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Course Code	Course Name	CO Code	CO
18MAT31	TRANSFORM CALCULUS, FOURIER SERIES AND NUMERICAL TECHNIQUES	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 functionals using calculus of variations and solve problems arising in dynamics of rigid bodies and vibrational analysis.
18CS33	ANALOG AND DIGITAL ELECTRONICS	CO1	Demonstrate application of analog circuits using photo devices, timer IC, power supply and regulator IC and op-amp
		CO2	Find the simplified digital circuits using Karnaugh Map, and Quine-McClusky Methods
		CO3	Illustrate combinational and sequential digital circuits
		CO4	Explain Gates and flip flops and make us in designing different data processing circuits, registers and counters and compare the types and develop simple HDL programs
		CO5	Demonstrate registers and counters and its design
18CS32	DATA STRUCTURES AND APPLICATIONS	CO1	To understand the fundamentals of data structures and their applications essential for programming/problem solving.
		CO2	To apply Linear Data Structures: Stack, Queues and Recursion.
		CO3	To apply Linear Data Structures: Linked Lists.
		CO4	To apply Non-Linear Data Structures: Trees and Graphs.

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		CO5	To understand the concepts of Hashing, Files and their Organization and Sorting Algorithms.
18CS34	COMPUTER ORGANIZATIONS	CO1	Explain the basic organization of a computer system.
		CO2	Demonstrate functioning of different sub systems, such as processor, Input/output, and memory.
		CO3	Illustrate hardwired control and micro programmed control, pipelining, embedded and other computing systems.
		CO4	Design and analyze simple arithmetic and logical units.
		CO5	Understand the concepts of Basic Processing Units.
18CS35	SOFTWARE ENGINEERING	CO1	Outline software engineering principles and activities involved in building large software programs. Identify ethical and professional issues and explain why they are of concern to software engineers
		CO2	Explain the fundamentals of object oriented concepts.
		CO3	Describe the process of requirements gathering, requirements classification, requirements specification and requirements validation. Differentiate system models, use UML diagrams and apply design patterns.
		CO4	Discuss the distinctions between validation testing and defect testing.
		CO5	Recognize the importance of software maintenance and describe the intricacies involved in software evolution.
18CS36	DISCRETE MATHEMATICAL STRUCTURES	CO1	Use Propositional and Predicate logic in Knowledge representation and truth verification.
		CO2	Demonstrate the application of discrete structures in different fields of computer science.
		CO3	Solve problems using recurrence relations and generating functions.
		CO4	Application of Different mathematical proofs techniques in proving theorems in the courses.
		CO5	Compare graphs, trees and their applications.
18CSL37	ANALOG AND DIGITAL ELECTRONICS LABORATORY	CO1	Get practical experience in design, assembly and evaluation/testing of Analog components and circuits including Operational Amplifier, Timer, etc.

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		CO2	Use appropriate design equations / methods to design the given circuit.
		CO3	Examine and verify the design of both analog and digital circuits using simulators.
		CO4	Make us of electronic components, ICs, instruments, and tools for design and testing of circuits for the given the appropriate inputs.
		CO5	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.
18CSL38	DATA STRUCTURES LABORATORY	CO1	Asymptotic performance of algorithms using arrays and strings.
		CO2	DEVELOP Linear data structures and their applications of stacks
		CO3	EXTEND Linear data structures and their applications of queues.
		CO4	DEMONSTRATE Linear data structures and their applications of Lists and its types
		CO5	Experiment with Non-Linear data structures and their applications such as trees and graphs
18KAK39	AADALITHA KANNADA	CO1	students are able to learn and understand the kannada language Kannada grammar.
		CO2	students are able to learn and understand kannada language rules and special symbols.
		CO3	students are able to learn and write all types of letter writing.
		CO4	students are able to learn and write easy writing.
		CO5	students are able to learn and understand the Kannada language with the different words used for communication.
18KVK39	VYAVAHARIKA KANNADA	CO1	Limits the barriers between people: barriers cause distrust and fear.
		CO2	Opens the door to art, music, dance, fashion, cuisine, film, philosophy, science…etc.
		CO3	Leads to an appreciation of cultural diversity.
		CO4	Encourages the respect for other people.
		CO5	It fosters an understanding of the interrelation of language and human nature.
18MAT41	COMPLEX ANALYSIS, PROBABILITY AND	CO1	Use the concepts of analytic function and complex potentials to solve the problems arising in electromagnetic field theory.

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	STATISTICAL METHODS	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	Describe various methods of algorithm analysis
		CO2	Apply Divide and Conquer approach to solve a given problem.
		CO3	Apply Greedy approach to solve a given problem.
		CO4	Apply Dynamic programming approach to solve a given problem.
		CO5	Apply Backtracking approach to solve a given problem.
18CS43	OPERATING SYSTEMS	CO1	Identify the significance of operating system in computing devices.
		CO2	Exemplify the communication between application programs and hardware devices through system calls.
		CO3	Compare and illustrate various process scheduling algorithms.
		CO4	Apply appropriate memory and file management schemes.
		CO5	Illustrate various disk scheduling algorithms.
18CS44	MICROCONTROLLER AND EMBEDDED SYSTEMS	CO1	Describe the architectural features and instructions of arm microcontroller
		CO2	Apply the knowledge gained for programming arm for different applications
		CO3	interface external devices and i/o with arm microcontroller.
		CO4	interpret the basic hardware components and their selection method based on the characteristics and attributes of an embedded system
		CO5	develop the hardware /software co-design and firmware design approaches and demonstrate the need of real time operating system for embedded system applications

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18CS45	OBJECT ORIENTED CONCEPTS	CO1	Understand fundamentals of Object Oriented Concepts.
		CO2	Explore the features of Object-oriented Programming in Java including defining classes, invoking methods, using class libraries, etc.
		CO3	Develop the ability to program in Java to solve specified problems using inheritance and exception handling.
		CO4	Develop computer programs to solve real world problems using packages ,interfaces and Multithreaded programming.
		CO5	Develop simple GUI interfaces for a computer program to interact with users, and to understand the event-based GUI handling principles using swings.
18CS46	DATA COMMUNICATION	CO1	Explain the various components of data communication.
		CO2	Explain the Fundamentals of digital communication and switching.
		CO3	Explain switching And Error detection and correction.
		CO4	Compare and contrast data link layer protocols.
		CO5	Summarize IEEE 802.X Standards.
18CSL47	DESIGN AND ANALYSIS OF ALGORITHM LABORATORY	CO1	Design and implement various algorithms in JAVA
		CO2	Implement a variety of sorting algorithms such as quick sort and Merge sort.
		CO3	Design algorithms using appropriate design techniques (brute-force, greedy, dynamic programming, etc.
		CO4	Employ various design strategies and Algorithms for problem solving.
		CO5	Implement a variety of algorithms such as graph related, combinatorial, etc., in a high level language.
18CSL48	MICROPROCESSORS LABORATORY	CO1	Illustrate the architectural features and instructions of arm microcontroller.
		CO2	Apply the knowledge gained for programming arm for different applications.
		CO3	Make use of interfacing devices such external memory and i/o with arm microcontroller.
		CO4	Interpret the basic hardware components and their selection method based on the

			characteristics and attributes of an embedded system.
		CO5	Develop the hardware /software co-design and firmware design approaches and demonstrate the need of real time operating system for embedded system applications.
18CPH39/49	Constitution of India, Professional Ethics and Human Rights	CO1	Learn in details with examples To assimilate and get familiarized with basic information about Indian constitution.
		CO2	Specify in details with examples provide overall legal literacy to the young technograts to manage complex societal issues in the present scenario.
		CO3	Learn the characteristics of To identify their individual roles and ethical responsibilities towards society.
		CO4	Specify in depth To understand engineering ethics & responsibilities.
		CO5	Deliberate in details with application, if applicable, To understand engineering ethics & responsibilities, through the learning of these topics students will be able to understand human rights/ values and its implications in their life.
18CS51	MANAGEMENT AND ENTREPRENEURSHIP FOR IT INDUSTRY	CO1	Explain the principles of management, organization and entrepreneur.
		CO2	Discuss on planning, staffing, ERP and their importance.
		CO3	Discuss on Preparation of project report and its importance.
		CO4	Explain the meaning of Entrepreneur and its process.
		CO5	Infer the importance of intellectual property rights and relate the institutional support.
18CS52	COMPUTER NETWORKS AND SECURITY	CO1	Explain principles of application layer protocols.
		CO2	Recognize transport layer services and infer UDP and TCP protocols.
		CO3	Classify routers, IP and Routing Algorithms in network layer.
		CO4	Understand the Wireless and Mobile Networks covering IEEE 802.11 Standard.
		CO5	Describe Multimedia Networking and Network Management.
18CS53		CO1	Understand the concept of database objects and ER model.

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	DATABASE MANAGEMENT SYSTEM	CO2	Analyse and develop relational model, Relational algebra and SQL commands .
		CO3	Design and build simple real-world database systems and applications using GUI.
		CO4	Implement normalization algorithms using database design theory for different Applications.
		CO5	Analyse and implement transaction processing, concurrency control and database recovery protocols in databases.
18CS54	AUTOMATA THEORY AND COMPUTABILITY	CO1	Understand the fundamentals of the core concepts in automata theory and Theory of Computation
		CO2	Illustrate how to translate between different models of Computation (e.g., Deterministic and Non-deterministic and Software models).
		CO3	Remembering pumping lemma for regular languages and context free languages.
		CO4	Develop skills in formal reasoning and reduction of a problem to a formal model, with an emphasis on semantic precision and conciseness.
		CO5	Classify a problem with respect to different models of Computation.
18CS55	APPLICATION DEVELOPMENT USING PYTHON	CO1	Demonstrate the proficiency in handling loops and creation of functions.
		CO2	Identify the method to create and manipulate list ,tuple and dictionaries.
		CO3	Discover the commonly used operations involving regular expressions and files
		CO4	Interpret the concept of Object Oriented Programming as used in python.
		CO5	Determine the need for scrapping website and working with CSV ,JSON and other file format.
18CS56	UNIX PROGRAMMING	CO1	Understand the UNIX Architecture, file system and basic Unix commands.
		CO2	Apply the shell programming concepts in real time problems.
		CO3	Apply the UNIX File and Process system calls on problems.
		CO4	Understand the application/service concepts over a Unix system.
		CO5	Understand the working of Signals and Daemon Processes.
18CSL57		CO1	Able to Analyze the working of networking protocols using modern tool NS2.

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	COMPUTER NETWORK LABORATORY	CO2	CO2: Able to Develop wired and wireless topology using XGraph, NAM in NS2.
		CO3	CO3: Able to Simulate and demonstrate the performance of GSM and CDMA.
		CO4	CO4: Able to Apply and develop the algorithms in data link layer, Network layer and application layer.
		CO5	CO5: Able to Design client-server applications using TCP and UDP socket IPC.
18CSL58	DBMS LABORATORY WITH MINI PROJECT	CO1	Create, update and query on the database using SQL commands.
		CO2	CO2: Design and implement a database schema for a given problem-domain.
		CO3	CO3: Strong practice in SQL programming through a variety of database problems.
		CO4	CO4: Analyse and apply concepts of normalization to design an optimal database.
		CO5	CO5: Develop database applications using front-end tools and back-end DBMS.
18CS61	SYSTEM SOFTWARE & COMPILERS	CO1	Explain the System Software.
		CO2	Design and Develop lexical
		CO3	Design and Develop parser
		CO4	Utilize Lex and Yaac tools for implementing different concepts of system software
		CO5	Design and Develop Syntax Directed Translation, Intermediate Code Generator and code generator
18CS62	COMPUTER GRAPHICS AND VISUALIZATION	CO1	Design and implement algorithms for 2D graphics primitives and attributes.
		CO2	Illustrate Geometric transformations on both 2D and 3D objects.
		CO3	Apply concepts of clipping in 2D viewing and Illumination Models.
		CO4	Apply concepts of visible surface detection in 3D viewing.
		CO5	Infer the representation of curves and surfaces.
18CS63	WEB TECHNOLOGY AND ITS APPLICATIONS	CO1	Illustrate the Semantic Structure of HTML
		CO2	Compose forms and tables using HTML and CSS
		CO3	Design Client-Side programs using JavaScript and Server-Side programs using PHP.
		CO4	Infer Object Oriented Programming capabilities of PHP.

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		CO5	Examine JavaScript frameworks such as jQuery and Backbone.
18CS641	DATA MINING AND DATA WAREHOUSING	CO1	Define multi-dimensional data models. •, and clustering analysis. • Compare and contrast between different classification and clustering algorithms
		CO2	Illustrate data preprocessing techniques and OLAP server.
		CO3	Explain rules related to association analysis.
		CO4	Demonstrate rules related to classification techniques.
		CO5	Discuss rules related to clustering algorithms.
18CSL66	SYSTEM SOFTWARE LABORATORY	CO1	To make students familiar with Lexical Analysis and Syntax Analysis phases of Compiler Design.
		CO2	To make students to implement programs on these phases using LEX & YACC tools and/or C/C++/Java.
		CO3	To enable students to learn different types of CPU scheduling algorithms used in the operating systems.
		CO4	To make students able to implement memory management - page replacement and deadlock handling algorithms.
		CO5	To make students can utilize lex and yacc tools for implementing different concepts of system software.
18CSL67	COMPUTER GRAPHICS LABORATORY WITH MINI PROJECT	CO1	Demonstrate simple algorithms using OpenGL Graphics Primitives and attributes.
		CO2	Implementation of line drawing algorithm using OpenGL.
		CO3	Implementation of line drawing clipping algorithms using OpenGL functions
		CO4	Design and implementation of algorithms Geometric transformations on 2D objects.
		CO5	Implementation of algorithms Geometric transformations on 3D objects.
18CSMP68	MOBILE APPLICATION DEVELOPMENT	CO1	Build an application using Android development environment .
		CO2	2.Experiment with the method of storing, sharing and retrieving the data in Android Applications
		CO3	3.Examine responsive user interface across wide range of devices .

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		CO4	4.Create a mobile Application by using various components like activity, views, services, content providers and receivers.
		CO5	5. Create a mobile Application by using various components like Permissions, Performance and Security.
18CS71	ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING	CO1	Understand the theory of Artificial intelligence and Machine Learning.
		CO2	Understand the Knowledge representation issues and concept learning.
		CO3	Apply decision tree learning and artificial neural networks.
		CO4	Apply Bayesian learning using bayes theorem, naive bayes classifier and EM Algorithm.
		CO5	Apply Instance based learning and reinforcement learning.
18CS72	BIG DATA AND ANALYTICS	CO1	Understand fundamentals of Big Data analytics.
		CO2	Investigate Hadoop framework and Hadoop Distributed File system. Demonstrate the MapReduce programming model to process the big data along with Hadoop tools.
		CO3	Illustrate the concepts of NoSQL using MongoDB and Cassandra for Big Data.
		CO4	Use Machine Learning algorithms for real world big data
		CO5	Analyze web contents and Social Networks to provide analytics with relevant visualization tools.
18CS733	ADVANCED COMPUTER ARCHITECTURES	CO1	Describe the parallelism and principles of scalable computer.
		CO2	Discuss the various Processors and Memory Architecture.
		CO3	Describe the performance of pipelining processors.
		CO4	Demonstrate the various techniques in multi computers and multiprocessors.
		CO5	Summarize parallel architecture and the software used for them.
18CS742	NETWORK MANAGEMENT	CO1	Describe the issues and challenges pertaining to management of emerging network technologies such as wired/wireless networks and high-speed internets.
		CO2	Understand network management standards to manage practical networks

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		CO3	Describe the functions SNMP for managing the network and RMON for monitoring the behavior of the network.
		CO4	Understand possible approaches for managing OSI network model.
		CO5	Identify the various components of network and understand the scheme for the managing them.
18CSL76	ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING LABORATORY	CO1	Implement and Demonstrate Heuristic Searching Algorithms using Python
		CO2	Implement and Demonstrate Concept - Learning Algorithms
		CO3	Implement and Demonstrate Backpropagation Algorithm by building an Artificial Neural Network.
		CO4	Implement and Demonstrate Bayesian Classifier Algorithms
		CO5	Implement and Demonstrate Instance - Based Learning Algorithms
18CS81	INTERNET OF THINGS	CO1	Interpret the impact and challenges posed by IoT networks leading to new architectural models.
		CO2	Compare and contrast the deployment of smart objects and the technologies to connect them to network.
		CO3	Appraise the role of IoT protocols for efficient network communication
		CO4	Elaborate the need for Data Analytics and Security in IoT.
		CO5	Illustrate different sensor technologies for sensing real world entities and identify the applications of IoT in Industry.
18CS822	STORAGE AREA NETWORKS	CO1	Discuss the fundamentals of storage centric and server centric systems.
		CO2	Analyze the Technologies used for Designing storage area networks.
		CO3	Explain the Backup, Archive and Replication.
		CO4	Explain Cloud Computing and virtualization concepts.
		CO5	Apply the techniques used for Securing and Managing Storage Infrastructure
18CSP83	PROJECT WORK PHASE II	CO1	Survey the changes in the technologies relevant to the topic selected.
		CO2	Discuss the technology and interpret the impact on the society.

		CO3	Discuss the technology and interpret the impact on the environment.
		CO4	Discuss the technology and interpret the impact on the domain.
		CO5	Compile report of the study and present to the audience, following the ethics.
18CSI85	INTERNSHIP / PROFESSIONAL PRACTISE	CO1	Adapt easily to the industry environment
		CO2	Take part in team work
		CO3	Make use of modern tools
		CO4	Decide upon project planning and financing.
		CO5	Adapt ethical values.