Koneru Lakshmaiah Education Foundation
(Category -1, Deemed to be University estd. u/s. 3 of the UGC Act, 1956)
Accredited by NAAC as 'A++' ❖ Approved by AICTE ❖ ISO 21001:2018 Certified
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Department of Computer Science and Applications
Program: MCA
Academic Year : 2024-2025

COURSE CODE	COURSETITLE	CO. No.	Course Outcome
23UC5201	PROFESSIONAL COMMUNICATION SKILLS	CO1	Develop the skill of contextual Vocabulary and Critical Reading
		CO2	Demonstrate different types of personal and professional skills and apply them for growth in professional zone.
		CO3	Apply the concepts of Mathematical Principles to solve problems on Arithmetic , Algebra & Geometry to improve problem solving ability.
		CO4	Apply the concepts and using Logical thinking to solve problems on verbal & Non-Verbal Reasoning to develop Logical thinking skills.
23CA5101	COMPUTER NETWORKS AND COMMUNICATIONS	CO1	Understand the fundamentals of computer networks and data communication
		CO2	Choose the issues in Data Link Layer, IEEE Standards in networks
		CO3	Analyse Internet Transport Protocols and different types of protocols
		CO4	Examine various types of Network Devices and different types of Networks
		CO5	Develop networking solutions using Routing Algorithms
23CA5102	DATA STRUCTURES AND ALGORITHMS	CO1	Understanding the fundamental algorithms, data structures (arrays, pointers, strings), and their applications, equipping you for efficient programming
		CO2	Classify fundamental data structures, Stacks and Queues, covering their implementation, operations, and applications in computer science.
		CO3	Apply the techniques of Tree and Linked Lists data structures and their operations is essential for designing efficient algorithms and data storage systems.
		CO4	Develop versatile data structures such as Graphs are used to represent relationships between objects. And identifying the fundamental operations of Searching and Sorting in computer science for organizing and retrieving data efficiently.
		CO5	Evaluate applications using control structures for linear and non-linear data structures
		CO6	Asses the data structure for its functions based on performance metrics.

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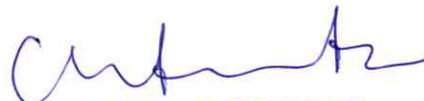Guntur District, Andhra Pradesh.

Code	Course	CO	Description
24CA5103	OPERATING SYSTEMS CONCEPTS	CO1	Describe the core functionalities of operating systems, different types of operating systems, and explain the support provided by computer architecture to operating systems.
		CO2	Explain the concepts of process and CPU scheduling in operating systems by understanding how processes are managed and prioritized for CPU execution to optimize system performance and resource utilization
		CO3	Demonstrate an understanding of process synchronization mechanisms and apply techniques to prevent and resolve deadlocks, using illustrative examples to clarify these concepts
		CO4	Illustrate Memory Management, Fragmentation, and File Systems: Apply techniques to visualize and interpret memory allocation, address fragmentation issues, and structure file systems for efficient data management
23CA5104	DATABASE SYSTEMS	CO1	Illustrate the functional components of DBMS and Design an ER Model for a database.
		CO2	Design a relational model for a database & Implement SQL concepts and relational algebra.
		CO3	Implement PL/SQL programs, normalization techniques, indexing to construct and access database
		CO4	Analyse the importance of transaction Processing, concurrency control and recovery techniques.
		CO5	Choose the Mango DB to perform CURD, Indexing, Aggregation, Replication, Sharding, Performance analysis for distributed Databases
		CO6	Choose a Mongo DB and implement SQL queries and PL/SQL programs to do various operations on data.
23CA5205	OBJECT ORIENTED PROGRAMMING	CO1	Understand the behaviours of programs involving the basic programming constructs of Java.
		CO2	Make use of class and objects with access control to represent real world entities.
		CO3	Inspect the different predefined classes and interfaces in packages.
		CO4	Examine thread concepts to establish inter process communication
		CO5	Assess the robustness of Java programs through comprehensive debugging and error handling techniques
		CO6	Evaluate various design techniques and the Object Oriented Programming concepts
23CA5206	DATA ANALYTICS	CO1	Understanding Data analytics as the process of examining, cleaning, and transforming raw data into meaningful insights that can be used for informed decision making. Demonstrates the importance of R programming.
		CO2	Develop the ability to store, organize, manipulate, and analyze data using R\'s data structures, operators, control flow statements, functions, and string manipulation techniques.
		CO3	Examine the function of various data structures in R. You\'ll be able to create, manipulate, explore, and transform data, laying the groundwork for further statistical analysis and data visualization in R.
		CO4	Inference data analysis pattern using statistics and Data visualization; , extract meaningful insights from data using descriptive statistics; clean, analyze, and manipulate data from various sources (CSV and Excel files) for further exploration.
		CO5	Experiment with pattern detection and data analytics functions with data set.

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23CA5207	COMPREHENSIVE SOFTWARE ENGINEERING	CO1	Understanding the fundamentals and practices of software engineering, including software development lifecycle and web application specifics.
		CO2	Develop UML diagrams and process models for Echo Systems.
		CO3	Applying contemporary software development methodologies, mastering requirements engineering, and implementing advanced design principles effectively.
		CO4	Analyze advanced behavioral modeling, strategic software testing, user interface design, and software quality assurance methodologies.
23CA6108	WEB TECHNOLOGIES	CO1	Understand the features of different web technologies. Basic concepts of HTML and CSS
		CO2	Understand and Illustrate applications using HTML, CSS and JavaScript and XML
		CO3	Apply based on XML and PHP technologies
		CO4	Apply web technologies - servlets, JSP and build the data base connectivity
		CO5	Design Dynamic Web Pages by using HTML, CSS, JS, PHP
		CO6	Design dynamic webpages using html,css, javascript, servlets, php, jsp
23IE5201	ESSENTIALS OF RESEARCH DESIGN	CO1	Analyze existing research to identify a focused and answerable research question or develop a well-defined hypothesis
		CO2	Evaluate different research designs based on their strengths and weaknesses in relation to the chosen research question and data needs.
		CO3	Apply appropriate data collection methods considering the chosen research design and data characteristics.
		CO4	Analyze and interpret data using relevant data analysis methods to address the research question
24IE6101	INTERNSHIP	CO1	Able to understanding the procedure and its importance of industrial training
		CO2	Able to Applying the techniques in the live projects in the industrial training
24IE6102	TERM PAPER	CO1	Demonstrate enhanced ability to organize and articulate their ideas clearly and coherently in a well-structured academic paper, adhering to formal writing conventions and proper grammar
		CO2	Develop proficiency in using advanced research tools and techniques to efficiently locate, evaluate, and integrate scholarly sources, ensuring the credibility and relevance of their academic work.
24IE6203	PROJECT	CO1	Organize literature search to review current knowledge and developments in the chosen technical area.
		CO2	Analyze detailed technical work in the chosen area using one or more of: theoretical studies computer simulations hardware construction.
		CO3	Evaluate progress reports or maintain a professional journal to establish work completed, and to schedule additional work within the time frame specified for the project.

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23CA52A1	APPLIED MACHINE 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 utilized. It gives a 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	Interpret 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	Analyze 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.
		CO5	Evaluate the practical applications of linear regression in various fields such as economics, finance, healthcare, marketing, and social sciences.
		CO6	Evaluate a comprehensive introduction to the applications of linear regression analysis using Python and will learn how to build, interpret linear regression models using Python\'s powerful data analysis libraries.
23CA52A2	PATTERN RECOGNITION	CO1	Understanding of pattern recognition (PR) concepts, including supervised and unsupervised statistical approaches, along with various PR applications.
		CO2	Apply Bayes Theorem to improve classification and Explore different error rate classifiers using Python , Implement their techniques.
		CO3	Apply Formal Language based Approaches on Syntactic (structural) pattern recognition & NN Classifiers.
		CO4	Utilize advanced pattern recognition methodologies to analyze and solve complex, real-world problems across various domains
23CA61A3	COMPUTER VISION	CO1	Understand the need for image transformations and modelling types of image transformation and their properties and understand the techniques and transformation methods for image enhancement and image transformation
		CO2	Identify basic concepts, terminology, theories, models and methods in the field of computer vision and describe the known principles of human visual system
		CO3	Apply computer vision techniques to solve specific tasks and apply basic computer vision algorithms in Python and Analyze the performance of computer vision algorithms on a dataset
		CO4	Describe basic methods of computer vision related to multi-scale representation, edge detection and detection of other primitives, stereo, motion and object recognition
		CO5	Critically review and assess scientific literature in the field and apply theoretical knowledge to identify the novelty and practicality of proposed method and develop practical and innovative image processing and computer vision applications or systems.
		CO6	Design and develop practical and innovative image processing and computer vision applications or systems and Conduct themselves professionally and responsibly in the areas of computer vision

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23CA61A4	APPLIED DEEP LEARNING	CO1	Illustrate Perceptron Learning Algorithm and Convergence, Multilayer Perceptron\'s, Sigmoid Neurons, Feedforward Neural Networks, Gradient Descent (GD), Dimensional Reduction, Principal Component Analysis
		CO2	Experiment with the Convolutional Neural Networks, LeNet, AlexNet, ZF-Net, VGGNet, GoogLeNet, ResNet Object Detection, RCNN, Fast RCNN, Faster RCNN, YOLO
		CO3	Build the concepts to implement, evaluate, and critically analyze ensemble methods, batch normalization, and various CNN architectures such as LeNet, AlexNet, ZF-Net, VGGNet, GoogLeNet, and ResNet.
		CO4	Represent advanced deep learning topics such as LSTM, RBM, Deep Dream, GRU, neural style transfer, and their applications in computer vision, text, and sequential data processing.
23CA61A5	APPLICATIONS OF NATURAL LANGUAGE PROCESSING	CO1	Understand approaches to syntax and semantics in NLP involves studying how language structure (syntax) and meaning (semantics) are modeled computationally to enable tasks like parsing
		CO2	Apply mathematical techniques to infer parameters from data, essential in fields like machine learning and natural language processing for model training and optimization
		CO3	Analyze grammar formalism and context-free grammars involves studying structured rules that define syntactic relationships in languages
		CO4	Apply rule-based techniques involves using predefined linguistic rules for tasks like syntax parsing and text generation in NLP.
		CO5	Evaluate NLP algorithms using Python involves implementing metrics such as text classification or named entity recognition.
23CA52D2	HADOOP AND BIGDATA	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	Demonstrate their understanding of the master-slave architecture by outlining its functionalities within the Hadoop framework. Apply Hadoop MapReduce technique to solve Big Data related Problems.
		CO3	Survey Spark deployment options, and test for the effectiveness of Spark\'s actions and transformations, leading to a comprehensive understanding of its application in real-world scenarios.
		CO4	Analyze the limitations of Hadoop and how Spark overcomes these challenges, and categorize practical applications of both in Big Data analytics

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23CA61D3	DATA VISUALISATION 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	Examine bar graphs, grouping bars, customizing color, size, and title, adding labels, and applying bar graphs in business scenarios.
		CO6	Practicing annotation techniques such as adding text, mathematical expressions, lines, arrows, shaded shapes, and error bars. Modifying axes, including swapping x and y axes, changing scaling ratios, positioning tick marks and labels, adjusting the appearance of axis labels, creating circular graphs, using themes, and manipulating legends.
23CA61D4	STATISTICS FOR DATA SCIENCE	CO1	Analyze security data using core statistical methods.
		CO2	Analyze data-driven decisions for security by analyzing and interpreting security data using probability distributions.
		CO3	Construct the linear and non-linear regression lines for the given data
		CO4	Apply basic concepts of statistics and explains the various methods of descriptive data collection and analysis
23CA61D5	GRAPH & WEB ANALYTICS	CO1	Understand the impact of big data on graphs ,Network Basics and Social Networks
		CO2	Make use of Web Analytics:- Data sources, tools, Web traffic data
		CO3	Analyzing Web Analytics Strategy- website traffic analysis, audience identification and segmentation analysis, Emerging Analytics
		CO4	Compare Email Testing Analysis, competitive Intelligence Analysis and Social ,Mobile, Video Analysis
		CO5	Choose Python programs for graph and web analytics
23CA52C1	CLOUD COMPUTING	CO1	Understand various concepts, architectures and deployment models relating to the cloud computing technologies
		CO2	Interpret the fundamentals of cloud, cloud Architectures and types of services in cloud
		CO3	Build the concept of virtualization and identify the development of Cloud Computing
		CO4	Design different sample applications using IaaS, PaaS and SaaS deployment Model
		CO5	Develop application programs using different platforms and languages
		CO6	Interpret and design the Concept of Advanced Cloud Technologies and Cloud Databases

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23CA52C2	CLOUD INFORMATION SECURITY	CO1	Illustrate core virtualization and cloud computing concepts, including deployment models, service models, security considerations, and hypervisor functionalities
		CO2	Outline cloud security using the Cloud Controls Matrix, explore secure cloud architecture, understand Security as a Service (SaaS) requirements, and identify the top cloud threats
		CO3	Identify mitigate cloud security risks, understand key cloud security protocols and frameworks, and prepare for the CCSK certification.
		CO4	Apply Cloud Trust Protocol (CTP) and the concept of transparency to assess security, privacy, and compliance of cloud services.
23CA61C3	CLOUD ARCHITECTURES	CO1	Demonstrate the setting and scaling cloud infrastructure on leading platforms like AWS, Azure, and Google Cloud.
		CO2	Interpret various cloud service models (IaaS, PaaS, SaaS) to meet specific application and business needs.
		CO3	Explain various virtualization concepts and its applications in cloud computing .
		CO4	Apply cloud services using Web Services Cloud to utilize cloud resources in cloud computing.
		CO5	Make use of various cloud services using web services for building and deploying applications.
		CO6	Organize different cloud applications for using the Web services cloud to utilize cloud resources
23CA61C4	CLOUD SERVERLESS COMPUTING	CO1	Understand the fundamental concepts, benefits, drawbacks of serverless computing and identify major serverless platforms and providers.
		CO2	Apply serverless design patterns and architecture principles to develop scalable and elastic microservices
		CO3	Develop and manage serverless functions on Function-as-a-Service (FaaS) platforms
		CO4	Identify the need of event-driven workflows in serverless architectures by applying event-driven programming models
23CA61C5	CLOUD WEB SERVICES	CO1	Explain the concepts form the foundation of modern cloud computing, enabling efficient, scalable, and secure operations.
		CO2	Understand the fundamental concepts of networking and storage in cloud environments and Learn about cloud database services.
		CO3	Identify the Control of workflow in cloud services, Global Infrastructure and Security in the context of AWS.
		CO4	Examine built-in cloud tools and third-party solutions for real-time monitoring, logging, and alerting to maintain system performance and security.
		CO5	Evaluate the AWS Cloud services by simplifying the deployment of third-party applications and services.
23CA52S1	CYBER SECURITY AND ETHICAL HACKING	CO1	Organize 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	Analyze different ethical hacking methods
		CO5	Evaluate various cryptographic algorithms and cyber security measures
		CO6	Evaluate various Ethical Hacking Methods

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		CO1	Demonstrate to Virtualization & Cloud: Understanding and Securing the Cloud Landscape and Security between Hosts and Guests
23CA61S5	CLOUD SECURITY	CO2	Demonstrate navigating Cloud Security with Controls and Threat Awareness Upon successful completion of the Cloud Controls Matrix (CCM) to identify and assess security risks in cloud deployments
		CO3	Apply Mastering Cloud Security for Certification Readiness Upon successful completion of Synthesize knowledge of cloud security vulnerabilities and their corresponding mitigating controls to design and implement robust cloud security strategies
		CO4	Apply a cloud security vulnerabilities by comprehensively analyzing their characteristics and proposing effective mitigating controls
		CO5	Evaluate the Cloud Trust Protocol (CTP) and its role in fostering trust and transparency in cloud deployments

Academic Professor -I/C

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