Sri SAIRAM COLLEGE OF ENGINEERING
Anekal, Bengaluru

ISO 9001:2015 certified Institution
Approved by AICTE, New Delhi
Affiliated to Visvesvaraya Technological University
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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
2015 SCHEME-CO's

Course Code	Course Name	CO Code	CO
15MAT31	ENGINEERING MATHEMATICS - 3	CO1	Know the use of periodic signals and Fourier series to analyze circuits and system communication.
		CO2	Explain the general linear system theory for continuous-time signals and digital signal processing using the Fourier transforms and Z-transform.
		CO3	Employ appropriate Numerical methods to solve algebraic and transcendental equations.
		CO4	Apply Greens theorem, Divergence theorem and Stokes theorem in various applications in the field of elector-magnetic and gravitational fields and fluid flow problems.
		CO5	Determine the externals of functional and solve the simple problems of the calculus of variations.
15CS32	ANALOG AND DIGITAL ELECTRONICS	CO1	Understand the fundamental concepts and techniques used in digital electronics.
		CO2	Understand and examine the structure of various number systems and its application in digital design.
		CO3	Understand, analyze and design various combinational and sequential circuits.
		CO4	Understand the simplification of Algebraic Expressions using Q-M method.
		CO5	Design Decoders, Multiplexers, De-multiplexer, Comparators, and latches.
15CS33	DATA STRUCTURES AND APPLICATIONS	CO1	Understanding the linear and non-linear data structures
		CO2	Implementing Sorting and searching operations, File structures.
		CO3	Implement Applications of Linked lists – Polynomials, Sparse matrix representation
		CO4	Implement all the applications of Data structures in a high-level language.
		CO5	Design and apply appropriate data structures for solving computing problems
15CS34	COMPUTER ORGANIZATION	CO1	Acquire knowledge of the basic structure of computers & machine instructions and programs, Addressing Modes, Assembly Language, Stacks, Queues and Subroutines.
		CO2	Acquire knowledge of Memory system basic Concepts, Semiconductor RAM Memories, Static memories, Asynchronous DRAMS, Read Only Memories, Cache Memories and Virtual Memories.
		CO3	Acquire knowledge of Some Fundamental Concepts of Basic Processing Unit, Execution of a Complete Instruction, Multiple Bus Organization, Hardwired Control and Micro programmed

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			Control.
		CO4	Apply the knowledge gained in the design of Computer. Design and evaluate performance of memory systems
		CO5	Understand the importance of life-long learning
15CS35	UNIX AND SHELL PROGRAMMING	CO1	Explain multi user OS UNIX and its basic features
		CO2	Design and develop shell programming.
		CO3	Design and develop communication terminology.
		CO4	Design and develop UNIX File I/O and UNIX Processes
		CO5	Perl script writing
15CS36	DISCRETE MATHEMATICAL STRUCTURES	CO1	Make use of 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	Apply different mathematical proofs, techniques in proving theorems.
		CO5	Compare graphs, trees and their applications.
15CSL37	ANALOG AND DIGITAL ELECTRONICS LABORATORY	CO1	Use various Electronic Devices like Cathode ray Oscilloscope, Signal generators, Digital
		CO2	Trainer Kit, Millimeters and components like Resistors
		CO3	Design and demonstrate various combinational logic circuits.
		CO4	Design and demonstrate various types of counters and Registers using Flip-flops
		CO5	Understand the working and implementation of ALU
15CSL38	DATA STRUCTURES LABORATORY	CO1	Analyze and Compare various linear and non-linear data structures.
		CO2	Code, debug and demonstrate the working nature of different types of data structures and their applications
		CO3	Design and develop a Program in C using Hashing Technique
		CO4	Design and develop a Program in C using BST
		CO5	Implement, analyze and evaluate the searching and sorting algorithms
15MAT41	ENGINEERING MATHEMATICS - 4	CO1	Solve first and second order ordinary differential equations arising in flow problems using single step and multi step numerical methods.
		CO2	Understand the analyticity, potential fields, residues and poles of complex potentials in field theory and electromagnetic theory.
		CO3	Describe conformal and bilinear transformation arising in aerofoil theory, fluid flow visualization and image processing.
		CO4	Solve problems of quantum mechanics, hydrodynamics and heat conduction by employing Bessel's function relating to cylindrical polar coordinate systems and Legendre's polynomials relating to spherical polar coordinate systems.
		CO5	Solve the problems on probability distributions relating to

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			digital signal processing, information theory and optimization concepts of stability of design and structural engineering.
15CS42	SOFTWARE ENGINEERING	CO1	Outline software engineering principles and activities involved in building large software programs.
		CO2	Identify ethical and professional issues and explain why they are of concern to software engineers.
		CO3	Describe the process of requirements gathering, requirements classification, requirements specification and requirements validation.
		CO4	Recognize the importance of software maintenance and describe the intricacies involved in software evolution.
		CO5	Apply estimation techniques, schedule project activities and compute pricing.
15CS43	DESIGN AND ANALYSIS OF ALGORITHMS	CO1	Describe computational solution to well known problems like searching, sorting etc.
		CO2	Estimate the computational complexity of different algorithms.
		CO3	Devise an algorithm using appropriate design strategies for problem solving.
		CO4	Compare traditional taxonomy with new taxonomy of algorithm design techniques which is valuable endeavor from the practical standpoint.
		CO5	Understand good principles of algorithm design and estimate their worst-case, best-case and average-case behavior.
15CS44	MICROPROCESSORS AND MICROCONTROLLERS	CO1	Understand and apply the fundamentals of Assembly Level programming.
		CO2	Program Microprocessors using assembly language programming
		CO3	Troubleshoot interactions between software and hardware
		CO4	Apply the concepts of data transfer schemes and its applications.
		CO5	Create any simple type of Embedded System & real time applications by knowing the concept of ARM Embedded System.
15CS45	OBJECT ORIENTED CONCEPTS	CO1	Understand the concepts of object oriented programming, its applications and Simple programs
		CO2	Understand the concepts of objects and functions, objects and arrays, Namespaces, Nested classes, Constructors, Destructors
		CO3	Understand the concepts of Java, History, JDK Components and Simple Java Programs
		CO4	Design Applet classes, Applet window, audio clip, Applet stub interface, swing applications using components and ontainers
		CO5	Apply the knowledge of java and C++ programming in developing the application oriented projects
15CS46	DATA COMMUNICATION	CO1	Explain the functions of OSI & TCP/IP model & Identify the different types of network topologies and protocols

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		CO2	Describe different types of switching network & Convert Data using different transmission techniques
		CO3	Detect and correct errors using different techniques and discuss various functions of data link layer protocols
		CO4	Analyze different media access control protocol& wired and wireless LAN Ethernet
		CO5	Demonstrate different types of wireless network & Discriminate IPV4 & IPV6
15CSL47	DESIGN & ANALYSIS OF ALGORITHMS LAB	CO1	Design algorithms using appropriate design techniques (brute-force, greedy, dynamic programming, etc.)
		CO2	Implement a variety of algorithms such assorting, graph related, combinatorial, etc., in a high level language.
		CO3	Apply and implement learned algorithm design techniques and data structures to solve real world problems.
		CO4	Implement classes like String Tokenizer.
		CO5	Apply Object oriented concepts.
15CSL48	MICROPROCESSOR AND MICROCONTROLLER LAB	CO1	Describe the fundamental of assembly level programming of microprocessors and microcontroller.
		CO2	Solve basic binary math operation using the microprocessor/ microcontroller & identify the Basic of ARM and to interface with the various applications.
		CO3	Examine the programming proficiency using the various addressing modes and data transfer instruction of the target microprocessor/ microcontroller.
		CO4	Apply knowledge of the microprocessor's internal registers and operations by use of a PC based microprocessor simulator.
		CO5	Design the Program using the capabilities of the stack, the program counter, and the status register and show how these are used to execute a machine code program.
15CS51	MANAGEMENT, ENTREPRENEURSHIP AND IT INDUSTRY	CO1	The students should be able to: • Define management, organization, planning and their importance.
		CO2	The students should be able to: • Define staffing, Controlling, Coordination, Communication and their nature.
		CO3	The students should be able to: •Outline the importance of Entrepreneurship and identification of business opportunities.
		CO4	The students should be able to: • Utilize the resources available effectively through ERP
		CO5	The students should be able to: • Acquire knowledge on Micro and Small Enterprises and its importance and Make use of IPRs and institutional support in entrepreneurship.
15CS52	COMPUTER NETWORKS	CO1	Demonstration of application layer protocols.
		CO2	Discuss transport layer services and understand UDP and TCP protocols.
		CO3	Classify the problem into suitable testing model.
		CO4	Apply the appropriate technique for the design of flow graph.

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		CO5	Create appropriate document for the software artifact.
15CS53	DATABASE MANAGEMENT SYSTEM	CO1	Provide a strong foundation in database concepts, technology, practice and ER model.
		CO2	Design and build database applications for real world problems.
		CO3	Practice SQL programming through a variety of database problems.
		CO4	Familiarize the concepts of functional dependencies and Normal forms
		CO5	Demonstrate the use of concurrency and transactions in database
15CS54	AUTOMATA THEORY AND COMPUTABILITY	CO1	Acquire fundamental understanding of the core concepts in Automata Theory and Theory of Computation
		CO2	Learn how to translate between different models of Computation.(e.g, Deterministic and Non-deterministic and Software models)
		CO3	Design Grammars and Automata (Recognizers) for different formal language classes and become knowledgeable about restricted models of Computation (Regular, Context Free) and their relative powers.
		CO4	Develop skills in formal reasoning and reduction of a problem to a format model, with an emphasis on semantic precision and conciseness.
		CO5	Classify a problem with respect to different models of Computation.
15CS552	INTRODUCTION TO SOFTWARE TESTING	CO1	Derive test cases for any given problem
		CO2	Compare the different testing techniques
		CO3	Classify the problem into suitable testing model
		CO4	Apply the appropriate technique for the design of flow graph.
		CO5	Create appropriate document for the software artefact
15CS564	DOTNET FRAMEWORK APPLICATION DEVELOPMENT	CO1	Build applications on Visual Studio .NET platform by understanding the syntax and semantics of C#
		CO2	Demonstrate Object Oriented Programming concepts in C# programming language
		CO3	Design custom interfaces for applications and leverage the available built-in interfaces in building complex applications
		CO4	Illustrate the use of generics and collections in C#
		CO5	Compose queries to query in-memory data and define own operator behavior.
15CSL57	COMPUTER NETWORK LAB	CO1	Analyze and Compare various networking protocols.
		CO2	Implement, analyze and evaluate networking protocols in NS2 / NS3
		CO3	Simulate and demonstrate the performance of GSM and CDMA
		CO4	Implement data link layer and transport layer protocols.
		CO5	Demonstrate the working of encryption and decryption algorithm

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15CSL58	DBMS LABORATORY WITH MINI PROJECT	CO1	Develop an Entity Relationship model and create database for Library.
		CO2	Develop an Entity Relationship model and create database for Order.
		CO3	Develop an Entity Relationship model and create database for Movie.
		CO4	Develop an Entity Relationship model and create database for College.
		CO5	Develop an Entity Relationship model and create database for Company.
15CS61	CRYPTOGRAPHY , NETWORK SECURITY& CYBER LAW	CO1	Discuss Cryptography and its need to various applications
		CO2	Design and Develop simple cryptography algorithms
		CO3	Illustrate key management issues and solutions
		CO4	Understand IEEE802.11 Wireless LAN Security
		CO5	Familiarize Cyber Security Law and Ethics
15CS62	COMPUTER GRAPHICS & 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.
15CS63	SYSTEM SOFTWARE & COMPILER DESIGN	CO1	Define and explain system software such as Assemblers and Macro processors
		CO2	Explain and implement Loaders and Linkers.
		CO3	To introduce the major concept areas of language translation and in various phases of compiler and its use.
		CO4	To extend the knowledge of parser by parsing LL parser and LR parser.
		CO5	To enrich the knowledge in Syntax Directed Translation, Intermediate code generation and Code generation.
15CS64	OPERATING SYSTEM	CO1	Describe need for OS and different types of Operating System structure and the role of operating system in process management
		CO2	Familiar with multi threading and understanding the process scheduling and process synchronization in CPU.
		CO3	Familiar with deadlocks, detection and recovery and evaluate the requirement for Describe and analyze the memory management.
		CO4	Identify use and evaluate virtual memory management and file system.
		CO5	Familiar with Secondary storage disk and protection. Realize the different concepts of OS in platform of usage through case studies

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15CS651	DATA MINING AND DATA WAREHOUSING	CO1	Understand the concepts of Data Warehousing.
		CO2	Understand the Techniques of Data Warehousing and Basic of Concepts of Data Mining.
		CO3	Understand the Concepts of Association analysis in Data mining.
		CO4	Understand the Concepts of Classification in Data Mining.
		CO5	Understand the Concepts of Clustering in Data Mining.
15CS653	OPERATION RESEARCH	CO1	Select and apply optimization techniques for various problems
		CO2	Methodology of OR, LPP, solving methods, Algebra of the SM, Big M method, Two phase method, Tie breaking in SM
		CO3	Methodology of OR, LPP, Primal and dual problems and Dual simplex method
		CO4	Model the given problem as Transportation and AP and solve
		CO5	Apply GM for Decision support system and Metaheuristics
15CS664	PYTHON APPLICATION PROGRAMMING	CO1	Examine Python syntax and semantics and be fluent in the use of Python flow control and functions
		CO2	Demonstrate proficiency in handling Strings and File Systems
		CO3	Create, run and manipulate Python Programs using core data structures like Lists, Dictionaries and use Regular Expressions
		CO4	Interpret the concepts of Object-Oriented Programming as used in Python.
		CO5	Implement exemplary applications related to Network Programming, Web Services and Databases in Python.
15CSL67	SYSTEM SOFTWARE & OPERATING SYSTEM LAB	CO1	To make students familiar with Lexical Analysis and Syntax Analysis phases of Compiler Design and implement programs on these phases using LEX & YACC tools
		CO2	Utilize YACC/C program to construct Predictive / LL(1) Parsing Table or Shift Reduce Parsing technique for the grammar rules for different concepts of system software.
		CO3	Develop and implement a C/Java program to generate the machine code using Triples.
		CO4	To enable students to learn implementation of different types of CPU scheduling algorithms used in operating system using C/C++/Java.
		CO5	To make students able to implement memory management - page replacement and deadlock handling algorithms using C/C++/Java.
15CSL68	COMPUTER GRAPHICS LABORATORY WITH MINI PROJECT	CO1	Implement line drawing and clipping algorithms using OpenGL functions
		CO2	Design and implement geometric transformation algorithms on both 2D and 3D objects
		CO3	Apply the concepts of computer Graphics
		CO4	Implement computer Graphics applications using OpenGL
		CO5	Animate real world problem using OpenGL
15CS71	WEB TECHNOLOGY	CO1	Understand the concepts of Data Warehousing.

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	AND ITS APPLICATIONS	CO2	Understand the Techniques of Data Warehousing and Basic of Concepts of Data Mining.
		CO3	Understand the Concepts of Association analysis in Data mining.
		CO4	Understand the Concepts of Classification in Data Mining.
		CO5	Understand the Concepts of Clustering in Data Mining.
15CS72	ADVANCED COMPUTER ARCHITECTURE	CO1	Explain the concepts of parallel computing ,Theory of Parallelism
		CO2	Compare and contrast the parallel architectures, Hardware Technologies
		CO3	Illustrate parallel programming concepts, Processors Hardware technologies
		CO4	Performance of architectures in terms of right parameters , Parallel and Scalable Architectures
		CO5	Software for Parallel Programming
15CS73	MACHINE LEARNING	CO1	Identify the problems for machine learning and select the either supervised, unsupervised or reinforcement learning
		CO2	Problems on Decision Tree learning and Inductive Bias
		CO3	Investigate concept learning on ANN
		CO4	Investigate concept on Bayesian classifier Learning
		CO5	K nearest neighbor, Q learning
15CS744	UNIX SYSTEM PROGRAMMING	CO1	Ability to Understand UNIX and POSIX APIs
		CO2	Mapping the relationship between UNIX Kernel support for files
		CO3	Understanding Kernel support for process creation and termination and memory allocation
		CO4	Learn about Process Accounting process UID ,Terminal logins, network logins
		CO5	Analyze process control, Deamon characteristics, coding rules and error logging
15CS754	STORAGE AREA NETWORK	CO1	Apply the techniques used for data storage and protection.
		CO2	Realize strong storage networking technologies.
		CO3	Ability to demonstrate the storage area networks and their products Ability to provide the mechanisms for the backup/recovery
		CO4	Discuss different types of logical and physical components of a storage infrastructure with regard to cloud.
		CO5	Design storage configurations that effectively meet scalability, security, resilience, and availability requirements.
15CSL76	MACHINE LEARNING LAB	CO1	Understand the implementation procedures for the machine learning algorithms.
		CO2	Design and implement machine learning solutions to classification problems.
		CO3	Design and implement machine learning solutions to clustering and regression problems and be able to evaluate and interpret the results of the algorithm.

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		CO4	Apply appropriate data sets to the Machine Learning algorithms.
		CO5	Identify and apply Machine Learning algorithms to solve real world problems.
15CSL77	WEB TECHNOLOGY LAB WITH MINI PROJECT	CO1	Design and develop static web pages.
		CO2	Design and develop dynamic web pages.
		CO3	Create XML and XHTML documents and Schemas
		CO4	Familiarize with Client-Side Programming, Server-Side Programming, and Active server Pages.
		CO5	Learn Database Connectivity to web applications.
15CS81	INTERNET OF THINGS AND APLICATIONS	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.
15CS82	BIG DATA ANALYTICS	CO1	Master the concepts of HDFS and Map Reduce framework
		CO2	Investigate Hadoop related tools for Big Data Analytics and perform basic Hadoop Administration.
		CO3	Recognize the role of Business Intelligence, Data warehousing and Visualization in decision making.
		CO4	Infer the importance of core data mining techniques for data analytics.
		CO5	Compare and contrast different Text Mining Techniques.
15CS834	SYSTEM MODELING AND SIMULATION	CO1	Define and explain the basic concepts in modeling and simulation.
		CO2	Able to apply statistical models to find system behavior.
		CO3	Apply appropriate methods for the generation of random numbers and test them for ideal statistical properties.
		CO4	Understand process of input modeling.
		CO5	Understand the process of verification and validation models