

## 2021-22 Course Outcome Statement

Subject	Subject Name		CO's Statement
18MAT31	Engineering Mathematics-III	CO1	Use Laplace transform and inverse Laplace transform in solving differential/ integral equation arising in network analysis, control systems and other fields of engineering.
		CO2	Demonstrate Fourier series to study the behavior of periodic functions and their applications in system communications, digital signal processing and field theory.
		CO3	Make use of Fourier transform and Z-transform to illustrate discrete/continuous function arising in wave and heat propagation, signals and systems.
		CO4	Solve first and second order ordinary differential equations arising in engineering problems using single step and multistep numerical methods.
		CO5	Determine the externals of functional using calculus of variations and solve problems arising in dynamics of rigid bodies and vibrational analysis.
18MAT32	Data Structures And Applications	CO1	Understand and apply the various operations or algorithms of data structures like array, structures, unions, strings and dynamic memory allocation functions.
		CO2	Apply the concepts of stack, queue and recursion for solving problems in data structures.
		CO3	Apply the knowledge of linked list and its types to perform various operations on it.
		CO4	Demonstrate the working of nonlinear data structure tree and develop the algorithm for different tree traversal methods.
		CO5	Demonstrate different methods for traversing the graph data structure and develop the algorithm for searching, sorting, hashing also identify various file types, organization techniques.
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18CS33	Analog And Digital Electronics	CO1	Design and analyze application of analog circuits using photo devices, timer IC, power supply and regulator IC and op-amp, Explain the basic principles of A/D and D/A Conversion circuits and develop the same.
		CO2	Discuss simplification of Boolean functions, by using various techniques such as k-map, qm method and implementation of simplified function by using suitable logic gates.
		CO3	Realize the combinational logic circuits by using various logical blocks.

		CO4	Develop simple HDL programs for combinational and sequential logic circuits.
		CO5	Design counters and develop sequential circuit applications using flip-flop and registers.
18CS34	Computer Organisation	CO1	Build the basic structure of computer, machine instruction and assembly language.
		CO2	Demonstrate the functioning of different sub system, such as processor and Input/output.
		CO3	Utilize the most common components and organizations used to implement the memory.
		CO4	Experiment and analyze simple arithmetic and logical units.
		CO5	Explain the fundamentals of Basic Processing Unit, Embedded Systems and Large Computer Systems.
18CS35	Software Engineering	CO1	Explain common lifecycle processes in the development of a system using waterfall (linear), incremental approaches (such as Unified process) and agile approaches.
		CO2	Understand and make use object orientation modeling modelling and design thesmes techniques
		CO3	Build the context, structure and behavioral models of a software system using the UML diagrams.
		CO4	Illustrate various software testing and quality assurance techniques at the module level and also at the system and organization level.
		CO5	Summarize software pricing, different estimation techniques and different types of plans.
18CS36	Discrete Mathematical Structures	CO1	Demonstrating the correctness of an argument using mathematical logic and construct the proofs for quantifiers.
		CO2	Using the concepts of mathematical induction construct the proofs and solve the counting problems
		CO3	Solve the problems associated with relations and functions.
		CO4	Solve the problems involving principle of inclusion-exclusion with its applications and recurrence relations
		CO5	Apply the different concepts of graphs and trees in the field of information science.
18CSL37	Analog and Digital Electronics Laboratory	CO1	Use appropriate design equations / methods to design the given circuit
		CO2	Examine and verify the design of both analog and digital circuits using simulators.
		CO3	Make use of electronic components, ICs, instruments and tools for design and testing of circuits for the given the appropriate inputs.
		CO4	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.
		CO1	Develop C programs to demonstrate the concepts of array and string operations

18CSL38	Data Structures Laboratory	CO2	Implement the concepts of stack and queue to demonstrate their operations by using C programming language.
		CO3	Develop C programs to demonstrate the concepts of linked list
		CO4	Design, develop and demonstrate the concept of non-linear data structures –Trees and Graphs.
		CO5	Develop C program to demonstrate the concepts of hashing.
18KAK39	Adalitha Kannada	CO1	Students are able to understand about the kannada province, language and culture.
		CO2	Able to understand different movements at different periods, in the form of poetry from various revolutionary writers.
		CO3	Students are able to understand the modern poetry and how society has been reflected in it.
		CO4	Students are able to able to self-transformed by studying eminent engineer's biography, modern stories and essay writing patterns.
18KVK39	Vyavaharika Kannada	CO5	Students are able to understand scientific knowledge along with cultural heritage and computer related vocabulary in kannada language.
		CO1	Students are able to learn kannada pronouns, nouns, different forms of nouns and pronouns and adjectives.
		CO2	Students are able to learn suffixes, ordinal numerals and different forms of verbs.
		CO3	Students are able to learn imperative words, commands, accusative cases and potential forms used in general communication.
		CO4	Students are able to understand comparative, relationship, identification and negation words; as well as, tense, time and verbs.
		CO5	Students will able to learn about Karnataka, kannada literature, etc.

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18MAT41	Complex Analysis, Probability and Statistical methods	CO1	Use the concepts of analytic function and complex potentials to solve the problems arising in electromagnetic field theory.
		CO2	Utilize conformal transformation and complex integral arising in aerofoil theory, fluid flow visualization and image processing.
		CO3	Apply discrete and continuous probability distributions in analyzing the probability models arising in engineering field.
		CO4	Make use of the correlation and regression analysis to fit a suitable mathematical model for the statistical data.
		CO5	Construct joint probability distributions and demonstrate the validity of testing the hypothesis
18CS42	Design and Analysis of Algorithms	CO1	Understand and Explain the concepts used in Algorithm design and analysis.
		CO2	Identify and analyze various algorithm design techniques
		CO3	Estimate the computational complexity of different algorithms.
		CO4	Develop an algorithm using appropriate design technique for problem solving.
		CO5	Develop algorithms for solving real world problems
		CO1	Explain and illustrate the various operating system concepts , system structure and Computing environments

18CS43	Operating System	CO2	Analyze different multithreading models, summarize the techniques of process synchronization, and develop a scheduling solution using proper algorithm
		CO3	Examine the different deadlock scenarios to Provide the solutions and choose the appropriate memory management strategy
		CO4	Make use of virtual memory management model for page replacement and outline the implementation of file system
		CO5	Demonstrate different Secondary Storage structures. protection mechanism- disk allocation mechanism and Case Study of Linux system
18CS44	Microcontroller and Embedded Systems	CO1	Demonstrate the architecture of ARM processor, fundamentals of ARM based systems and attributes of an embedded system
		CO2	Understand the ARM instruction set and Develop the program for ARM controller using various instructions
		CO3	Illustrate the components of an Embedded System and interfacing with external hardware devices
		CO4	Identify the applicability of an Embedded system
		CO5	Summarize the real time operating system used for the embedded system
18CS45	Object Oriented Concepts	CO1	Describe the features of C++ and the associated merits as an object oriented programming language
		CO2	Illustrate the concepts of object oriented programming using JDK environment
		CO3	Demonstrate the concepts of interface, packages and runtime error handling using java programs
		CO4	Illustrate the multi-threaded programs and event handling mechanisms to solve real world problems using Java.
		CO5	Construct event based GUI interfaces using Applets and swings for the computer applications
18CS46	Data Communication	CO1	Explain the data communication system, the different network topologies, the protocol layering, and its functions.
		CO2	Apply the digital and analog transmission techniques to solve problems.
		CO3	Explain the switching criteria and data link layer protocols.
		CO4	Analyze the wired and wireless LAN using media access control
		CO5	Compare various wireless network and their protocols.
18CSL47	Design And Analysis of Algorithm Laboratory	CO1	Design and implement the basic concepts like threads, inheritance and exception handling of java programming language
		CO2	Design , Analyze and implements the divide and conquer algorithms using java programming language and compare its time complexity for different cases.
		CO3	Design and implements the greedy algorithms using java programming language
		CO4	Design and implements the algorithms based on dynamic programming concepts using java programming language
		CO5	Design and implements the backtracking algorithms by using java programming language.
18CSL48	Microcontroller and Embedded	CO1	Illustrate ALP using ARM7TDMI/LPC2148.
		CO2	Demonstrate "Hello World" message in Embedded C using internal UART.
		CO3	Develop an Embedded C Program to interface DC motor and Stepper motor

	system Laboratory	CO4	Experimenting ADC/DAC interface with ARM microcontroller to generate various waveforms.
		CO5	Developing interface for LED/LCD, 4*4 keyboard and Seven Segment Display using ARM7TDMI/LPC2148

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18CS51	Management, Entrepreneurship for IT industry	CO1	Explain and illustrate the Management, Planning, Organizing and Staffing and outline their importance in entrepreneurship
		CO2	Identify the traits of leadership. Demonstrate the importance of Coordination, Communication, Directing and Controlling.
		CO3	Define the basics of Entrepreneurship and how to deal with the problems while setting up a business.
		CO4	Analyze the case studies of various Small Scale Industries, the institutional support provided to them and their rights.
		CO5	Analyze the case studies of various Small Scale Industries, the institutional support provided to them and their rights.
18CS52	Computer Networks and Security	CO1	Outline the functionalities and principle of application layer protocols..
		CO2	Illustrate transport layer services, mechanism and infer UDP and TCP protocols.
		CO3	Explain routers and classify IP versions and Routing Algorithms in network layer
		CO4	Identify the network security methods, network attacks and cryptography algorithms.
		CO5	Analyze multimedia Networking and Network Management
18CS53	Data Base Management System	CO1	Explain the basic concepts of data base system
		CO2	Construct appropriate databases by applying the various concepts of Relational Model.
		CO3	Explain and apply Structure Query Language (SQL) to solve various database operations.
		CO4	Analyze and develop standard databases for various real world problems
		CO5	Utilize the concepts of transaction processing in Database System.
18CS54	Automata theory and Computability	CO1	Acquire fundamental understanding of the core concepts in formal languages and automata theory
		CO2	Learn to design Deterministic and Nondeterministic FSMs, Regular Expressions for Regular languages and translate between different models of computation
		CO3	Design Grammars and Push Down Automata for context free languages and become knowledgeable about restricted models of computation
		CO4	Design and develop Turing Machines and its variants, Linear Bounded Automata for decidable and semidecidable languages
		CO5	Classify problems with respect to different models of computations and applications
18CS55	Application Development using Python	CO1	Understand the syntax and semantics of Python Programming language.
		CO2	Build Python Programs using core data structures like Lists, Tuples, Dictionaries and Strings.
		CO3	Demonstrate proficiency in handling regular expressions, file system and debugging the programs.
		CO4	Illustrate the concepts of Object-Oriented Programming as used in Python.

	using python	CO5	Implement python applications associated with web, and handling excel spreadsheets, word and pdf documents along with csv and JSON data.
18CS56	Unix Programming	CO1	Explain Unix Architecture, file system and use of Basic Commands.
		CO2	Illustrate Shell interpretive cycle and Programming construct to write Shell Scripts.
		CO3	Summarize UNIX file APIs and process control
		CO4	Explain the overview of IPC methods and shared memory
		CO5	Outline the signals and daemon process..
18CSL57	Computer Network Laboratory	CO1	Design program for simulating the packet transfer in wired networks with duplex link
		CO2	Design and implement ethernet LAN /simple ESS using Wireless networks.
		CO3	Implement CDMA/GSM on NS2/NS3 to study and analyse their performances.
		CO4	Apply java/c programming skills to verify and solve network related issues.
		CO5	Infer the connection oriented and connectionless protocols to implement socket programming.
18CSL58	DBMS Laboratory with mini project	CO1	Create data base and write significant queries to retrieve data and also demonstrate the concept of partitioning the table.
		CO2	Create data base and write significant queries to retrieve data and also demonstrate the use of UNION operation
		CO3	Create data base and write significant queries to retrieve data and also demonstrate the use of JOIN operation.
		CO4	Create data base and write significant queries to retrieve data and also demonstrate how triggers can be created and applied.
		CO5	Create data base and write significant queries to retrieve data and also demonstrate the use Correlated nested queries
		CO6	Design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing and implementing a database mini project.

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18CS61	System Software and Compilers	CO1	Understand the concepts of system software and make use of it to generate machine codes
		CO2	Explain the functionality of each phase involved in compilation process and construct the grammar for the given regular expression.
		CO3	Analyze the parsing techniques for the given programming construct described in context free grammar.
		CO4	Make use of LEX and YACC tool to describe the concept of lexer and parser
		CO5	Construct syntax directed tree and develop machine level codes.
18CS62	Computer Graphics and	CO1	Demonstrate the various aspects of computer graphics and OpenGL
		CO2	Apply algorithms to implement 2D graphics, primitives and attributes, geometric transformations and viewing
		CO3	Illustrate 2D clipping, 3D geometric transformations, color and illumination models

	Visualization	CO4	Apply the concepts of viewing and visible surface detection on 3D objects
		CO5	Implement interactive graphic applications using various input devices, curves and computer animations
18CS63	Web Technology & its applications	CO1	Develop web pages using HTML and CSS syntax and semantics.
		CO2	Construct and visually format tables and forms using HTML and CSS
		CO3	Develop Client-Side Scripts using JavaScript and Server-Side Scripts using PHP to generate and display the contents dynamically
		CO4	Evaluate the principles of object oriented development using PHP
		CO5	Inspect JavaScript frameworks like jQuery and Backbone which facilitates developer to focus on core features
18CS641	Data Mining and Data Warehousing	CO1	Illustrate the concept of data warehouses and OLAP operations for data analysis
		CO2	Demonstrate the methods for the implementation of data warehouse systems and OLAP query processing
		CO3	Interpret the concept of data mining and practice the Similarity/Dissimilarity Measures used in data mining
		CO4	Illustrate the concept of frequent patterns, associations, correlations and the evaluation of patterns
		CO5	Apply the suitable classifier for the real-world applications
18CS642	Object Oriented Modelling and Design	CO1	Describe the concepts involved in Object-Oriented modeling and their benefits.
		CO2	Demonstrate concept of use-case model, sequence model and state chart model for a given problem.
		CO3	Explain the facets of the unified process approach to design and build a Software system.
		CO4	Translate the requirements into implementation for Object Oriented design.
		CO5	Choose an appropriate design pattern to facilitate development procedure.
18CS645	System Modelling and Simulation	CO1	Illustrate the importance of system simulation and make use of different techniques to simulate various systems.
		CO2	Analyze the real world phenomena by using appropriate statistical models and perform the the analysis of queing models through simulation.
		CO3	Analyze and examine the properties of random numbers.
		CO4	Examine the use of input models in simulation by choosing the statistical distributions and perform the output analysis of simulation.
		CO5	Interpret the output performance of simulation data and discuss the verification and validation process of the simulation model.
18CSL66	System Software Laboratory	CO1	Construct a scanner and parser using LEX and YACC tools
		CO2	Apply different parsing algorithms to develop the parsers for a given grammar
		CO3	Apply various CPU scheduling Algorithms and compare the performance
		CO4	Develop suitable deadlock avoidance algorithm
		CO5	Analyze the performance of various page replacement algorithms

18CSL67	Computer Graphics Laboratory	CO1	Demonstrate Computer Graphics algorithms using OpenGL.
		CO2	Illustrate various transformation and rotation concepts.
		CO3	Demonstrate geometric transformations and viewing on 3D objects.
		CO4	Demonstrate representation of curves, surfaces, colors and illumination models
		CO5	Demonstrate and document the concepts used in Computer Graphics using a Mini Project.
18CSMP68	Mobile Application Development Laboratory with Mini Project	CO1	Create and debug various Android applications by setting up Android development environment with necessary virtual devices using Android Virtual Device Manager.
		CO2	Demonstrate adaptive, responsive user interfaces that work across a wide range of devices and analyse the various APIs used in developing responsive Android applications.
		CO3	Demonstrate various APIs and methods used for storing, sharing and retrieving data in Android applications.
		CO4	Examine the different permissions and security aspects available for android applications and discuss its roles in different usecases.
		CO5	Design, implement and demonstrate a mini project using Android Development Tool Kit and Compile the working with well document using modern tool.

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18CS71	Artificial Intelligence and Machine Learning "	CO1	Classify the learning techniques with this basic knowledge
		CO2	Identify the characteristics of decision tree and solve respective problems
		CO3	Apply effectively neural networks for appropriate applications
		CO4	Apply Bayesian techniques and derive effectively learning rules
		CO5	Choose and differentiate reinforcement and analytical learning techniques
18CS72	Big Data Analytics	CO1	Illustrate the fundamentals of big data analytics
		CO2	Interpret the the Hadoop framework and Hadoop Distributed File system
		CO3	Illustrate the concepts of NoSQL using MongoDB and Cassandra for Big Data
		CO4	Explain MapReduce, Hive, HiveQL, Pig programming model to understand processing of big data
		CO5	Make use of various machine learning algorithms for Big Data Analytics, Web Mining and Social Network Analysis.
18CS734	User Interface Design	CO1	Understand the User Interface concepts and Explain the importance of good Interface, Characteristics of graphical and Web User Interface & its principles.
		CO2	Understand the User Interface Design process and the Business Functions.
		CO3	Describe the structure and functions of system menus, navigation menus, and types of graphical menus.
		CO4	Discuss the characteristics, components of windows and its various controls.
		CO5	Describe screen based controls, various problems in window design with color text graphics and testing methods.
		CO1	Discuss the classical encryption techniques and block ciphers and the data encryption standard



18CS744	Cryptography	CO2	Describe the public key cryptography and RSA and the other Public Key Cryptosystems
		CO3	Solve the Elliptic curve arithmetic, abelian groups, elliptic curves over real numbers, Illustrate the need of the key management and distribution
		CO4	Describe the User Authentication, Electronic Mail Security
		CO5	Illustrate the IP security, transport and tunnel modes
18CSL76	Artificial Intelligence and Machine Learning Laboratory"	CO1	Apply the algorithms for A* search, AO* Search.
		CO2	Apply the candidate Elimination, decision tree.
		CO3	Artificial neural network algorithms
		CO4	Apply the algorithms for Naive Bayesian classifier and EM Classifier.
		CO5	Apply the K-Nearest Neighbor and regression algorithms.
18CSP77	Project Work Phase – 1	CO1	Conduct literature survey on domain interest
		CO2	Develop the problem statement and objectives
		CO3	Design engineering solutions for the problem statement.
		CO4	Develop hardware or the software solution for the defined problem
		CO5	Document the various phases of the project
18CSL752	Python Application Programming (Open Elective)	CO1	Illustrate the syntax and semantics of the Python including types, operators, Function, Loops and Conditional statements
		CO2	Demonstrate expertise in usage of Strings and File Systems.
		CO3	Create, build and test Python Programs using core data structures like Lists, Dictionaries and use Regular Expressions.
		CO4	Apply the concepts of Object-Oriented Programming in Python.
		CO5	Develop typical python applications associated with Network Programming, Web Services and Databases.

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18CS81	Internet of Things Technology	CO1	Explain the impact and challenges posed by IoT networks leading to new architectural models.
		CO2	Illustrate the deployment of smart objects and the technologies to connect them to network.
		CO3	Apply the IoT protocols for efficient network communication.
		CO4	Summarize the need for Data Analytics and Security in IoT.
		CO5	Analyze the different sensor technologies for sensing real world problems using case studies.
18CS822	Storage area	CO1	Describe the evolution of information storage architecture and detail the storage system environmen
		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.

18CS822	networks	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.
18CS823	NoSQL Database	CO1	Illustrate Aggregate orientation, the four types of NoSQL Databases and Aggregate Data Access Models.
		CO2	Demonstrate an understanding of the detailed architecture of Distribution models and consistency using various version stamps.
		CO3	Demonstrate an understanding of the Map-reduce and performance tune Key-Value NoSQL databases.
		CO4	Explain the detailed architecture, objects, load data, query data and performance tune Document-oriented NoSQL databases.
		CO5	Demonstrate an understanding of the detailed architecture, consistency and transactions of Graph Databases.
18CSP83	Project Work Phase - II	CO1	Ability to apply the identified concepts and engineering tools to arrive at design solution(s) for identified engineering problem.
		CO2	Ability to analyse and interpret results of experiments conducted on the designed solution(s) to arrive at valid conclusions.
		CO3	Ability to perform the budget analysis of the project through the utilization of resources (finance, power, area, bandwidth, weight, size any other).
		CO4	Ability to engage in effective written communication through the prpjct report, the one page poster presentation and the four page IEEE format of the work.
		CO5	Ability to engage in effective oral communication through the project report, demonstrate of the project and presentation of the video about the project
		CO6	Ability to perform in the team, contribute to the team and mentor/lead the team.
		CO7	Ability to abide by the norms of professional ethics.
18CSS84	Seminar 1	CO1	Identify the research papers/applied knowledge resources on latest trends in area of interest and formulate objectives of study.
		CO2	Acquaint literature review methods and identify the significant technical information relevant to the selected topic.
		CO3	Interpret the observations with hypothesis and summarize the conclusions.
		CO4	Adopting logical thought process and conclude the findings efficiently to produce well structured and tailored report.
		CO5	Prepare and present the outcomes of the observations and suggestions to improve the future scope.
18CSI85	Internship	CO1	Relate the Hypothesis and basic knowledge acquired and apply them to the real-world scenario.
		CO2	Realize and report the structural flow of the organization and critical issue management process.
		CO3	Realize and practice the modern tools and techniques to solve complex engineering problems at appropriate level
		CO4	Demonstrate Professional values by satisfying requirements and code of conduct of Industrial practices

		CO5	Interact effectively with industrial stakeholders to acquire the experience and enable life-long learning
		CO6	Monitor the workflow day to day activities and document the findings in a presentable format
		CO7	Present effectively the knowledge and experience gained during Internship.