Koneru Lakshmaiah Education Foundation
(Deemed to be University estd. u/s. 3 of the UGC Act, 1956)

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Department of Artificial Intelligence and Data Science

Y21 B.Tech

S No	Course Code	Course Title	CO NO	Description of the Course Outcome
1	21UC1101	Integrated Professional English	CO1	Understand the concepts of grammar to improve communication, reading, and writing skills
			CO2	Demonstrate required knowledge over Dos and Don'ts of speaking in the corporate context. Demonstrate ability to face formal situations / interactions.
			CO3	Understand the varieties of reading and comprehend the tone and style of the author. Skim and scan effectively and appreciate rhetorical devices
			CO4	Apply the concepts of writing to draft corporate letters, emails, and memos
2	21MT1101	Mathematics for Computing	CO1	Model a system of equations for real world applications in engineering, physical and biological sciences, computer science, finance, economics and solve them through matrix algebra
			CO2	Model basic and computational techniques on discrete structures like relations, orders, functions & FSM, Lattices, and propositional &predicate logic
			CO3	Model real world structures and their related applications using advanced discrete structures like graphs and trees.
			CO4	Model the given Statistical data for real world applications in Engineering science, Economics and Management.
			CO5	Demonstrate the Aptitude and Reasoning skills (Tests in skilling hours)

3	21EC1101	Digital Logic & Processors	CO1	Understand numerical and character representations in digital logic, number system, data codes and the corresponding 8design of arithmetic circuitry. Understanding Logic gates, Logic theorems, Boolean algebra and SOP/POS expressions.
			CO2	Combinational systems design using standard gates and minimization methods
			CO3	Sequential systems: Design of counters using flip flops.
			CO4	Understanding PLA's, PAL's, FPGA's and processors
			CO5	Analyzing and realization of Boolean functions, half adder, encoders, decoders, flip flops and counters.
4	21SC1101	Computational Thinking for Structured Design	CO1	Design Basic and Complex Building Blocks for real world problems using structured programming paradigm.
			CO2	Translate computational thinking into Logic Design for Solving real world problems.
			CO3	Apply and Analyze CRUD operations on Basic Data Structures using Asymptotic Notations.
			CO4	Apply and Analyze CRUD operations on Linear Data Structures using Asymptotic Notations.
			CO5	Apply the structured programming paradigm with logic building skills on Basic and Linear Data Structures for solving real world problems.
5	21ME1103	Design Tools Workshop - I	CO1	Practice design thinking by developing artistic skills, Visualize and complete his/her innovative design by final drafting using 3D modeling
			CO2	Understand the concept of web page, web browser, web server, and able to create Static webpages. Apply the HTML5 and CSS knowledge in building static web pages. Introduction to building social profiles through web blogging and video blogging.
			CO3	Understand the concept of report writing using a markup language Latex. Build reports using Latex and apply templates and Bibliography in latex for various documentation purposes.
				Understand the concept of data visualization and apply visualization techniques in creating data visualization dashboards with tools like

			CO4	Power BI, Understand the basic concept of VR/AR and apply them to build projects from neighborhood for social causes.
6	21UC1203	Design Thinking and Innovation	CO1	Understand the basics of design thinking and its implications in product or service development
			CO2	Understand and Analyze the requirements of a typical problem
			CO3	Plan the necessary activities towards solving the problem through ideation and prototyping
			CO4	evaluate the solution and refine them based on the customer feedback
7	21UC1202	English Proficiency	CO1	Demonstrating different interpersonal skills for employability
			CO2	Distinguishing business essential skills
			CO3	Classifying social media and corporate communication skills
			CO4	Applying analytical thinking skills
8	21MT2102	Mathematics for Engineers	CO1	Apply differential and integral calculus to find maxima & minima of functions, evaluate the integrals and solve the differential equations.
			CO2	Demonstrate the Fourier series and Laplace transforms.
			CO3	Describe probability , Random Variables
			CO4	Explain complex variables, analytic functions and introduction to stochastic process and Algebraic structures.
9	21SC1209	DESIGN TOOLS WORKSHOP 2	CO1	Practice the design ideology by artistic skill
			CO2	Visualize the design ideology by using VR technology
			CO3	Visualize the design ideology by incorporating VR technique
			CO4	Visualize and present his design idea by applying AR technique

10	21SC1202	Data Structures	CO1	Analyze and measure efficiency of algorithms
			CO2	Develop and analyze different Sorting Algorithms along with stacks and queues.
			CO3	Develop and Analyze different Trees and their applications.
			CO4	Develop and Analyze different Hashing techniques and priority queues
			CO5	Implement Data Structures concepts by Analyzing requirements of a problem and design to implement lab-based project.
11	21AD1202	Object Oriented Programming System (Python)	CO1	Apply the concepts of Basic Data types, Operators, Decision and Looping Control Statements, Strings
			CO2	Apply the concepts of Lists, Tuples, Dictionaries. Functions, Modules, Class, Object, OOPS principles.
			CO3	Apply Concepts of OOP principles, classes and objects, Call by value vs. Call by reference recursion, and Nested classes
			CO4	Apply Concepts of Files, Interfaces, Packages, Threads
			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
12	21SC1201	Artificial Intelligence	CO1	Understand the Terminology of Artificial Intelligence and its allied technologies.
			CO2	Summarize the stages in Artificial Intelligence and Machine learning
			CO3	Determine the Applications of AI and state of art algorithms
			CO4	Demonstrate problem solving through applications of AI
13	21AD2104	Probability and Statistics for Data Science	CO1	Identify the types of random variables and apply discrete distributions to analyse various real-world situations
			CO2	Construct the probability distribution of a continuous random variable based on a real-world problem, and also predict the linear and non-linear relationship between the two variables
			CO3	Apply statistical tests for large and small samples to test the hypothesis.
			CO4	Testing the hypothesis to analyze the variance by applying suitable design
14	21AD2109	Design and Analysis of Algorithms	CO1	Understand time and space complexity, computation of complexity for problems solvable by divide and conquer technique

			CO2	Apply greedy and dynamic algorithm design methodologies to solve problems
			CO3	Apply state space tree methods for solving searching problems.
			CO4	Distinguish between P and NP classes of problems and solve complex problems
			CO5	Analyze and apply suitable design technique to solve given real world problems
15	21AD2205	Machine Learning	CO1	Understanding the basics of Machine learning and regression analysis
			CO2	Apply classification algorithms for solving real world problems
			CO3	Apply unsupervised learning algorithms for solving real world problems
			CO4	Apply Reinforcement learning, Dimensionality reduction techniques and Ensemble methods
			CO5	Implement Machine Learning Techniques using Python Language
16	21AD2202	Data Science & Visualization	CO1	Understanding data science, data collection, and data pre-processing
			CO2	Applying descriptive statistical sampling techniques to explore the various real world data sets
			CO3	Build data wrangling models with data science libraries like NumPy and pandas
			CO4	Applying various data visualization tools to explore the data
			CO5	Implement Various Data Science and Visualization Techniques to Real World Problems using Python
17	21AD2203	Datawarehouse and Data Mining	CO1	Understand data models, transactions, and concurrency control mechanism.
			CO2	Understand stages in building a Data Warehouse
			CO3	Analyze pre-processing techniques for data cleansing multi-dimensional modelling techniques.
			CO4	Analyze and evaluate performance of algorithms for Association Rules. Analyze Classification and Apriori algorithm, FP-Growth
			CO5	Evaluate mining techniques like classification, clustering, and association rules on data objects
18	21AD2206	Mathematical Programming	CO1	Apply various methods for finding the optimal solution of Linear Programming Problem.
			CO2	Apply Integer and Fractional programming approaches for solving discrete and concave optimization problems.
			CO3	Apply Combinatorial optimization techniques to build Approximation algorithms.

			CO4	Apply Robust Linear programming and Non-Linear programming
19	21AD2102	Data Management	CO1	Understand the fundamentals of DBMS, relational model and views
			CO2	Analyze queries using relational algebra, calculus and SQL
			CO3	Apply normalization techniques and indexing to construct and access decent database.
			CO4	Understand the importance of NOSQL and its categories
			CO5	Create a good database and develop SQL queries for data analysis
20	21AD2204	Enterprise Software Development	CO1	Understand the basic concepts of XML. Apply JDBC API and callable statements Learn Maven to build Enterprise Java applications. Implement servlets using Maven
			CO2	Implement enterprise application using JSP and Hibernate
			CO3	Implement enterprise application using Spring Framework
			CO4	Use Spring Boot, Rest APIs and integrating Enterprise Java applications
			CO5	Develop the programs for enterprise application development.
21	21AD2201	Computer Networks and Security	CO1	Understand the OSI and TCP/ IP reference models and classify the error control mechanisms like CRC and Hamming code.
			CO2	Categorize the static and dynamic routing algorithms like Dijkstra, distance vector routing and link state. Identify the significance of UDP and TCP.
			CO3	Implement various symmetric and Asymmetric Cryptographic algorithms
			CO4	Apply the Concepts of hashing and various key distribution mechanisms to secure the network
			CO5	Implement various Networking concepts and analyse their performance using various networking tools
22	21AD2107	Operating Systems	CO1	Students will be able to understand various concepts of operating system, implement various means of inter-process communication techniques
			CO2	Understand the concept of threads and apply various scheduling algorithms, understand the synchronization problems.
			CO3	offer solutions to the synchronization problems, deal with various means of handling deadlock .

			CO4	Analyze various means of managing the memory and understand file system concepts
23	21AD2105	Software Engineering	CO1	Able to understand the software process and choose appropriate process model and with a brief of agile software developments.
			CO2	Able to understand models and methodology, elicit, analyze and specify software requirements through a productive working relationship with various stakeholders of a software development project.
			CO3	Apply the Concepts of design approaches and implement the user interface and get inside the testing strategies.
			CO4	Apply the software quality metrics and measure and cost estimation of the developing software before delivery to the customer
24	21AD3102	Cloud Computing	CO1	Understand and analyze the architecture of Cloud
			CO2	Identify and apply deployment and management options of AWS Cloud Architecture
			CO3	Design architectures to decouple infrastructure and reduce interdependencies
			CO4	Formulate policy-based scenarios in Cloud simulators
			CO5	To understand and implement the concepts of cloud computing using AWS, GCP &Azure.
25	21AD3101	Automata Theory & Compiler Design	CO1	Construct FA for different languages and regular expressions.
			CO2	Construct Context Free Grammars for different languages. And analyze the role of the Lexical Analyzer
			CO3	Construct different top-down and bottom-up parsers and define syntax directed definition and translation schemes
			CO4	Generate intermediate code, target code and apply different code optimization techniques
26	21AD3104	Deep Learning	CO1	To be able to understand and remember the concepts of Perception, Back Propagation, PCA, Singular Value Decomposition
			CO2	To able to remember auto encoders- 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	To be able to Solve the vanishing gradient problem with LSTMs Encoder Decoder Models, Attention Mechanism, Attention over images, Hierarchical Attention Directed Graphical Models, Markov Networks
			CO4	To be able to use Markov Chains Sampling for training RBMs, Contrastive Divergence for training RBMS
			CO5	Implement basic Neural Networks, optimization algorithms, engine vector decomposition, various types of auto encoders, batch normalization, convolutional neural networks

27	20AD3105	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
28	21AD3107	Signal Processing	CO1	To understand fundamentals of digital signals
			CO2	To understand the relationships between continuous-time and discrete-time signals and systems.
			CO3	To study fundamentals of time, frequency and z-plane analysis and to discuss the interrelationships of these analytic method.
			CO4	To be able to use Markov Chains Sampling for training RBMs, Contrastive Divergence for training RBMS
29	21AD3202	Natural Language Processing	CO1	Understanding basic concepts related to Natural Language Processing
			CO2	Apply the statistical estimation and statistical alignment models
			CO3	Applying grammar formalism and context free grammars
			CO4	Applying Rule based Techniques, Statistical Machine translation (SMT), word alignment,
30	21AD3203	Computer Vision	CO1	Understanding concepts of Geometric primitives & transformations
			CO2	Understanding overview of Image Processing
			CO3	Apply Feature Detection and Matching
			CO4	Apply Machine Learning for Computer Vision Applications
31	21AD3204	Speech processing	CO1	Understanding concepts of speech processing
			CO2	Understanding overview of speech analysis
			CO3	Applying classical speech analysis models
			CO4	Applying deep neural networks in Speech processing

32	21AD3210	High Performance Computing	CO1	Analyse the performance of Parallel Computers and understand shared memory API OpenMP
			CO2	Analyse the performance of Distributed memory programming with MPI
			CO3	Develop mixed mode programs for Multicore, GPU and cluster optimization systems
			CO4	Generate parallel programs for matrix, graph and sorting problems using Cuda, OpenMP library
33	21AD3106	Big Data Engineering	CO1	Apply big data use cases from selected business domains.
			CO2	Construct NoSQL big data management
			CO3	Install, configure, and run Hadoop and HDFS
			CO4	Perform map-reduce analytics using Hadoop
34	21AD3205	Analytics for the IoT	CO1	Understand the working process of IOT and its Architecture, Visualization and Integration, Device Management, IoT Data Lifecycle
			CO2	Understand the Arduino IDE, pins of ESP8266 Development Board, Programming Node MCU Board and ESP8266 Web server.
			CO3	Apply Analog sensors - Working Light, source code for measuring Temperature and Humidity.
			CO4	Analyze and apply Thing speak IoT Cloud API. And Implementing the Project: Sending Temperature and Humidity Values to Thing speak Cloud, Visualizing Sensor Data in APP.
35	21AD3206	Social Media Analytics	CO1	Understand to the basic concepts of social network analysis.
			CO2	Understand Apply 'R' Language for Data Analytics and Visualization.
			CO3	Apply and Analyze the Twitter Data using 'R', and to draw meaningful insights and provide Graphical representation of data analysis
			CO4	Apply and Analyze the Facebook Data using 'R', and native analytics tools
36	21AD3207	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.
37	21AD3211	Cyber Security 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.
38	21AD3208	Recommender systems	CO1	Understand the core principles of convex and linear optimization principles
			CO2	Understand the digital and user choice engineering
			CO3	Analyse the contextual information model and reinforcement learning
			CO4	Interpret the diffusion awareness in RS through social network