Koneru Lakshmaiah Education Foundation
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Department of Computer Science and Applications
Program: BCA
Academic Year : 2024-2025

COURSE CODE	Course Title	CO. No.	Course Outcome
23MT1112	Mathematics For Computer Science	CO1	Ability to understand the conceptualize the basic concepts of Matrices and its Applications
		CO2	Ability to understand the applications of truth tables to logic gates usage in digital circuit design and identify the logical expressions and their minimization techniques for logical circuit Optimization
		CO3	Ability to understand identify the operations on sets and properties. Relations and functions
		CO4	Ability to understand Graph and Graph theory applications in Circuits and Networking Theory
23MT1213	Probability And Statistics	CO1	Apply Central Tendency and dispersion in Data Analysis
		CO2	Apply Correlation and Regression in Real-World Problem Solving
		CO3	Apply probability concepts and distributions to solve real-world problems
		CO4	Apply Hypothesis Testing in Real-World Problem Solving
24CA1101	Computer Organization	CO1	Understanding the fundamental concepts and techniques used in digital electronics and using K-Maps for Boolean Expression simplification
		CO2	Model the building blocks of Combinational and Sequential circuits and explaining registers and its usage
		CO3	Analyze the basic concepts of computer organization: structure and operation of computers and their peripherals the design of the functional units of a digital computer system.
		CO4	Classify the working of the Central Processing Unit. Design and evaluate the performance of memory systems
24CA1102	Essentials Of Information Technology	CO1	Illustrate the basic building blocks of computers (hardware), system software, and essential programming concepts for problem solving.
		CO2	Understand various basic concepts of creating, formatting, and collaborating on documents in MS Word.
		CO3	Apply the concepts of Microsoft PowerPoint for building presentations with slides, layouts, visuals, animations, and speaker notes for effective delivery.
		CO4	Examine the basic and advanced functions in Microsoft Excel for data manipulation, analysis, and presentation.
		CO5	Evaluate and Explore data through Word Processing, Spreadsheet applications and Presentations.

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24CA1103R	Computational Thinking For Structured Design Through C	CO1	Understand different concepts of C programming constructs for creating programs.
		CO2	Illustrate different control structures and Arrays.
		CO3	Experiment with functions and pointers for solving real world problems.
		CO4	Analyze the working of structures and different file handling methods
		CO5	Evaluate solutions for programs using basic and advanced concepts of C language .
24CA1204R	Essentials Of Operating System	CO1	Discuss Operating System Functionalities, Types of Operating Systems, Computer Architecture support to Operating Systems.
		CO2	Explain the Process and CPU Scheduling.
		CO3	Demonstrate Process Synchronization, and Deadlocks
		CO4	Illustrate Memory management, Fragmentation and file system.
24CA1205R	Data Structures	CO1	Understanding the fundamental data structures, is crucial for designing efficient algorithms and solving complex problems in computer science.
		CO2	Apply the Basic operations sorting, searching, insertion and deletion of data for arrays and linked list . Stacks and queues are essential building blocks in computer science, providing structured ways to organize data based on specific access patterns.
		CO3	Analyze real time problems and design solutions using Trees and Graphs. Trees and graphs are fundamental data structures that excel at representing hierarchical and network relationships between elements.
		CO4	Analyze the strengths and weaknesses of different searching and sorting techniques, you can select the most appropriate algorithm for your specific needs, leading to efficient and well-performing software solutions
		CO5	Evaluating programs to demonstrate the functionality of different data structures, sorting algorithms, searching algorithms, etc.
24CA1206R	Database Management Systems	CO1	Understanding Database and File System and Applying different kinds of data models with functional components of DBMS
		CO2	Applying design, SQL, PL/SQL and corelating appropriate strategies for optimization of queries with Tuple Relational Calculus and Domain Relational Calculus
		CO3	Analysing normal forms based on functional dependency and Apply normalization techniques to eliminate redundancy with the ACID properties
		CO4	Analyse concurrency techniques to demonstrate the organization of Databases with log mechanism and check pointing techniques for system recovery
		CO5	Analysing and apply in Identifying variety of methods for effective processing of given queries
		CO6	Implement SQL queries and PL/SQL programs to do various operations on data

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24CA2107R	Design And Analysis of Algorithms	CO1	Understand the fundamentals of algorithmic problem-solving, including techniques such as divide and conquer, and recognize their significance in solving computational problems efficiently.
		CO2	Apply and evaluate the applicability of the Greedy Method to different types of optimization problems, including the Knapsack Problem, Job Sequencing with Deadlines, Minimum-cost Spanning Trees, and Optimal Merge Patterns.
		CO3	Develop proficiency in formulating dynamic programming solutions by breaking down complex problems into smaller subproblems, solving them recursively, and storing intermediate results to avoid redundant computations.
		CO4	Analyse the relationship between backtracking and other algorithmic paradigms, such as dynamic programming and branch and bound, understanding when each approach is most suitable for solving optimization problems.
24CA2108R	Computer Networks	CO1	Understand the fundamentals of computer networks and data communication.
		CO2	Understand and Analyze the fundaments of Data Communication
		CO3	Analyze the IEEE Standards, Data Link Layer and Evaluate design issues in networks.
		CO4	Analyze Internet Transport Protocols and Evaluate different types of protocol, Evaluate various types of Network Devices and different types of Networks.
24CA2209	Object Oriented Analysis & Design	CO1	Illustrate the fundamentals of object modelling
		CO2	Build static and dynamic UML diagrams.
		CO3	Make use of design patterns for Software design
		CO4	Analyse various Object-Oriented Methodologies.
24CA2210	Software Engineering	CO1	Demonstrate the requirement of software development for various applications.
		CO2	Utilize some of the Process Models in software engineering for software development.
		CO3	Identify stakeholders requirements, multiple viewpoints, eliciting requirements pts, Extreme Programming, SAFE Methodology
		CO4	Examine a wide range of testing techniques used in software development to ensure comprehensive understanding and application.

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	Devops	CO3	the Kubernetes Pod Configuration.
		CO4	Inspect Configuration Management using Infrastructure as Code, Analyze Continuous Monitoring and Container Orchestration process.
		CO5	Build and Inspect the Tools associated to DevOps Life Cycle
24CA3112	Network And Infrastructure Security	CO1	Estimate the knowledge and skills required to protect your organization\'s network from physical security threats and understand the security considerations of copper and optical media.
		CO2	Explain the role of routers and switches in network security, Analyze lookup and classification algorithms used in routers, Configure packet scheduling and fair queuing mechanisms.
		CO3	Apply security best practices for wireless communication in distributed systems and implement a holistic approach to securing distributed and networked systems.
		CO4	Analyze the types of vulnerabilities and attacks in web applications and algorithms designed against them, and implement advanced security measures for web and DNS systems.
		CO5	Apply security concepts and analyse their performance using networking tools.
24SDCA01R	Web And Social Media Technologies	CO1	Explain the understanding of HTML and CSS by explaining their syntax, structure, and basic components.
		CO2	Apply knowledge of HTML and CSS to construct web pages, including layouts, images, iframes, and hypertext links.
		CO3	Apply knowledge of the evolution and types of social media to discuss its influence on individuals, businesses, and society.
		CO4	Apply strategies for using LinkedIn to build and maintain a professional network, including account setup, connection management, and profile optimization.
		CO5	Evaluate the use and impact of mainstream and non-mainstream social media platforms, such as blogs, wikis, and video platforms, on academic and professional domains.

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24SDCA02R	Object Oriented Programming	CO1	Understand the basic concepts of Object-Oriented Programming, Datatypes, Operators and Type Conversion.
		CO2	Design and implement programs using standard design patterns to solve general problems.
		CO3	Choose the best type of Inheritance, creation of packages and interfaces to implement multiple inheritance.
		CO4	Build and Analyze Java applications using exceptions, formatted and unformatted I/O Streams.
		CO5	Use an integrated development environment to write, compile, run, and test simple object-oriented Java programs that solve real-world problems.
24SDCA03R	Web Development Using Python	CO1	Understand the basic programming skills in core Python.
		CO2	Apply the advanced modules in Python to build Object Oriented Applications
		CO3	Build python application to connect with the database and perform CRUD operations
		CO4	Analyze Web forms and Application in Django
		CO5	Create Web Applications in Python using Django Framework
24SDCA04R	Java Full Stack Development	CO1	JDBC API - Introduction to JDBC API, Type of Drivers in JDBC, Statement, Prepared Statement, Callable Statement, Result Set Meta Data, Database Meta Data, Scrollable & Updatable Result Set, Transaction Management in JDBC.
		CO2	JUnit - Introduction to JUnit framework, JUnit Environment Setup, Features of Junit Framework, Junit Framework and its Implementation. XML - Introduction to XML, Advantages of XML, XML Tree, XML Attributes, XML DOM, DTD, XSD, XML with CSS, XSLT. Servlets - Introduction to Servlets, Lifecycle, Init and context parameters, Servlet Collaboration, Session Tracking Techniques, Servlet CRUD Operations.
		CO3	jSP Servlets Vs JSP, JSP Architecture and Lifecycle, JSP Scripting Elements, Session Tracking Techniques, JSP Implicit Hibernate JDBC Vs Hibernate, Introduction to Hibernate Framework, Advantages, XML & Annotation based Hibernate CRUD Operations, Generator Classes in Hibernate, HQL, HCQL
		CO4	Spring and Spring Boot Introduction to Spring, Spring Architecture, Spring Vs Spring Boot, Maven Repository, Introduction to Spring Boot, Advantages of Spring Boot over Spring, bjects, JSP Directive Elements, JSP Action Tags, JSP MVC Architecture, JSP CRUD Operations.
		CO5	Spring Boot and RESTful API Vs REST API with JSON, Spring Boot and Hibernate CRUD Operations, Microservices with Spring monolithic vs micro-service Architecture, SOA vs Microservices,Web Application MVC using Spring Boot,
		CO6	RESTful API Vs REST API with JSON,.,Spring Boot and Hibernate CRUD Operations. Microservices with Spring monolithic vs micro-service Architecture.SOA vs Microservices.

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24SDCA05R	Aspects of Mobile Application	CO1	Discuss various concepts of mobile app design programming that make it unique from programming for other platforms,
		CO2	Apply Android concepts and user Interface components for mobile app programming
		CO3	Apply Background tasks and Design Activities, communication between activities
		CO4	Apply data requirements and background data storage for mobile app development.
		CO5	Evaluate a mobile application through publishing and testing.
24CA21C1	Cloud Architectures	CO1	Classify cloud computing importance and services
		CO2	Relate cloud services & models.
		CO3	Explain Virtualization and its applications.
		CO4	Apply cloud services using web services Cloud to Utilize cloud resources.
		CO5	Experiment with various cloud services using web services Cloud for building and deploying applications.
24CA22C2	Cloud Web Services	CO1	Design and manage cloud-based solutions, leveraging key cloud services and adhering to best practices in cloud architecture and economics
		CO2	Understanding network types and build various storage services , solutions in cloud environments
		CO3	Identify and utilize key AWS core services essential for cloud computing environments
		CO4	Analyze the benefits of AWS services such as Cloud Watch for real-time monitoring and Cloud Trail for auditing and compliance.
24CA22C3	Cloud Server less Computing	CO1	Describe Cloud computing and cloud service scheduling hierarchy.
		CO2	Describing the Functions-as-a-service and Event-driven programming. Develop Scalable Models Using Server less Architectures.
		CO3	Demonstrating the application functionalities using Server less runtimes and Server less databases
		CO4	Apply server less programming practices and Patterns. Architect, Build, and operate the server less applications
24CA31C4	Design and Development of Cloud Application	CO1	Understand the basic concept of hybrid cloud
		CO2	Understand the management of hybrid cloud interms of development and deployment
		CO3	Plan the establishment of hybrid plan
		CO4	Apply the usage of Azure as a platform for hybrid cloud
		CO5	Evaluate Applications using AWS cloud

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24CA31C5	Cloud Security	CO1	Cloud security is vital because it protects sensitive data, keeps critical applications running smoothly, ensures compliance with regulations, and builds trust with customers by safeguarding their information.
		CO2	Cloud security goes beyond firewalls, encompassing multiple layers to protect data. This includes identity and access management (IAM) to control who sees what, encryption to scramble data, data loss prevention (DLP) to monitor for leaks,
		CO3	Cloud environments, while convenient, introduce new security risks. Misconfigured settings, weak access controls, and insecure APIs can create openings for attackers to steal data
		CO4	Achieving a seamless cloud security model involves creating a unified environment where security measures are integrated throughout the cloud infrastructure.
24CA21D1	Data Science Methodologies	CO1	Discuss navigate the entire data science lifecycle, from understanding Big Data to operationalizing analytical models.
		CO2	Classify probability, analyze random events, and apply common probability distributions
		CO3	Construct relationships between data (correlation), predict one variable from another (regression), assess model fit, and minimize error in linear regression analysis using R software
		CO4	Demonstrate supervised and unsupervised learning methods, apply common classification algorithms like Naive Bayes and decision trees, and perform clustering tasks using K-means clustering and K-nearest neighbors
		CO5	Execute data science algorithms using Python
24CA22D2	Data Warehousing &Mining	CO1	Demonstrate Data preprocessing methods for basic data cleaning , transformation and integration in knowledge Discovery Process for data set for pattern identification process
		CO2	Construct various multidimensional model like data cube with star , snowflake schema for processing analytic operations
		CO3	Infer knowledge pattern for various data mining applications using association, clustering and Classification methods belong to supervised and unsupervised algorithms
		CO4	Categorize knowledge pattern for various data mining applications using different advanced clustering methods.

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24CA22D3	Applied Mahine Learning	CO1	Demonstrate the in-depth exploration of the various types of machine learning and the diverse ways in which models can be represented and gain comprehensive understanding of supervised, unsupervised, and reinforcement learning.
		CO2	Apply multiple linear regression approach on complex data sets effectively and it will give an immersive knowledge on multiple linear regression
		CO3	Interpreting a comprehensive introduction to multiple linear regression analysis, focusing on both the theoretical foundations and practical applications and will learn to build, interpret, and validate multiple linear regression models.
		CO4	Analyzing regression coefficients within the context of various regression models and learn how to estimate, interpret, and validate regression coefficients, gaining insights into their practical implications in statistical modeling and data analysis.
24CA31D4	Introduction to Big Data Analytics	CO1	Extend the understanding of Big Data use cases by identifying applications in specific IT industries, and demonstrate the methods for the storage and maintenance of Big Data.
		CO2	Classify different components of the Apache Hadoop ecosystem (e.g., HDFS, YARN, MapReduce) based on their functionalities.
		CO3	Apply MapReduce programming techniques to solve real-world data processing problems and Develop an understanding of fault tolerance mechanisms within MapReduce & design jobs to handle potential failures.
		CO4	Classify the relationships between different Hadoop daemons (Name Node, Data Node, Resource Manager, Node Manager) and their interactions within the cluster.
		CO5	Evaluate cluster management using YARN and with use of Map reduce technique to solve big data maintenance related problems
24CA31D5	Data Visualization Techniques	CO1	Understand the brief history of data visualization, its importance, and the challenges involved in visualizing data
		CO2	Apply static graphical techniques such as bar graphs to represent data, including grouping bars, Customizing colors, sizes, titles, and axis units
		CO3	Experiment with static graphical techniques such as bar graphs to represent data, including grouping bars, customizing colors, sizes, titles, and axis units
		CO4	Examine the visualizations by adding annotations such as text, mathematical expressions, lines, arrows, shaded shapes, and error bars.
		CO5	Students will apply data visualization techniques to real-world datasets, demonstrating the practical application of learned concepts.

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24CA21A1	Applied Artificial Intelligence	CO1	Understand about intelligence Vs, knowledge and artificial Intelligence, techniques of AI as a State space search, production systems.
		CO2	Implement problem solving by search, Heuristic search, Randomized search techniques and Finding optimal paths
		CO3	Experiment with the appropriate methodologies for problem decompositions, planning and constraint Data constraint satisfactions.
		CO4	Analyze knowledge representation using Predicate Logic, representing knowledge using rules, Semantic Nets, Frames and conceptual dependencies.
		CO5	Evaluate the theoretical concepts to conduct various experiments on Search Techniques and Language Representation and processing using AI .
24CA31A4	Applied Deep Learning	CO1	Apply with various Convolution models of deep learning
		CO2	Utilize the You Only Look Once (YOLO) framework for object detection and localization.
		CO3	Apply Recurrent Neural Networks for Sequence Learning for real time applications
		CO4	Apply various Generative Adversarial Networks to find fake and real images
		CO5	Design model architectures for different applications with different modalities such as image, text and time series data and implement with pytorch and keras
24CA31A5	Perception and Computer Vision	CO1	Understand the scene or features in images of the real world using the techniques of image processing and pattern recognition
		CO2	Apply Image transformation methods of translation, rotation and scaling in 2 and 3 Dimensional.
		CO3	Implement image processing algorithms using various tools and techniques, with their types and applications.
		CO4	Analyze the imaging system using the support vector machines and to evaluate simple relations between object and image.

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24CA21S1	Cyber Security and Ethical Hacking	CO1	Understand Information Systems and Cyber Security
		CO2	Build measures for various types of security threats and electronic payment systems.
		CO3	Identify the security issues involved in developing secure information systems.
		CO4	Apply different ethical hacking methods
		CO5	Evaluate various cryptographic algorithms
24CA22S2	Cyber Forensics	CO1	Outline digital evidence following established procedures, analyze recovered data for traces of cybercrime, and effectively present findings for further investigation
		CO2	Analyze complex digital evidence from various sources (Windows, Linux, networks, mobile devices) using advanced forensic techniques (packet analysis, intrusion detection, steganography.
		CO3	Examine advanced forensic techniques such as cross-drive analysis, live analysis, deleted file recovery, stochastic forensics, password cracking methods
		CO4	Inspect legal principles and best practices to effectively handle corporate espionage, digital evidence, and cybercrime incident
24CA22S3	Malware Analysis	CO1	Illustrate the Goals of Malware Analysis and Creating fake networks
		CO2	Demonstrate the usage of virtual machines in the context of malware analysis.
		CO3	Apply the concept of exception handling in the context of malware analysis. How can it be used to identify and analyze malware activity
		CO4	Develop a plan for analyzing malware persistence mechanisms
24CA31S4	Security Governance and Management	CO1	Introduction to E-Government and E-Governance; Models of E-Governance
		CO2	E-Government Infrastructure Development
		CO3	Security fore-Government; Applications of Data Warehousing and Data Mining in Government
		CO4	Case Studies
		CO5	Implementing e-governance models and systems Using suitable platform.
24UC1103	Language Skills	CO1	Understand the essential listening, speaking, and reading skills
		CO2	Apply and produce essential writing and non-verbal communication skills

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24UC2105	Communication Skills	CO1	To Understand the essential career skills, including resume writing, interview techniques
		CO2	Apply a comprehensive understanding of essential team skills, preparing them for successful collaboration and contribution in professional team environments.
24UC1203	Design Thinking And Innovation	CO1	Understand the importance of Design thinking mindset for identifying contextualized problems
		CO2	Analyze the problem statement by empathizing with user.
		CO3	Develop ideation and test the prototypes made
		CO4	Explore the fundamentals of entrepreneurship skills for transforming the challenge into an opportunity
23UC0026	Human Values, Gender Equality & Professional Ethics	CO1	Understanding the basic concepts of value education
		CO2	Gain basic understanding of the principles in harmony among the human beings.
		CO3	Gain knowledge in the concept of Harmony in the family and society
		CO4	Acquire knowledge in the concepts of harmony in the nature
23FL3055	Foreign Language Elective - German Language	CO1	classify their understanding of greeting wishes, alphabets and numbers learning. to understand the greetings in formal and informal way.
		CO2	Apply their knowledge of essential daily expressions, present, past and future tense. Conjugating the verbs in the Singular and Plural groups, Past participle tense and the futertenseand relations with the verbs
		CO3	Utilize their understanding with suitable prepositions, questions, and possessive pronouns, and the importance of four German cases. Prepositions in Akkusativ and Dativ
		CO4	Develop their knowledge about how to move in public places, such as shopping centres, restaurants, tourist places, etc, and preparation of them for German A1 level examination.

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23UC0027	Leadership And Management Skills	CO1	Understand basic leadership, skills and perspectives and leadership styles
		CO2	Understand different managerial skills and apply them to develop high performance teams.
		CO3	Analyse effective communicative strategies and apply them in team tasks
		CO4	Apply strategic planning fundamentals and decision-making techniques, through exercises and case studies
22UC0009	Ecology And Environment	CO1	Discuss natural resources and importance of environmental science.
		CO2	Describe various ecosystems and applications of biodiversity.
		CO3	Identify and discuss causes, preventive measures of environmental pollution.
		CO4	Summarize constitutional acts for environmental science, knowledge on solid waste management and disaster management.
23UC0008	Indian Constitution	CO1	To acquire knowledge of the historical developments that culminated in the drafting of the Indian Constitution.
		CO2	To understand the basic features of the Indian Constitution.
		CO3	To understand the structure of the Federal government as defined by the Indian Constitution.
		CO4	To understand the Indian Judicial system and election commission of india.
23OEBT01	IPR and Patent Laws	CO1	Understand the the principles of copy rights in applying patents, trademarks, copyrights, and trade secrets
		CO2	Apply the guidelines framed by GATT & WTO in patenting
		CO3	Apply the regulatory affairs in maintaining patenting rights
		CO4	Classify the relationships between different Hadoop Apply the concepts of copy rights in drafting patents of various types.
23OEEC11	Image Processing	CO1	Understand the fundamental concepts of a digital image processing system and transformation techniques
		CO2	Understand image enhancement techniques in spatial and frequency domains.
		CO3	Apply image restoration and compression techniques

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		CO4	Apply image segmentation, representations, and description
22UC0021	Social Immersive Learning	CO1	Apply effective communication and collaboration skills to work with diverse populations in addressing social issues within the community
		CO2	Build technological solutions to real-world problems or challenges with peers to achieve common goals.
		CO3	Plan effectively to communicate ideas and collaborate with others to achieve artistic or recreational goals.
		CO4	Develop innovative solutions by thinking critically and creatively within a collaborative social immersive learning environment.
		CO5	Identify the strategies to promote personal well-being for healthy living through social interaction and shared experiences.

Academic Professor -I/C

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