.<br><b>CO3:</b> Design and build simple database systems<br><b>CO4:</b> Develop application to interact with databases.  |
| Automata Theory And Computability               | 18CS54       | <b>CO1:</b> Acquire fundamental understanding of the core concepts in automata theory and Theory of Computation<br><b>CO2:</b> Learn how to translate between different models of Computation (e.g., Deterministic and Non-deterministic and Software models).<br><b>CO3:</b> Design Grammars and Automata (recognizers) for different language classes and become knowledgeable about restricted models of Computation (Regular, Context Free) and their relative powers.<br><b>CO4:</b> Develop skills in formal reasoning and reduction of a problem |

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|                                      |         | to a formal model, with an emphasis on semantic precision and conciseness.<br><b>CO5:</b> Classify a problem with respect to different models of Computation.   |
| Application Development Using Python | 18CS55  | <b>CO1:</b> Demonstrate proficiency in handling of loops and creation of functions<br><b>CO2:</b> Identify the methods to create and manipulate lists, tuples and dictionaries.<br><b>CO3:</b> Discover the commonly used operations involving regular expressions and file system.<br><b>CO4:</b> Interpret the concepts of Object-Oriented Programming as used in Python.<br><b>CO5:</b> Determine the need for scraping websites and working with CSV, JSON and other file formats   |
| UNIX Programming                     | 18CS56  | <b>CO1:</b> Explain Unix Architecture, File system and use of Basic Commands<br><b>CO2:</b> Illustrate Shell Programming and to write Shell Scripts<br><b>CO3:</b> Describe the Unix system calls, The Unix Process and IPC<br><b>CO4:</b> Explain the significance of Unix signals   |
| Computer Network Laboratory          | 18CSL57 | <b>CO1:</b> Analyze and Compare various networking protocols.<br><b>CO2:</b> Demonstrate the working of different concepts of networking.<br><b>CO3:</b> Implement, analyze and evaluate networking protocols in NS2 / NS3 and JAVA programming language  |
| DBMS Laboratory With Mini Project    | 18CSL58 | <b>CO1:</b> Create, Update and query on the database<br><b>CO2:</b> Demonstrate the working of different concepts of DBMS<br><b>CO3:</b> Implement, analyze and evaluate the project developed for an application   |
| Environmental Studies                | 18CI59  | <b>CO1:</b> Understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale,<br><b>CO2:</b> Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment.<br><b>CO3:</b> Demonstrate ecology knowledge of a complex relationship between biotic and abiotic components.<br><b>CO4:</b> Apply their ecological knowledge to illustrate and graph a problem and describe the realities that managers face when dealing with complex issues |

| 6 <sup>th</sup> Semester |              |  |
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| Subject Code             | Subject Code | Cos  |
| File structures          | 18IS61       | <b>CO1:</b> Choose appropriate file structure for storage representation<br><b>CO2:</b> Identify a suitable sorting technique to arrange the data.<br><b>CO3:</b> Select suitable indexing and hashing techniques for better performance to a given problem. |
| Software Testing         | 18IS62       | <b>CO1:</b> Derive test cases for any given problem<br><b>CO2:</b> Compare the different testing techniques<br><b>CO3:</b> Classify the problem into suitable testing model  |

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|  |          | <p><b>CO4:</b> Apply the appropriate technique for the design of flow graph.</p> <p><b>CO5:</b> Create appropriate document for the software artefact</p>   |
| Web Technology And Its Applications          | 18CS63   | <p><b>CO1:</b> Adapt HTML and CSS syntax and semantics to build web pages.</p> <p><b>CO2:</b> Construct and visually format tables and forms using HTML and CSS</p> <p><b>CO3:</b> Develop Client-Side Scripts using JavaScript and Server-Side Scripts using PHP to generate and display the contents dynamically.</p> <p><b>CO4:</b> Appraise the principles of object oriented development using PHP</p> <p><b>CO5:</b> Inspect JavaScript frameworks like jQuery and Backbone which facilitates developer to focus on core features</p> |
| Data Mining And Data Warehousing             | 18CS641  | <p><b>CO1:</b> Identify data mining problems and implement the data warehouse</p> <p><b>CO2:</b> Write association rules for a given data pattern.</p> <p><b>CO3:</b> Choose between classification and clustering solution</p>   |
| Programming In Java (Open Elective)          | 18CS653  | <p><b>CO1:</b> Explain the object-oriented concepts and JAVA.</p> <p><b>CO2:</b> Develop computer programs to solve real world problems in Java.</p> <p><b>CO3:</b> Develop simple GUI interfaces for a computer program to interact with users</p>   |
| Software Testing Laboratory                  | 18CSL66  | <p><b>CO1:</b> List out the requirements for the given problem</p> <p><b>CO2:</b> Design and implement the solution for given problem in any programming language(C,C++,JAVA)</p> <p><b>CO3:</b> Derive test cases for any given problem</p> <p><b>CO4:</b> Apply the appropriate technique for the design of flow graph.</p> <p><b>CO5:</b> Create appropriate document for the software artefact</p>  |
| File Structures Laboratory With Mini Project | 18ISL67  | <p><b>CO1:</b> Implement operations related to files</p> <p><b>CO2:</b> Apply the concepts of file system to produce the given application.</p> <p><b>CO3:</b> Evaluate performance of various file systems on given parameters.</p>  |
| Mobile Application Development               | 18CSMP68 | <p><b>CO1:</b> Create, test and debug Android application by setting up Android development environment.</p> <p><b>CO2:</b> Implement adaptive, responsive user interfaces that work across a wide range of devices.</p> <p><b>CO3:</b> Infer long running tasks and background work in Android applications.</p> <p><b>CO4:</b> Demonstrate methods in storing, sharing and retrieving data in Android applications.</p> <p><b>CO5:</b> Infer the role of permissions and security for Android applications.</p>                           |

| 7 <sup>th</sup> Semester |              |   |
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| Subject Code             | Subject Code | Cos   |
| Artificial               | 18CS71       | <b>CO1:</b> Appaise the theory of Artificial intelligence and Machine |

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| Intelligence & Machine Learning                |         | Learning.<br><b>CO2:</b> Illustrate the working of AI and ML Algorithms.<br><b>CO3:</b> Demonstrate the applications of AI and ML  |
| Big Data And Analytics                         | 18CS72  | <b>CO1:</b> Understand fundamentals of Big Data analytics<br><b>CO2:</b> Investigate Hadoop framework and Hadoop Distributed File system.<br><b>CO3:</b> Illustrate the concepts of NoSQL using MongoDB and Cassandra for Big Data.<br><b>CO4:</b> Demonstrate the MapReduce programming model to process the big data along with Hadoop tools.<br><b>CO5:</b> Use Machine Learning algorithms for real world big data.<br><b>CO6:</b> Analyze web contents and Social Networks to provide analytics with relevant visualization tools   |
| Software Architecture and Design Patterns      | 18CS731 | <b>CO1:</b> Design and implement codes with higher performance and lower complexity<br><b>CO2:</b> Be aware of code qualities needed to keep code flexible<br><b>CO3:</b> Experience core design principles and be able to assess the quality of a design with respect to these principles.<br><b>CO4:</b> Capable of applying these principles in the design of object oriented systems.<br><b>CO5:</b> Demonstrate an understanding of a range of design patterns. Be capable of comprehending a design presented using this vocabulary.<br><b>CO6:</b> Be able to select and apply suitable patterns in specific contexts |
| Advanced Computer Architectures                | 18CS733 | <b>CO1:</b> Explain the concepts of parallel computing and hardware technologies<br><b>CO2:</b> Compare and contrast the parallel architectures<br><b>CO3:</b> Illustrate parallel programming concepts  |
| Network Management                             | 18CS742 | <b>CO1:</b> Analyze the issues and challenges pertaining to management of emerging network technologies such as wired/wireless networks and high-speed internets.<br><b>CO2:</b> Apply network management standards to manage practical networks<br><b>CO3:</b> Formulate possible approaches for managing OSI network model.<br><b>CO4:</b> Use on SNMP for managing the network<br><b>CO5:</b> Use RMON for monitoring the behavior of the network<br><b>CO6:</b> Identify the various components of network and formulate the scheme for the managing them  |
| Python Application Programming (Open Elective) | 18CS752 | <b>CO1:</b> Examine Python syntax and semantics and be fluent in the use of Python flow control and functions.<br><b>CO2:</b> Demonstrate proficiency in handling Strings and File Systems.<br><b>CO3:</b> Create, run and manipulate Python Programs using core data structures like Lists, Dictionaries and use Regular Expressions.<br><b>CO4:</b> Interpret the concepts of Object-Oriented Programming as used in Python.<br><b>CO5:</b> Implement exemplary applications related to Network Programming, Web Services and Databases in Python.   |
| Artificial Intelligence And Machine            | 18CSL76 | <b>CO1:</b> Implement and demonstrate AI and ML algorithms.<br><b>CO2:</b> Evaluate different algorithms   |

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| Learning Laboratory |  |  |
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| 8 <sup>th</sup> Semester |              |   |
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| Subject                  | Subject Code | Cos   |
| Internet of Things       | 18CS81       | <p><b>CO1:</b> Interpret the impact and challenges posed by IoT networks leading to new architectural models.</p> <p><b>CO2:</b> Compare and contrast the deployment of smart objects and the technologies to connect them to network.</p> <p><b>CO3:</b> Appraise the role of IoT protocols for efficient network communication.</p> <p><b>CO4:</b> Elaborate the need for Data Analytics and Security in IoT.</p> <p><b>CO5:</b> Illustrate different sensor technologies for sensing real world entities and identify the applications of IoT in Industry.</p> |
| Storage Area Networks    | 18CS822      | <p><b>CO1:</b> Identify key challenges in managing information and analyze different storage networking technologies and virtualization</p> <p><b>CO2:</b> Explain components and the implementation of NAS</p> <p><b>CO3:</b> Describe CAS architecture and types of archives and forms of virtualization</p> <p><b>CO4:</b> Illustrate the storage infrastructure and management activities</p>   |

2021

| 1 <sup>st</sup> / 2 <sup>nd</sup> Semester |              |  |
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| Subject                                    | Subject code | Co   |
| Problem-Solving Through Programming        | 21PSP23/13   | <p><b>CO1:</b>Elucidate the basic architecture and functionalities of a computer and also recognize the hardware parts.</p> <p><b>CO2:</b>Apply programming constructs of C language to solve the real world problem</p> <p><b>CO3:</b>Explore user-defined data structures like arrays in implementing solutions to problems like searching and sorting</p> <p><b>CO4:</b>Explore user-defined data structures like structures, unions and pointers in implementing solutions</p> <p><b>CO5:</b>Design and Develop Solutions to problems using modular programming constructs using functions</p> |
| Computer Programming Laboratory            | 21CPL27/17   | <p><b>CO1:</b>Define the problem statement and identify the need for computer programming</p> <p><b>CO2:</b>Make use of C compiler, IDE for programming, identify and correct the syntax and syntactic errors in programming</p> <p><b>CO3:</b>Develop algorithm, flowchart and write programs to solve the given problem</p> <p><b>CO4:</b>Demonstrate use of functions, recursive functions, arrays, strings, structures and pointers in problem solving.</p> <p><b>CO5:</b>Document the inference and observations made from the implementation.</p>  |

| <b>3<sup>rd</sup> Semester</b>                              |                     |  |
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| <b>Subject</b>  | <b>Subject code</b> | <b>Co</b>  |
| Transform Calculus, Fourier Series and Numerical Techniques | 21MAT31             | CO 1. To solve ordinary differential equations using Laplace transform. CO 2. Demonstrate Fourier series to study the behaviour of periodic functions and their applications in system communications, digital signal processing and field theory. CO 3. To use Fourier transforms to analyze problems involving continuous-time signals and to apply ZTransform techniques to solve difference equations CO 4. To solve mathematical models represented by initial or boundary value problems involving partial differential equations CO 5. Determine the extremals of functionals using calculus of variations and solve problems arising in dynamics of rigid bodies and vibrational analysis. |
| Data Structures and its Applications                        | 21CS32              | <ul style="list-style-type: none"> <li>CO 1. Identify different data structures and their applications. CO 2. Apply stack and queues in solving problems. CO 3. Demonstrate applications of linked list. 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</li> </ul>  |
| Analog and Digital Electronics                              | 21CS33              | CO 1. Design and analyze application of analog circuits using photo devices, timer IC, power supply and regulator IC and op-amp. CO 2. 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 CO 4. Explain Gates and flip flops and make us in designing different data processing circuits, registers and counters and compare the types. CO 5. Develop simple HDL programs  |
| Computer Organization and Architecture                      | 21CS34              | CO 1. Explain the organization and architecture of computer systems with machine instructions and programs<br>CO 2. Analyze the input/output devices communicating with computer system<br>CO 3. Demonstrate the functions of different types of memory devices<br>CO 4. Apply different data types on simple arithmetic and logical unit<br>CO 5. Analyze the functions of basic processing unit, Parallel processing and pipelining  |
| Object Oriented Programming with JAVA Laboratory            | 21CSL35             | CO 1. Use Eclipse/NetBeans IDE to design, develop, debug Java Projects.<br>CO 2. Analyze the necessity for Object Oriented Programming paradigm over structured programming and become familiar with the fundamental concepts in OOP.<br>CO 3. Demonstrate the ability to design and develop java programs, analyze, and interpret objectoriented data and document results.<br>CO 4. Apply the concepts of multiprogramming, exception/event handling, abstraction to develop   |



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|  |          | robust programs.<br>CO 5. Develop user friendly applications using File I/O and GUI concepts.   |
| Mastering Office                       | 21CSL381 | CO 1. Know the basics of computers and prepare documents, spreadsheets, make small presentations with audio, video and graphs and would be acquainted with internet.<br>CO 2. Create, edit, save and print documents with list tables, header, footer, graphic, spellchecker, mail merge and grammar checker<br>CO 3. Attain the knowledge about spreadsheet with formula, macros spell checker etc.<br>CO 4. Demonstrate the ability to apply application software in an office environment.<br>CO 5. Use Google Suite for office data management tasks  |
| Programming in C++                     | 21CS382  | CO 1. Able to understand and design the solution to a problem using object-oriented programming concepts.<br>CO 2. Able to reuse the code with extensible Class types, User-defined operators and function Overloading.<br>CO 3. Achieve code reusability and extensibility by means of Inheritance and Polymorphism<br>CO 4. Identify and explore the Performance analysis of I/O Streams.<br>CO 5. Implement the features of C++ including templates, exceptions and file handling for providing programmed solutions to complex problems.  |
| Mathematical Foundations for Computing | 21CS41   | CO 1. Apply the concepts of logic for effective computation and relating problems in the Engineering domain.<br>CO 2. Analyze the concepts of functions and relations to various fields of Engineering. Comprehend the concepts of Graph Theory for various applications of Computational sciences.<br>CO 3. Apply discrete and continuous probability distributions in analysing the probability models arising in the engineering field.<br>CO 4. Make use of the correlation and regression analysis to fit a suitable mathematical model for the statistical data.<br>CO 5. Construct joint probability distributions and demonstrate the validity of testing the hypothesis. |
| Design and Analysis of Algorithms      | 21CS42   | CO 1. Analyze the performance of the algorithms, state the efficiency using asymptotic notations and analyze mathematically the complexity of the algorithm.<br>CO 2. Apply divide and conquer approaches and decrease and conquer approaches in solving the problems analyze the same<br>CO 3. Apply the appropriate algorithmic design technique like greedy method, transform and conquer approaches and compare the efficiency of algorithms to solve the given problem.<br>CO 4. Apply and analyze dynamic programming approaches to solve some problems. and improve an algorithm time efficiency by sacrificing space.   |

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|                                      |          | CO 5. Apply and analyze backtracking, branch and bound methods and to describe P, NP and NPCComplete problems.   |
| Microcontroller and Embedded Systems | 21CS43   | CO 1. Explain C-Compilers and optimization<br>CO 2. Describe the ARM microcontroller's architectural features and program module.<br>CO 3. Apply the knowledge gained from programming on ARM to different applications.<br>CO 4. Program the basic hardware components and their application selection method.<br>CO 5. Demonstrate the need for a real-time operating system for embedded system applications.   |
| Operating Systems                    | 21CS44   | CO 1. Identify the structure of an operating system and its scheduling mechanism.<br>CO 2. Demonstrate the allocation of resources for a process using scheduling algorithm.<br>CO 3. Identify root causes of deadlock and provide the solution for deadlock elimination<br>CO 4. Explore about the storage structures and learn about the Linux Operating system.<br>CO 5. Analyze Storage Structures and Implement Customized Case study   |
| Python Programming Laboratory        | 21CSL46  | CO 1. Demonstrate proficiency in handling of loops and creation of functions.<br>CO 2. Identify the methods to create and manipulate lists, tuples and dictionaries.<br>CO 3. Discover the commonly used operations involving regular expressions and file system.<br>CO 4. Interpret the concepts of Object-Oriented Programming as used in Python.<br>CO 5. Determine the need for scraping websites and working with PDF, JSON and other file formats.                                |
| Web Programming                      | 21CSL481 | CO 1. Describe the fundamentals of web and concept of HTML.<br>CO 2. Use the concepts of HTML, XHTML to construct the web pages.<br>CO 3. Interpret CSS for dynamic documents.<br>CO 4. Evaluate different concepts of JavaScript & Construct dynamic documents.<br>CO 5. Design a small project with JavaScript and XHTML.  |
| Unix Shell Programming               | 21CS482  | CO 1. Know the basics of Unix concepts and commands.<br>CO 2. Evaluate the UNIX file system.<br>CO 3. Apply Changes in file system.<br>CO 4. Understand scripts and programs.<br>CO 5. Analyze Facility with UNIX system process   |
| R Programming                        | 21CSL483 | CO 1. To understand the fundamental syntax of R through readings, practice exercises,<br>CO 2. To demonstrations, and writing R code.<br>CO 3. To apply critical programming language concepts such as data types, iteration,<br>CO 4. To understand control structures, functions, and Boolean operators by writing R programs and through examples<br>CO 5. To import a variety of data formats into R using R-Studio<br>CO 6. To prepare or tidy data for in preparation for analyze. |
| Automata Theory                      | 21CS51   | CO 1. Acquire fundamental understanding of the core  |

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| and compiler Design                                      |          | <p>concepts in automata theory and Theory of Computation</p> <p>CO 2. Design and develop lexical analyzers, parsers and code generators</p> <p>CO 3. Design Grammars and Automata (recognizers) for different language classes and become knowledgeable about restricted models of Computation (Regular, Context Free) and their relative powers.</p> <p>CO 4. Acquire fundamental understanding of the structure of a Compiler and Apply concepts automata theory and Theory of Computation to design Compilers</p> <p>CO 5. Design computations models for problems in Automata theory and adaptation of such model in the field of compilers</p> |
| Computer Networks  | 21CS52   | <p>CO 1. Learn the basic needs of communication system.</p> <p>CO 2. Interpret the communication challenges and its solution.</p> <p>CO 3. Identify and organize the communication system network components</p> <p>CO 4. Design communication networks for user requirements.</p>  |
| Database Management Systems                              | 21CS53   | <p>CO 1. Identify, analyze and define database objects, enforce integrity constraints on a database using RDBMS</p> <p>CO 2. Use Structured Query Language (SQL) for database manipulation and also demonstrate the basic of query evaluation.</p> <p>CO 3. Design and build simple database systems and relate the concept of transaction, concurrency control and recovery in database</p> <p>CO 4. Develop application to interact with databases, relational algebra expression.</p> <p>CO 5. Develop applications using tuple and domain relation expression from queries.</p>   |
| Artificial Intelligence and Machine Learning             | 21CS54   | <p>CO 1. Apply the knowledge of searching and reasoning techniques for different applications.</p> <p>CO 2. Have a good understanding of machine leaning in relation to other fields and fundamental issues and challenges of machine learning.</p> <p>CO 3. Apply the knowledge of classification algorithms on various dataset and compare results</p> <p>CO 4. Model the neuron and Neural Network, and to analyze ANN learning and its applications.</p> <p>CO 5. Identifying the suitable clustering algorithm for different pattern</p>   |
| Database Management Systems Laboratory with Mini Project | 21CSL55  | <p>CO 1. Create, Update and query on the database.</p> <p>CO 2. Demonstrate the working of different concepts of DBMS</p> <p>CO 3. Implement, analyze and evaluate the project developed for an application.</p>  |
| Angular JS and Node JS                                   | 21CSL581 | <p>CO 1. Describe the features of Angular JS.</p> <p>CO 2. Recognize the form validations and controls.</p> <p>CO 3. Implement Directives and Controllers.</p> <p>CO 4. Evaluate and create database for simple application.</p> <p>CO 5. Plan and build webservers with node using Node .JS.</p>   |

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| C# AND .NET FRAMEWORK                       | 21CS582 | CO 1. Able to explain how C# fits into the .NET platform.<br>CO 2. Describe the utilization of variables and constants of C#<br>CO 3. Use the implementation of object-oriented aspects in applications.<br>CO 4. Analyze and Set up Environment of .NET Core.<br>CO 5. Evaluate and create a simple project application.   |
| Software Engineering and Project Management | 21CS61  | CO 1. Understand the activities involved in software engineering and analyze the role of various process models<br>CO 2. Explain the basics of object-oriented concepts and build a suitable class model using modelling techniques<br>CO 3. Describe various software testing methods and to understand the importance of agile methodology and DevOps<br>CO 4. Illustrate the role of project planning and quality management in software development<br>CO 5. Understand the importance of activity planning and different planning models |
| Fullstack Development                       | 21CS62  | CO 1. Understand the working of MVT based full stack web development with Django.<br>CO 2. Designing of Models and Forms for rapid development of web pages.<br>CO 3. Analyze the role of Template Inheritance and Generic views for developing full stack web applications.<br>CO 4. Apply the Django framework libraries to render nonHTML contents like CSV and PDF.<br>CO 5. Perform jQuery based AJAX integration to Django Apps to build responsive full stack web applications,  |
| Software Testing                            | 21IS63  | CO 1. Explain the significance of software testing and quality assurance in software development<br>CO 2. Apply the concepts of software testing to assess the most appropriate testing method.<br>CO 3. Analyze the importance of testing in software development.<br>CO 4. Evaluate the suitable testing model to derive test cases for any given software<br>CO 5. Develop appropriate document for the software artefact.   |
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| Agile Technology                            | 21CS641 | CO 1. Understand the fundamentals of agile technologies<br>CO 2. Explain XP Lifecycle, XP Concepts and Adopting XP<br>CO 3. Apply different techniques on Practicing XP, Collaborating and Releasing<br>CO 4. Analyze the Values and Principles of Mastering Agility<br>CO 5. Demonstrate the agility to deliver good values  |
| Software Testing Laboratory                 | 21ISL66 | CO 1. List out the requirements for the given problem and develop test cases for any given problem .<br>CO 2. Design and implement the solution for given problem and to design flow graph<br>CO 3. Use Eclipse/NetBeans IDE and testing tools to design, develop, debug the Project and create appropriate document for the software artifact.<br>CO 4. Use the appropriate functional testing strategies. Compare the different testing techniques.<br>CO 5. Classify and Compare the   |

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|                                      |         | problems according to a suitable testing model applying the test coverage metrics.  |
| Advanced JAVA Programming            | 21CS642 | CO 1. Understanding the fundamental concepts of Enumerations and Annotations<br>CO 2. Apply the concepts of Generic classes in Java programs<br>CO 3. Demonstrate the concepts of String operations in Java<br>CO 4. Develop web based applications using Java servlets and JSP<br>CO 5. Illustrate database interaction and transaction processing in Java   |
| Data Mining and Data Warehousing     | 21IS643 | CO 1. Understand warehousing architectures and tools for systematically organizing large database and use their data to make strategic decisions. CO 2. Apply KDD process for finding interesting pattern from warehouse. CO 3. Analyze the kinds of patterns that can be discovered by association rule mining. CO 4. Evaluate interesting patterns from large amounts of data to analyze for predictions and classification. CO 5. Design select suitable methods for data mining and analysis. |
| Data science and Visualization       | 21CS644 | CO 1. Understand the data in different forms<br>CO 2. Apply different techniques to Explore Data Analysis and the Data Science Process<br>CO 3. Analyze feature selection algorithms & design a recommender system.<br>CO 4. Evaluate data visualization tools and libraries and plot graphs.<br>CO 5. Develop different charts and include mathematical expressions.   |
| Cryptography and Network Security    | 21IS71  | CO 1. Understand Cryptography, Network Security theories, algorithms and systems CO 2. Apply different Cryptography and Network Security operations on different applications<br>CO 3. Analyse different methods for authentication and access control CO 4. Evaluate Public and Private key, Key management, distribution and certification CO 5. Design necessary techniques to build protection mechanisms to secure computer networks   |
| Cloud Computing                      | 21CS72  | CO 1. Understand and analyze various cloud computing platforms and service provider.<br>CO 2. Illustrate various virtualization concepts.<br>CO 3. Identify the architecture, infrastructure and delivery models of cloud computing.<br>CO 4. Understand the Security aspects of CLOUD.<br>CO 5. Define platforms for development of cloud applications   |
| Object oriented Modelling and Design | 21CS731 | CO 1. Describe the concepts of object-oriented and basic class modelling.<br>CO 2. Draw class diagrams, sequence diagrams and interaction diagrams to solve problems.<br>CO 3. Choose and apply a befitting design pattern for the given problem.   |
| Blockchain Technology                | 21CS734 | CO 1. Describe the concepts of Distributed computing and its role in Blockchain<br>CO 2. Describe the concepts of Cryptography and its role in Blockchain   |

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|   |         | <p>CO 3. List the benefits, drawbacks and applications of Blockchain</p> <p>CO 4. Appreciate the technologies involved in Bitcoin</p> <p>CO 5. Appreciate and demonstrate the Ethereum platform to develop blockchain application.</p>  |
| Digital Image Processing                          | 21CS732 | <p>CO 1. Understand the fundamentals of Digital Image Processing.</p> <p>CO 2. Apply different Image transformation techniques</p> <p>CO 3. Analyze various image restoration techniques</p> <p>CO 4. Understand colour image and morphological processing</p> <p>CO 5. Design image analysis and segmentation techniques</p>   |
| Internet of Things                                | 21CS735 | <p>CO 1. Understand the evolution of IoT, IoT networking components, and addressing strategies in IoT.</p> <p>CO 2. Analyze various sensing devices and actuator types.</p> <p>CO 3. Demonstrate the processing in IoT.</p> <p>CO 4. Apply different connectivity technologies.</p> <p>CO 5. Understand the communication technologies , protocols and interoperability in IoT.</p>   |
| User Interface Design                             | 21CS733 | <p>CO 1. Understand importance and characteristics of user interface design</p> <p>CO 2. Apply user interface design process on business functions</p> <p>CO 3. Demonstrate system menus, navigation schemes and windows characteristics</p> <p>CO 4. Analyze screen based controls and device based controls</p> <p>CO 5. Design the prototypes and test plans of user interface</p>   |
| Robotic Process Automation Design and Development | 21CS744 | <p>CO 1. To Understand the basic concepts of RPA</p> <p>CO 2. To Describe various components and platforms of RPA</p> <p>CO 3. To Describe the different types of variables, control flow and data manipulation techniques</p> <p>CO 4. To Understand various control techniques and OCR in RPA</p> <p>CO 5. To Describe various types and strategies to handle exceptions</p>  |
| File Structures                                   | 21IS742 | <p>CO 1. Understand the fundamental concepts of file processing operations and storage structures</p> <p>CO 2. Apply object orientation concepts to manipulate records</p> <p>CO 3. Apply concepts of sorting and merging on multiple files</p> <p>CO 4. Analyze the sequential and indexing file accessing techniques with appropriate data structures</p> <p>CO 5. Illustrate the usage of hashing techniques to organize file structures</p> |
| NoSQL Data Base                                   | 21CS745 | <p>CO1. Demonstrate an understanding of the detailed architecture of Column Oriented NoSQL databases, Document databases, Graph databases.</p> <p>CO2. Use the concepts pertaining to all the types of databases.</p> <p>CO3. Analyze the structural Models of NoSQL.</p> <p>CO4. Develop various applications using NoSQL databases.</p>   |
| Software Architecture and Design Patterns         | 21CS741 | <p>CO 1. Design and implement codes with higher performance and lower complexity</p> <p>CO 2. Be aware of code qualities needed to keep code flexible</p> <p>CO 3. Experience core design principles and be able to assess the quality of a design with respect to these principles.</p>  |

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|               |         | <p>CO 4. Capable of applying these principles in the design of object oriented systems.</p> <p>CO 5. Demonstrate an understanding of a range of design patterns. Be capable of comprehending a design presented using this vocabulary.</p> <p>CO 6. Be able to select and apply suitable patterns in specific contexts</p>  |
| Deep Learning | 21CS743 | <p>CO1: Understand the fundamental issues and challenges of deep learning data, model selection, model complexity etc.,</p> <p>CO2: Describe various knowledge on deep learning and algorithms</p> <p>CO3: Apply CNN and RNN model for real time applications</p> <p>CO4: Identify various challenges involved in designing and implementing deep learning algorithms.</p> <p>CO5: Relate the deep learning algorithms for the given types of learning tasks in varied domain</p> |