SAHYADRI
COLLEGE OF ENGINEERING & MANAGEMENT
An Autonomous Institution
MANGALURU

Department of Information Science & Engineering

2021-22 (ODD-EVEN)-COs-MAPPING

COURSE OUTCOMES

Sl. No.	SUBJECT CODE	COURSE CODE	CO NO.	COURSE OUTCOME DESCRIPTION
3rd Semester	18MAT31	C201	C201.1	Use Laplace transform and inverse Laplace transform in solving differential/ integral equation arising in network analysis, control systems and other fields of engineering.
			C201.2	Demonstrate Fourier series to study the behavior of periodic functions and their applications in system communications, digital signal processing and field theory.
			C201.3	Make use of Fourier transform and Z-transform to illustrate discrete/continuous function arising in wave and heat propagation, signals and systems.
			C201.4	Solve first and second order ordinary differential equations arising in engineering problems using single step and multistep numerical methods.
			C201.5	Determine the externals of functional using calculus of variations and solve problems arising in dynamics of rigid bodies and vibrational analysis.
	18CS32	C202	C202.1	Acquire the fundamental knowledge of various types of data structures and pointers using that knowledge and design the programs using pointers.
			C202.2	Apply the fundamental programming knowledge of data structures to design abstract data types such as stack, queue and use them for solving problems.
			C202.3	Implement various functions for implementation of singly linked lists, circular linked lists and doubly linked list.
			C202.4	Implement and apply the concept of binary trees and binary search tree data structure.
			C202.5	Infer the knowledge of Graph representations, Graph problems and hashing Technique. Solve problems on Sorting and searching methods.
	18CS33	C203	C203.1	Explain the working principles and its applications of OPAMP, BJT, Astable Multivibrators, regulator IC and A/D & D/A conversion circuits.
			C203.2	Apply K-Map, QM method and MEV techniques to simplify digital circuits.
			C203.3	Explain the gates and its use in designing various data processing circuits.
			C203.4	Describe flip flops and VHDL Programming. Develop simple VHDL programs
			C203.5	Explain the Flip-flops and its use in designing various sequential circuits like registers and counters.

3rd Semester	**18CS34**	**C204**	**C204.1**	Demonstrate an understanding of the design of the functional units of a digital computer system
			C204.2	Demonstrate the design of control unit and explain the instruction set, instruction formats and addressing modes.
			C204.3	Discuss and analyze memory hierarchy and its impact on computer Cost/performance.
			C204.4	Apply the representations techniques of numbers stored in digital computers and perform Basic arithmetic Operations.
			C204.5	Explain the concepts of computer organization in the design of various embedded systems examples
	18CS35	**C205**	**C205.1**	Explain the process of building software, outline professional and ethical responsibility and illustrate the concept of Requirements Collection and Requirement Engineering Process.
			C205.2	Develop various models used for designing software systems. Explain various UML concepts used for Object Oriented Software Design. Identify and discuss various design and implementation issues.
			C205.3	Demonstrate software testing and identify various types of testing. Infer Software Evolution. Illustrate Legacy System Management
			C205.4	Analyze various project planning phases and inspect the Software Quality Management.
			C205.5	Explain the concept of Agile technique and demonstrate the Agile Software Development process
	18CS36	**C206**	**C206.1**	Demonstrating the correctness of an argument using mathematical logic and construct the proofs for quantifiers.
			C206.2	Using the concepts of mathematical induction construct the proofs and solve the counting problems.
			C206.3	Solve the problems associated with relations and functions.
			C206.4	Solve the problems involving principle of inclusion-exclusion with its applications and recurrence relations
			C206.5	Apply the different concepts of graphs and trees in the field of information science.
	18CSL37	**C207**	**C207.1**	Demonstrate Analog Electronic Circuits based on Op-Amps and 555 Timers.
			C207.2	Demonstrate the implementation of combinational logic circuits using digital logic design.
			C207.3	Demonstrate the implementation of sequential logic circuits using digital logic design.
			C207.4	Show the simulation of Analog Circuits using circuit simulation software.
			C207.5	Show the simulation of Digtal Circuits using Hardware Description Language.

3rd Semester	**18CSL38**	**C208**	**C208.1**	Demonstrate array and string data structures by designing and implementing the relevant function required
			C208.2	Demonstrate stack and queue data structures by designing and developing the required functions with its applications
			C208.3	Demonstrate the concepts of SLL,DLL and SCLL by designing and developing the required functions with its applications
			C208.4	Demonstrate trees and graphs by designing and implementing the relevant function required
			C208.5	Illustrate the application of file data structures by designing suitable hash techniques also analyze the collision problems and develop suitable functions to resolve collision problem.

4th Semester	**18MAT41**	**C209**	**C209.1**	Use the concepts of analytic function and complex potentials to solve the problems arising in electromagnetic field theory.
			C209.2	Utilize conformal transformation and complex integral arising in aerofoil theory, fluid flow visualization and image processing.
			C209.3	Apply discrete and continuous probability distributions in analyzing the probability models arising in engineering field.
			C209.4	Make use of the correlation and regression analysis to fit a suitable mathematical model for the statistical data.
			C209.5	Construct joint probability distributions and demonstrate the validity of testing the hypothesis
	18CS42	**C210**	**210.1**	Illustrate the correctness of algorithms using inductive proofs and invariants. Analyze worst-case, best case and average case running times of algorithms using asymptotic analysis for non-recursive and recursive algorithms and also explain the different data structures used for different data types.
			210.1	To dissect and solve recurrences describing the performance of divide-and-conquer algorithms with different examples. Also demonstrate the decrease and conquer paradigm.
			210.1	Illustrate the greedy technique and explain when an algorithmic design situation calls for it. Synthesize greedy algorithms, and analyze them. Also dissect the transform and conquer approach.
			210.1	Synthesize dynamic-programming algorithms, and analyze them using different examples.
			210.1	Ability to apply algorithm design principles to derive solutions for real life problems, NP class problems and comment on complexity of solution.

4th Semester	**18CS43**	**C211**	**211.1**	Discuss various Components of an Operating System and understand the management of process, memory and storage. Discuss various types of system calls, operations on processes and the communication pattern between two processes.
			211.2	Discuss the concept of threading by understanding various multithreading models and identify various threading issues. Identify and Apply various algorithms for scheduling processes. Understand the concept of process synchronization, problems and solutions relevent to synchronization.
			211.3	Define various characteristics of deadlock, Identify deadlock occurrence and handle deadlock situation. Illustrate the prevention, avoidance, detection and recovery from deadlock. Discuss various memory management strategies.
			211.4	Apply suitable page replacement algorithms, Demand paging concept, frame allocation, understand the concept of virtual memory management concept. Discuss various file concepts, access methods and file protection. Discuss the concept of various allocation methods.
			211.5	Discuss various secondary storage structures. Illustrate various disk scheduling and management techniques. Discuss various concepts of protection and access. Understand the working of the LINUX operating system
	18CS44	**C212**	**212.1**	Describe the architectural features, design philosophy and instructions of ARM microcontroller.
			212.2	Apply the knowledge gained for Programming ARM for different applications.
			212.3	Demonstrate the interfacing of external devices and I/O with ARM microcontroller.
			212.4	Interpret the basic hardware components and their selection method based on the characteristics and attributes by integrating firmware of an embedded system.
			212.5	Demonstrate the need of real time operating system for embedded system applications
	18CS45	**C213**	**213.1**	Apply Object Oriented programming concept using C++ language with basic syntaxes of function Prototyping and function Overloading, Classes, Objects and functions.
			213.2	Explain the features of Namespaces, Nested classes, Constructors, Destructors for developing skills of logic building activity in C++. Apply basic JAVA programming traits and Identify classes, objects, members of a class and the relationships among them needed for a finding the solution to specific problem using Java Programs.
			213.3	Demonstrate how to achieve reusability using inheritance, use of different exception handling mechanisms and describes faster application development can be achieved.
			213.4	Demonstrate the use of interfaces and packages mechanisms and concept of multithreading for robust faster and efficient application development.
			213.5	Illustrate common abstract user interface components to design GUI in Java using Applet along with response to events. Design & develop complex Graphical user interfaces using principal Java Swing classes.

4th Semester	**18CS46**	**C214**	**C214.1**	Illustrate the basics of computer network, different topologies and the layers of OSI model with its function compared with TCP/IP model.
			C214.2	Discuss the physical layer functions.
			C214.3	Demonstrate the bandwidth utilization and the different types of switching also make use of different techniques for error detection and correction.
			C214.4	Explain different protocols used in Data Link Layer and summarize IPv4 Addressing and subletting
			C214.5	Illustrate Wired and wireless protocols with its applications.
	18CS47	**C215**	**C215.1**	Apply and implement the learned data structures to solve the real world problems.
			C215.2	Design algorithms using Divide and Conquer technique and analyze the performance of algorithms
			C215.3	Develop variety of algorithms using Greedy technique for graph related problems.
			C215.4	Design and implement algorithms using the technique of Dynamic Programming for network related problems
			C215.5	Apply the concept of Backtracking for combinatorial problems.
	18CS48	**C216**	**C216.1**	Demonstrate ALP using ARM7TDMI/LPC2148.
			C216.2	Demonstrate to display "Hello World" message using internal UART.
			C216.3	Demonstration of ALP to interface and control a DC motor and a Steeper motor
			C216.4	Demonstration of ALP to interface 4x4 keyboard to display the key code and interface DAC and ADC to genearate waveforms and determining digital outputs.
			C216.5	Demonstrate the use of an external interrupt to toggle an LED On/Off and display the Hex digits 0 to F by interfacing 7-segment LED.

5th Semester	**18CS51**	**C301**	**C301.1**	Describe Management, Organization, Planning and outline their importance in the society.
			C301.2	Define Staffing and identify the traits of leadership indicating the importance of Coordination, Communication, Directing and Controlling.
			C301.3	Explain Entrepreneurship, its status in India by identifying various traits of becoming an Entrepreneur.
			C301.4	Identify and Discuss the steps involved in undertaking a project, importance of maintaining reports. Explain Enterprise Resource Planning and its use.
			C301.5	Define and identify the Government policies, Institutional supports available for Small and Micro Industries through various case studies. Explain the concept of IPR.

5th Semester	**18CS52**	**C302**	**C302.1**	Discuss the principles of application layer protocols and importance of web and HTTP.
			C302.2	Analyze transport layer services and infer UDP and TCP protocols.
			C302.3	Examine routers, IP and Routing Algorithms in network layer.
			C302.4	Demonstrate Wireless and Mobile Networks covering IEEE 802.11 Standard.
			C302.5	Analyze the Multimedia Networking and summarization of Voice-over-IP,RTP,SIP
	18CS53	**C303**	**C303.1**	Discuss the introduction into databases, overview of database languages and architecutures. Identify,analyze and define database objects,enforce integrity constraints on a database using RDBMS
			C303.2	Apply Structured Query Language (SQL) for database creation and manipulation.
			C303.3	Examine the usage of relational algebra in database applications.
			C303.4	Apply normalization to the database design theory and analyse the normalization algorithms.
			C303.5	Design database applications and demonstarte the concepts of transaction processing, concurrency control and recovery in databases.
	18CS54	**C304**	**C304.1**	Design finite state machines for different formal languages by discussing the central concepts of Automata Theory.
			C304.2	Write and simplify the regular expressions and disscuss the proofs of regular languages.
			C304.3	Write and simplify the context free grammars and design pushdown automata for the different formal languages.
			C304.4	Discuss the pumping theorem and closure properties of context free languages and design turing machine for the different formal languages.
			C304.5	Discuss the variants of turing machine, concepts of decidability and complexity related to computational problems.
	18CS55	**C305**	**C305.1**	Demonstrate proficiency in handling python flow controls and creation of functions
			C305.2	Apply the methods to create and manipulate strings, lists, tuples and dictionaries
			C305.3	Solve the commonly used operations involving regular expressions and file system
			C305.4	Demonstrate the concepts of Object-Oriented Programming in Python
			C305.5	Illustrate the need for scraping websites and working with CSV, JSON and other file formats
	18CS56	**C306**	**C306.1**	Interpret the UNIX architecture and features of Linux operating system. Demonstrate the basic commands for file handling system and process control
			C306.2	Illustrate the changing of file permission and owenership. Discuss the importance of filters and their need in UNIX and apply them to various shell programming.
			C306.3	Make use of the UNIX File API provided in the unix environment system.
			C306.4	Demonstarte the application/service over a UNIX system.
			C306.5	Explain the signal ,daemon process and client server model.

5th Semester	**18CSL57**	**C307**	**C307.1**	Analyze the networking scenarios with respect to implementation issues
			C307.2	Demonstrate the working of networking concepts.
			C307.3	Explain the fuctionalities of Protocols-layers
			C307.4	Ilustate the Connection oriented networks using suitable tools
			C307.5	Ilustrate the working of Wireless networks
	18CSL58	**C308**	**C308.1**	Use SQL programming and different concepts of DBMS to create, update and query on the Library and College databases.
			C308.2	Demonstarte SQL programming and different concepts of DBMS to create, update and query on the Order database.
			C308.3	Illustrate the concepts of SQL programming and DBMS to create, update and query on the Movie database.
			C308.4	Create, update and query on the Company database by using different concepts of DBMS and SQL programming.
			C308.5	Design, implement and demonstrate a mini project using front end tools and database and Compile the working with well document using modern tool.

6th Semester	**18IS61**	**C310**	**C310.1**	Choose an appropriate file structure for storage representation and their mechanism to store different types of files.
			C310.2	Explain the oraganization of files using object oriented concepts and retrieve the same using advanced concepts like inverted lists, selective indexes.
			C310.3	Identify a suitable sorting techniques to arrange the data and use of multi-level indexing and B-tree techniques for organization of data in a file.
			C310.4	Select suitable indexing, B+ tree mechanism and hashing technique for better performance of file accessing.
			C310.5	Examine some advanced file storage structures like extendible hashing for better performance.
	18IS62	**C311**	**C311.1**	Understand the concepts of testing and apply to derive different test cases.
			C311.2	Analyze and compare the different testing techniques.
			C311.3	Apply the appropriate testing techniques in classifying the problem.
			C311.4	Demonstrate the Path testing and Dataflow testing for designing of flow graph for creating run time support for test execution
			C311.5	Create appropriate document for the software artifact.

6th Semester	**18CS63**	**C312**	**C312.1**	To interpret the basics of web page design using HTML and CSS syntax and semantics.
			C312.2	Discuss the important components of HTML5 documents and use HTML5 to create web pages.
			C312.3	Using JavaScript in web pages to enhance function and appearance of web pages.
			C312.4	To develop dynamic web pages using PHP.
			C312.5	Illustrate JavaScript frameworks like jQuery and also discuss the role of XML and AJAX in web applications.
	18CS641	**C313**	**C313.1**	Describe the data warehouse and OLAP technology for understanding the overall data mining and knowledge discovery process.
			C313.2	Discuss the implementation aspects of the data warehouse and illustrate the importance of data for the mining process.
			C313.3	Use the association rules for discovering important relationships hidden in large data sets.
			C313.4	Solve many diverse applications using different classification techniques.
			C313.5	Apply the concepts of clustering for understanding data and solving different practical problems.
	18CS653	**C318**	**C318.1**	Understand the OOPs concepts & basics of java programming
			C318.2	Identify the use of operators, classes, interface, packages in solving specific problems.
			C318.3	Analyze the use of Single threading and multithreading programs using synchronization and handle the exceptions to increase the performance of program.
			C318.4	Demonstrate the importance of collection framework in developing effective programs.
			C318.5	Design GUI based applications using applets
	18ISL66	**C322**	**C322.1**	Design and develop testcases based on Boundary value Analysis testing method
			C322.2	Create testcases using Equivalence class partitioning ,execute testcases and discuss the results
			C322.3	Design and develop testcases using Decision table approach ,analyze the testcases along with the results.
			C322.4	Analyze structural testing techniques using Data flow approach.
			C322.5	Examine structural testing through basis path testing technique,discuss the test cases and results.
	18ISL67	**C323**	**C323.1**	Apply the concepts of Unix IPC to implement a given function.
			C323.2	Develop the operations related to files and apply the objectives of file system to produce the given application.
			C323.3	Build a program to implement operations on given file system using indexing.
			C323.4	Apply hashing alogorithm to implement cosequential and K-way merge.
			C323.5	Build file application projects using different concepts such as Document processing, transaction management, indexing and hashing, buffer management, configuration management

6th Semester	**18CSMP68**	**C324**	**C324.1**	Create and debug various Android Applications by setting up Android development environment with necessary virtual devices using Android Virtual Device Manager.
			C324.2	Demonstrate adaptive, responsive user interfaces that work across a wide range of devices and analyse the various APIs used in developing responsive Android Applications
			C324.3	Demonstrate various APIs and methods used for storing, sharing and retrieving data in Android applications.
			C324.4	Examine the different permissions and Security Aspects available for Android applications and discuss its roles in different usecaes.
			C324.5	Design, implement and demonstrate a mini project using Android Development Tool Kit and Compile the working with well document using modern tool.

7th Semester	**18CS71**	**C401**	**C401.1**	Discuss the need for machine learning for various problem solving and Heuristic Search Techniques.
			C401.2	Illustrate a wide variety of learning algorithms and evaluate models from generated data.
			C401.3	Apply Decision tree learning and Neural Networks in machine learning applications
			C401.4	Demonstrate Bayesian classifier to label data.
			C401.5	Illustrate instant based and reinforcement learning algorithms and identify its applicability in real life problems.
	18CS72	**C402**	**C402.1**	Discuss the fundamental concepts of Big Data analytics with its various applications and overview of data sources, pre-processing and storing.
			C402.2	Summarize the conceptualisation of Hadoop and its ecosystem, Hadoop Distributed File system and discuss various essential Hadoop Tools.
			C402.3	Illustrate the concepts and applications of NoSQL for Bigdata Analytics using MongoDB and Cassandra.
			C402.4	Demonstrate the MapReduce programming model to process the big data along with Hadoop tools.
			C402.5	Examine various Machine Learning algorithms used forBigdata Analytics. Also discuss the overview of Text, Web Content, Link, and Social Network Analytics.
	18CS731	**C403**	**C403.1**	Identify and describe a design pattern, Categorize the design pattern catalogue, explain various object oriented design concepts. Understand the importance of Analysis phase and apply the concept of UML for designing the Class diagrams, Use-Cases and Sequence diagrams for any given requirements.
			C403.2	Describe how the classes and objects are composed for forming a larger structure of the systems using Structural Patterns.
			C403.3	Describe the behavior of the system and explain the communication between the objects and the classes using the Behavioral Patterns
			C403.4	Explain the concepts of Interactive systems and summarize MVC architecture. Explain the architecture behind the working of the simple drawing program, implementing undo operations and completing the incomplete items.
			C403.5	Identify the design process related to Distributed Objects and describe its roles in building an object-oriented system.

7th Semester	**18CS743**	**C409**	**C409.1**	Understand the fundamental concept of NLP, define grammar-based language model and statistical-based language model.
			C409.2	Demonstrate the use of morphological analysis and parsing using Finite State Transducers. Apply spelling error detection and correction methods, parts of speech tagging, context free grammar, and different parsing approach in NLP.
			C409.3	Determine the concepts associated with extracting relations from text, mining diagnostic text reports, and natural language-based web search.
			C409.4	Understand the concept of iSTART, textual signatures, automatic document separation, and explanatory novel patterns for semantically based text mining.
			C409.5	Illustrate the use of Information Retrieval in the context of NLP and understand the lexical resources such as WordNet, FrameNet, Stemmers, POS Tagger, and Research Corpora
	18CS752	**C413**	**C413.1**	Illustrate the syntax and semantics of the Python including types, operators, Function, Loops and Conditional statements.
			C413.2	Demonstrate expertise in usage of Strings and File Systems.
			C413.3	Create, build and test Python Programs using core data structures like Lists, Dictionaries and use Regular Expressions.
			C413.4	Apply the concepts of Object-Oriented Programming in Python.
			C413.5	Develop typical python applications associated with Network Programming, Web Services and Databases.
	18CSL76	**C416**	**C416.1**	Implement and Demonstrate AI search algorithms
			C416.2	Demonstrate the Candidate Elimination Algorithm for finding the Hypothesis Space.
			C416.3	Demonstrate the implementation of Decision Tree Algorithm and use it to perform classification of a new data sample.
			C416.4	Demonstrate the implementation, training and testing of an Artificial Neural Network using Backpropagation Algorithm.
			C416.5	Demonstrate the use of Python ML libraries to implement Naïve Bayes Classifier, EM Algorithm,k-Means Clustering Algorithm, K-Nearest Neighbors Algorithm and Locally Weighted Regression algorithm.
	18CSL77	**C417**	**C417.1**	Acquire and evaluate latest developments in the research regarding technological advancement in engineering disciplines and their impact on social, cultural, environmental and legal aspects.
			C417.2	Analyse complex Engineering problems and apply appropriate engineering tools and techniques in design process.
			C417.3	Work collaboratively with interdisciplinary departments, industries and agencies while planning and executing the project/research to appraise the advance technologies.
			C417.4	Design and develop solutions to the complex engineering problems through innovative approaches
			C417.5	Execute responsibilities as a team member and contribute innovative ideas to accomplish the defined objectives and outcomes.
			C417.6	Demonstrate a responsible, ethical and professional attitude regarding the role of engineers in society, including financial and cultural aspects.
			C417.7	Prepare a high-quality engineering documents and exhibit a clear and coherent presentation of project/research findings to a range of technical and nontechnical audiences.

8th Semester	**18CS81**	**C418**	**C418.1**	Interpret the impact &challenges posed by IoT netwoks leading to new architectural models
			C418.2	Compare & constrast the deployment of smart objects and the technologies to connect them to network
			C418.3	Appraise the role of IoT protocols for efficient network communication
			C418.4	Elaborate the need for Data Analytics and Security in IoT.
			C418.5	Illustrate different sensor technologies for sensing real world entities and identify the applications ofIoT in industry.
	18CS822	**C419**	**CO1**	Describe the evolution of information storage architecture and detail the storage system environment.
			CO2	Explain the importance of RAID and an intelligent storage system for the effective maintenance and protection of data.
			CO3	Discuss the different storage networking technologies.
			CO4	Explain the process of business continuity, backup, and recovery to ensure the information availability for vital business operations.
			CO5	Explain the process of replication to ensure business continuity. Also, discuss the storage infrastructure and management activities.
	18CSP83	**C422**	**C422.1**	Acquire and evaluate latest developments in the research regarding technological advancement in engineering disciplines and their impact on social, cultural, environmental and legal aspects
			C422.2	Analyse complex Engineering problems and apply appropriate engineering tools and techniques in design process
			C422.3	Work collaboratively with interdisciplinary departments, industries and agencies while planning and executing the project/research to appraise the advance technologies
			C422.4	Design and develop solutions to the complex engineering problems through innovative approaches
			C422.5	Execute responsibilities as a team member and contribute innovative ideas to accomplish the defined objectives and outcomes
			C422.6	Demonstrate a responsible, ethical and professional attitude regarding the role of engineers in society, including financial and cultural aspects
			C422.7	Prepare a high-quality engineering documents and exhibit a clear and coherent presentation of project/research findings to a range of technical and nontechnical audiences

8th Semester	**18CSS84**	**C423**	**C423.1**	Identify the research papers/applied knowledge resources on latest trends in area of interest and formulate objectives of the study.
			C423.2	Acquaint literatures review methods and identify the significant technical information relevant to selected topic.
			C423.3	Interpret the observations with hypothesis and summarize the conclusions.
			C423.4	Adopting logical though process and sift the findings efficiently to produce well-structured and tailored report.
			C423.5	Prepare and present the outcomes of the observations and suggestions to improve the future scope.
	18CSI85	**C424**	**C424.1**	Demonstrate the application of knowledge and skillsets acquired from the course and workplace in the assigned job functions.
			C424.2	Use the work habits of internship carried out industry/R&D Organization/Research Institute/Educational Institute of repute for job success.
			C424.3	Determine the career options by considering opportunities in industry/R&D Organization/Research Institute/Educational Institute of repute.
			C424.4	Build a well-structured report of work experience and present it to the supervisor.
			C424.5	Show professional ethics by practicing a positive outlook during the internship.