



**Koneru Lakshmaiah Education Foundation**

(Category - I, Deemed to be University estd. u/s. 3 of the UGC Act, 1956)

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**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

**Y21-M.TECH-AIDS**

Course Code	Course Title	S No	CO No	Description of the course outcome
21CS5101	Mathematical Foundations of Computer	1	CO1	Utilize the sets and apply the knowledge of mathematical reasoning
		2	CO2	Apply combinatorial Analysis, Apply procedure to solve a recurrence relations and digraphs
		3	CO3	Model the different types of graphs, their usefulness in representing data and graph colouring problems perspective of problem solving.
		4	CO4	Make use of the concept of automata and the use of grammars in languages
21CS5110	COMPUTATIONAL THINKING FOR OBJECT ORIENTED DESIGN		CO1	Understand basic Concepts of OOP, fundamentals of java and apply the concepts of classes and objects through Java Language, Access control, Overloading.
			CO2	Apply constructors, parameter passing, String, String Buffer and String Tokenizer.
			CO3	Inheritance, Packages, Exception Handling
			CO4	Multithreading, Apply collection framework and event driven programming.
			CO5	Apply object-oriented programming concepts to write programs and Analyses requirements and design to implement lab-based project with SDLC in a group of students.
21CS5111	BIG DATA ANALYTICS		CO1	Understand the concepts of big data, Initial exploration of analysis of data and Data visualization.
			CO2	Analyze Initial exploration of data and advanced data analytics by using R
			CO3	Apply advanced algorithms & Statistical modelling for big data using HDFS, HIVE, and PIG.
			CO4	Apply advanced SQL functions for in-database analytics by MADlib, Greenplum along with common deliverables of analytics life cycle project
			CO5	Build and Evaluate the Big Data Analytical problems using R, Hadoop, HIVE Programming concepts.

21CS5112	MACHINE LEARNING & REINFORCEMENT LEARNING		CO1	Apply Machine Learning Techniques such as PCA, LDA, Decision Trees to solve Real World Problems
			CO2	Build Bayesian models for solving Classification and Prediction problems
			CO3	Inspect a movie recommender system
			CO4	Apply Neural Network Algorithm techniques to solve Classification, Prediction problems Build a Q-Learning based model for real world problems
			CO5	Implement Machine Learning Techniques using Python Language and develop a small project along with his/her team members.
21IE5149	SEMINAR		CO5	<b>The Seminar has to be taken up by the MTech Second Semester students. It is based on independent research in one of the areas opted by the student. In a Seminar, a student should demonstrate his/her ability in finding out the relevant sources, selection, an illustration of logic, and in organizing the information on the topic, gathering the data, processing, analyzing, and summarizing.</b>
21CS5113	MATHEMATICAL PROGRAMMING - 2		CO1	Solve linear programming problems in engineering and business decision making problems
			CO2	Make use of Duality and Sensitivity Analysis in Linear Programming models.
			CO3	Solve network models and LPP using interior point methods.
			CO4	Apply Cutting plane and Branch and Bound methods to solve Discrete optimization problems.
			CO5	Applying the problem solving and optimization models for finding the optimal solution
			CO1	Apply measures of efficiency to algorithms and Compare various linear data structures like Stack ADT, Queue ADT, Linked lists.
			CO2	Analyse and compare linear data structures and analyse different searching and hashing techniques

21CS5114	DATA STRUCTURES & ALGORITHMS		CO3	Analyse and compare various non – linear data structures like Trees and Graphs.
			CO4	Analyse and compare various Shortest Path and Pattern Matching algorithms, to select from a range of possible options, to provide justification for that selection, and to implement the algorithm in a particular context.
			CO5	Execute lab experiments and develop a small project along with his/her team members
	ADVANCED DATABASES		CO1	Understand the fundamentals of query optimization and database recovery protocols.
			CO2	Apply emerging database technologies and distributed databases.
21CS5115			CO3	Analyse and Discriminate object oriented and relational database systems.
			CO4	Analyse multimedia databases.
			CO5	Build and Evaluate advanced database applications
21CS5116	DEEP LEARNING		CO1	Able to understand and remember the concepts of Perception, Back Propagation, PCA, Singular Value Decomposition
			CO2	Able to understand auto encoders- and apply Regularization, Denoising, Sparse, Contractive, Vectoral Representations of words Convolutional Neural Networks, LeNet, AlexNet, ZF-Net, VGGNet, GoogleNet, ResNet Object Detection , RCNN, Fast RCNN, Faster RCNN, YOLO,
			CO3	Apply Long Short Term Memory (LSTM) Restricted Boltzmann Machines, Gibbs sampling for training RBMs, contrastive training RBMs. Deep Dream, GRU, Neural style transfer, Deep learning for computer vision, text and sequences.
			CO4	Build Markov models, Markov networks, Markov chains, Variational autoencoders, Autoregressive Models: NADE, MADE, PixelRNN, Generative Adversarial Networks (GANs), and DCGAN,
		CO5	Implement basic Neural Networks, optimization algorithms, engine vector decomposition, various types of auto encoders using tensorflow	

21IE5250	Term Paper		CO5	The term paper has to be taken up by the MTech Second Semester students. It is based on independent research in one of the areas opted by the student. In a term paper, a student should demonstrate his/her ability in finding out the relevant sources, selection, an illustration of logic, and in organizing the information on the topic, gathering the data, processing, analyzing, and summarizing.
21IE6050	Dissertation		CO5	The Project has to be taken up by the MTech Second Semester students. It is based on independent research in one of the areas opted by the student. In a project research paper, a student should demonstrate his/her ability in finding out the relevant sources, selection, an illustration of logic, and in organizing the information on the topic, gathering the data, processing, analyzing, and summarizing.
<b>ELECTIVE-1</b>				
21CS51E1	Cloud infrastructure & Services		CO1	Apply on-demand compute services, Understand IaaS Architectures and Implementation Guidelines.
			CO2	Analyze applications and frameworks for data analysis and Content delivery in the cloud.
			CO3	Analyze Cloud Service availability, Resiliency and Dynamic Scaling
			CO4	Use Networking and Security Services, Automate Cloud Infrastructure, Deployment and Management
			CO5	Hands-on Cloud Administration, Implement, Monitor and manage important cloud services and components including IaaS and PaaS
21CS51E2	Parallel & Distributed Computing		CO1	Analyse Distributed Computations, Graph Algorithms, Causality and Time, Message Ordering and group communication
			CO2	Analyse Coordination Algorithms, Consistency and Replication, Global state and snapshot recording algorithms, Self-stabilization, Fault-Tolerant Message-Passing Distributed Systems
			CO3	Understand parallel algorithm design. Demonstrate the ability to differentiate among parallel architectures and interconnection networks models by analyzing parallel sorting algorithms
			CO4	Design and analyze Parallel Computational algorithms
			CO5	Develop Parallel and Distributed computing programs using Hadoop Software tool and MapReduce Frame work

21CS51E3	Cloud Devops		CO1	Understand image representation and modeling
			CO2	Apply image transformation methods
			CO3	Interpret image processing algorithms
			CO4	Apply and analyze transformation, pose consistency and segmentation algorithms
			CO5	Analyze and implement computer vision techniques by means of Python using the OPENCV library.
<b>ELECTIVE-2</b>				
21CS51F1	Computer Vision and Perception		CO1	Understand image representation and modeling
			CO2	Apply image transformation methods
			CO3	Interpret image processing algorithms
			CO4	Apply and analyze transformation, pose consistency and segmentation algorithms
			CO5	Analyze and implement computer vision techniques by means of Python using the OPENCV library.
21CS51F2	Soft Computing		CO1	Interpret fuzzy logic system
			CO2	Analyze Artificial Neural Network Models
			CO3	Demonstrate Swarm and Evolutionary Algorithms
			CO4	Illustrate Hybrid Fuzzy-Neural- Evolutionary- Swarm Models
			CO5	Demonstration of neuro, fuzzy, evolutionary, and swarm algorithms using open source tools
			CO1	Understand and build basic network representations, topologies and models
			CO2	Apply various techniques for training and optimizing neural networks
			CO3	Analyze different techniques related to network stochastics
			CO4	Analyze different techniques related to learning algorithms for neural networks and develop knowledge on emerging software, tools and technologies related to these algorithms
			CO5	Evaluate different approaches and techniques for solving problems involving neural networks and their applications using python and develop knowledge on emerging software, tools and technologies related to these approaches.
<b>ELECTIVE-3</b>				

21CS51G1	Data Warehousing & Mining		CO1	Illustration of Warehouse & Mining, ETL, OLAP & OLTP, Data Cube Operations and Data Warehouse architecture
			CO2	Demonstration of Data Preprocessing through different methods
			CO3	Apply Different Classification Algorithms to Segregate Input data into different class levels and find out Hidden relationship between transactional dataset using Association Rule Mining.
			CO4	Build different Clustering Models using the predefined dataset.
			CO5	Implementation of warehousing and mining algorithms using suitable tools and programming languages
21CS51G2	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	Analysing 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	Implementing Python programing for graph and web analytics
21CS51G3	Big Data Optimization		CO1	Understand the concepts of big data, Initial exploration of analysis of data and Data visualization.
			CO2	Analyse Initial exploration of data and advanced data analytics by using R
			CO3	Apply advanced algorithms & Statistical modelling for big data using HDFS, HIVE, and PIG.
			CO4	Apply advanced SQL functions for in-database analytics by MADlib, Greenplum along with common deliverables of analytics life cycle project
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<b>ELECTIVE-4</b>				
21CS52H1	Cognitive Computing		CO1	Understand cognitive computing is, and how it differs from traditional approaches
			CO2	Applying the primary tools associated with cognitive computing
			CO3	Develop a project that leverages cognitive computing

			CO4	Analyse and discuss the business implications of cognitive computing
			CO5	Able to implement cognitive computing programs using IBM Watson
21CS52H2	Natural Language Processing		CO1	Understand approaches to syntax and semantics in NLP
			CO2	Apply the statistical estimation and statistical alignment models
			CO3	Analyze grammar formalism and context free grammars
			CO4	Apply Rule based Techniques, Statistical Machine translation (SMT), word alignment
			CO5	Inspect and Evaluate Language Processing Methods using python
21CS52H3	Edge Computing		CO1	Define the Edge/Fog Computing and infer the opportunities and challenges
			CO2	Examine the Architecture of Edge Computing and explore the issues that are being addressed by the Industry
			CO3	Determine the Middleware needed for Edge Computing and its Security Requirements
			CO4	Using the Edge/Fog Computing in various real-time projects
			CO5	Implement the programming on Edge and Fog computing