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
Campus: Green Fields, Vaddeswaram - 522 302, Guntur District, Andhra Pradesh, INDIA.
Phone No. +91 8645 - 350 200; www.klef.ac.in; www.klef.edu.in; www.kluniversity.in
Admin Off: 29-36-38, Museum Road, Governorpet, Vijayawada - 520 002. Ph: +91 - 866 - 3500122, 2576129

Department of Internet of Things

Program: B.Tech -Internet of Things

Academic Year:2023-2024

COURSE CODE	COURSE NAME	CO NO	Description of the Course Outcome
23UC1101	Integrated Professional English	CO1	Understand the concepts of grammar and to improve communication skills in reading and writing.
		CO2	Demonstrate the ability in interactive skills of speaking and writing that are better suited for a corporate environment.
		CO3	Understand various strategies of reading and use them in interpreting the text.
		CO4	Apply the concepts of writing to draft corporate letters, emails memos, reports, etc.
23UC1202	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
23UC2103	Essential Skills for Employability	CO1	Identify and organize sentence structures based on grammar
		CO2	Illustrate specific writing styles
		CO3	Relate intra-personal skills
		CO4	Interpret interpersonal Skills for developing oral communication
23UC2204	Corporate Readiness Skills	CO1	Extend word power for developing effective speaking and writing skills
		CO2	Differentiate critical and general reading skills
		CO3	Interpret interpersonal skills
		CO4	Demonstrate the necessary skills to be employable
23UC0010	Universal Human Values & Professional Ethics	CO1	Realize and understand the basic aspiration, and harmony in the human being.
		CO2	Envisage the roadmap to fulfil the basic aspirations of human beings.
		CO3	Analyze the profession and its role in this existence
		CO4	Understand the profession and his role in this existence
23UC0007	KNOWLEDGE SYSTEMS - ENGI	CO1	Familiarizing students with various aspects of Indian culture and how they contribute to the concept of Unity in Diversity

Dr. P. SATYANARAYANA
Professor & Head
Department of IoT
K L E F
Green Fields, Vaddeswaram
Guntur Dist., A.P. Pin-522 502.

		CO2	Understand the beginnings of Indian History and the developments during the ancient period
		CO3	Understand the developments in India during the Medieval Age along with how they contributed to Indian civilization
		CO4	Understand the reasons for colonial rule over India and how independence was achieved from British rule
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
23UC0009	Ecology & Environment	CO1	Understanding the importance of Environmental education and the conservation of natural resources
		CO2	Understanding the Ecosystems, biodiversity
		CO3	Understand global Environmental issues, pollution
		CO4	Understand the knowledge on solid waste management, disaster management and EIA process
23UC0016	GENDER & SOCIAL EQUALITY	CO1	Develop a better understanding of important issues related to gender in contemporary India
		CO2	Sensitize to basic dimensions of the biological, sociological, psychological and legal aspects of gender.
		CO3	Attain a finer grasp of how gender discrimination works in our society and how to counter it.
		CO4	Acquire insight into the gendered division of labour and its relation to politics and economics.
23MT1001	LINEAR ALGEBRA & CALCULUS FOR ENGINEERS	CO1	Apply matrix algebra concepts to solve a system of linear equations.
		CO2	Apply multivariate differential calculus to find the extremum of functions and solve differential equations.
		CO3	Solve improper integrals using beta and gamma functions and also evaluate double and triple integrals.
		CO4	Evaluate line, surface and volume integrals by vector calculus concepts.
22MT2003	MATHEMATICAL MODELLING & NUMERICAL METHODS	CO1	Modeling and solution of algebraic and transcendental equations: Bisection method and Newton–Raphson method. Finite differences: Forward, Backward, Shift operators, average operator and relations between the difference operators. Interpolation: Lagrange and Newton's divided difference formulas.
		CO2	Numerical solution of ordinary differential equations: Taylor's, Eulers, Modified Eulers's and Runge-Kutta's method of fourth order. Numerical solutions of a system of linear equations: Models of a system of linear equations-Jacobi and Gauss-Seidel methods

Dr. P. SATYANARAYANA
Professor & Head
Department of IoT
K L E F
Green Fields, Vaddeswaram
Guntur Dist., A.P. Pin-522 502.

		CO3	Formation of partial differential equations, solutions of first-order linear and nonlinear PDEs, Lagrange method, and Charpit's method
		CO4	Method of separation of variables i.e., one-dimensional wave and heat equations, Laplace equation in two dimensions. Solving Laplace equation by finite difference method.
23MT2007	RANDOM VARIABLES AND STOCHASTIC PROCESS	CO1	Apply Mathematical models of random phenomena and solve probabilistic problems.
		CO2	Analyze different types of random variables and compute statistical parameters of the random variables.
		CO3	Apply random processes in the time domain and model time-varying linear systems.
		CO4	Analyze random processes in frequency domains and model spectral characteristics of LTI systems.
23MT2004	MATHEMATICAL PROGRAMMING	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 LINEAR PROGRAMMING PROBLEMS using interior point methods
		CO4	Apply Cutting plane Branch and Bound methods to solve Discrete optimization problems.
23UC1203	Design Thinking and Innovation	CO1	Understand the importance of the Design Thinking process for contextualized problems
		CO2	Analyze, define, and ideate for solutions
		CO3	Develop and test the prototype made
		CO4	Explore the fundamentals of entrepreneurship skills for transforming the challenge into an opportunity
23CY1001	Engineering Chemistry	CO1	Predict potential complications from combining various chemicals or metals in an engineering setting
		CO2	Discuss fundamental aspects of electrochemistry and materials science relevant to corrosion phenomena
		CO3	Examine water quality and select the appropriate purification technique for the intended problem
		CO4	Explain the role of chemical kinetics in the formation and destruction of ozone in the atmosphere and predict the connection between molecular behaviour and observable physical properties.
		CO5	An ability to analyze and generate experimental skills
23UC3105	Problem Solving Skills-I	CO1	Apply the concepts of mathematical principles besides logic and identify certain basic mathematical formulae to solve these kinds of problems
		CO2	Formulate the concepts of mathematical principles of equations that contain the data relating to real life situations which require basic logic to analyze

Dr. P. SATYANARAYANA
Professor & Head
Department of IoT
K L E F
Green Fields, Vaddeswaram
Guntur Dist., A.P. Pin-522 502.

		CO3	Solve concepts of Venn diagrams and number patterns and illustrate the logic behind connectives, series, and analogies respectively
		CO4	Differentiate assumptions and arguments in critical reasoning
23UC3206	Problem Solving Skills-II	CO1	Implement problem solving ability by analyzing the given data and formulating solutions for real world problems based on time, travel and wages
		CO2	Determine the fundamental concepts of areas, and volumes and derive solutions using simple mathematical principles besides interpreting the data through smart tricks to check the number analytics
		CO3	Estimate inductive reasoning, to categorize the rules set from a given list of observations and relate them to predict the conclusions according to the given conditions
		CO4	Integrate verbal and non-verbal reasoning and identify the logic behind the given arrangement based on the given conditions to bring out the possible outcome
23SC1101	Computational Thinking for Structured Design	CO1	Design Basic and Complex Building Blocks for real world problems using a structured programming paradigm
		CO2	Translate computational thinking into Logic Design for Solving real world
		CO3	Apply and Analyse CRUD operations on Basic Data Structures using Asymptotic Notations
		CO4	Apply and Analyse 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
		CO6	Skill the students in such a way that students will be able to develop logic that helps them to create programs as well as applications in C
23UC0017	KNOWLEDGE SYSTEMS - VEDIC MATHE	CO 1	List all the 16 sutras in Vedic Mathematics, Using Vedic mathematics sutras to perform basic arithmetic operations.
		CO 2	Develop the critical thinking skills to solve Shakuntala Devi Puzzles.
23ME1103	Design Tools Workshop	CO 1	Practice design thinking by developing artistic skills, Visualize and complete his/her innovative design by final drafting using 3D modelling
		CO 2	Understand the concept of web pages, web browsers, web servers, and able to create Static webpages
		CO 3	Understand the concept of report writing using a markup language Latex
		CO 4	Understand the concept of data visualization and creating data visualization dashboards, Understand the basic concept of VR/AR
23EC1101	FUNDAMENTALS OF IOT AND SENSORS	CO1	Able to demonstrate their understanding and apply the basic concepts of IoT by utilizing the Development Hardware for implementation.

Dr. P. SATYANARAYANA
Professor & Head
Department of IoT
K L E F
Green Fields, Vaddeswaram
Guntur Dist., A.P. Pin-522 502

		CO2	Able to demonstrate their comprehension and apply knowledge about various sensors interfacing with Development Hardware
		CO3	Able to understand and apply the concepts on different systems to interface various actuators with Development Hardware.
		CO4	Able to apply and analyze the IoT concept to solve real time insights
		CO5	Able to apply and analyze the concept of IoT by interfacing with sensors and Development Hardware
23SC1202	Data Structures	CO1	Understand various sorting algorithms and analyze the efficiency of the algorithms
		CO2	Implement Linear Data Structures and Demonstrate their applications.
		CO3	Understand hashing techniques and Implement tree data structures.
		CO4	Understand graph data structures and apply graphs to solve problems
		CO5	Develop and evaluate common practical applications for linear and nonlinear data structures.
23EC1202	DIGITAL DESIGN AND COMPUTER ARCHITECTURE	CO1	Build the combinational and programmable digital logic circuits using logic gates and optimization methods
		CO2	Construct the sequential and memory circuits using flip-flops
		CO3	Able to organize computer architecture and instruction sequence
		CO4	Model the Memory Architecture and I/O Organization modules
		CO5	Develop and analyze computer architecture modules using basic combinational, sequential and memory logic
23SC1203	COMPUTATIONAL THINKING FOR OBJECT-ORIENTED DESIGN	CO1	Apply Object oriented paradigm for code reusability
		CO2	Design object-oriented solutions to real-world problems through SOLID design principles
		CO3	Demonstrate Exception handling and String manipulation techniques
		CO4	Build Abstract Data Types by applying generic classes and Java API
		CO5	Apply Object Oriented Paradigm with logical building blocks to develop solutions for real world problem
		CO6	Develop a real time project by using object-oriented programming concepts.
23EC1203	BASIC ELECTRICAL AND ELECTRONIC CIRCUITS	CO1	Understand the basic concepts of circuits and their fundamentals
		CO2	Grasp the principles of AC circuits,including sinusoidal waveforms, impedance, and power factor.
		CO3	Comprehend the behaviour of basic electronic components, such as diodes, and transistors.
		CO4	Understand the basic functional Principles of analog and digital ICs.
23IN2102	ELECTRONIC DEVICES AND INTEGRATED CIRCUITS	CO1	Understand the BJT operations and a circuit function.
		CO2	Understand the FET operations and circuit functions
		CO3	Understand the Op.-Amp operations and circuit functions
		CO4	Understand the Op-Amp filters and Oscillator circuit functions
22PH1211	PHYSICS FOR ELECTRONIC ENGINEERS	CO1	Understand and describe the classical and quantum free electron theory and the band theory of solids.
		CO2	Understand different types of semiconductors and determination of carrier concentration carrier generation - recombination mechanisms

Dr. P. SATYANARAYANA
Professor & Head
Department of IoT
K L E F
Green Fields, Vaddeswaram
Guntur Dist., A.P. Pin-522 502

		CO3	Understand the theory and operations of p-n junction diode and bipolar junction transistor.
		CO4	Understand the operations of optoelectronic semiconductor devices.
		CO5	Apply the knowledge of physics to understand the characteristics of semiconducting materials as different applications.
23EC2106	Processors and Controllers	CO1	Understand the architecture and programming concepts of the 8086 Microprocessor
		CO2	Understand the architecture and programming concepts of the 8052 microcontrollers
		CO3	Apply the Programming concepts of the 8051 and Interfacing of Peripherals.
		CO4	Understand the basic architectures of PIC and ARM 7 microcontrollers and design the systems.
23IN3105	Embedded Systems Design	CO1	Understand the architecture and programming concepts of the 8086 Microprocessor
		CO2	Apply the Programming concepts of the 8051 Microcontroller
		CO3	Analyse the Interfacing of Peripherals to the 8051 microcontrollers through programming. Understand the basic architectures of PIC and ARM 7 microcontrollers
		CO4	Understand the basic concepts of CORTEX STM-32 microcontroller and RTOS
		CO5	Analyze the applications of programming with 8051 and 8086 on hardware/software. Analyze the applications of programming with Arduino
23AD2102R	Database Management 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, and indexing to construct and access database
		CO4	Analyze the importance of transaction processing, concurrency control and recovery techniques.
		CO5	Design a database and implement SQL queries and PL/SQL programs to do various operations on data.
		CO6	Design and query database using database programming skills
23SDEC01R	IOT HARDWARE PROGRAMMING	CO1	ESP 32 Introduction – Pin Configuration – Features - Applications – Software and Driver Tools – Arduino IDE installation – ESP32 Boards manager package installation, GPIO, SERIAL COMMUNICATION– Posting data to cloud database
		CO2	Raspberry Pi Introduction – Features - Applications – Software and Driver Tools – Raspberry Pi OS installation –GPIO, control LEDs, Switches, Sensors, and Actuators
		CO3	Raspberry Pi Communication Protocol Connecting Raspberry Pi to cloud platforms, uploading sensor data to the cloud, Implementing cloud-based dashboards and remote control of devices
		CO4	Designing an IoT project using Raspberry Pi, integrating sensors, actuators, and communication protocols, Testing, debugging, and deploying IoT applications,

Dr. P. SATYANARAYANA
Professor & Head
Department of IoT
K L E F
Green Fields, Vaddeswaram
Guntur Dist., A.P. Pin-522 502.

23AD2001R	ARTIFICIAL INTELLIGENCE & MACHINE LEARNING	CO1	Acquire advanced Data Analysis skills.
		CO2	Stay Industry relevant and grow in your career
		CO3	Create AI/ML solutions for various business problems.
		CO4	Build and deploy production grade AI/ML applications
23SDIN03R	IOT FULL STACK DEVELOPMENT	CO1	Apply foundational Node-Red concepts to create structured and semantic front-end elements for IoT applications.
		CO2	Apply HTML and CSS styling techniques to design visually appealing and responsive user interfaces for IoT-based interfaces.
		CO3	Develop scripts and applications to collect and process data from IoT sensors and devices, providing real-time updates to the front end.
23IN2101R	IOT SYSTEM DESIGN	CO1	Apply the concepts of IoT Architecture and Technologies
		CO2	Apply the logical design of IoT systems and communication technologies.
		CO3	Apply IoT networking protocols and Authentication Protocols for the IoT Application layer.
		CO4	Apply IoT protocols and programming concepts for real-world problems.
		CO5	Analyze the diverse application of diverse case studies
23IN2203	WIRELESS TECHNOLOGIES FOR INTERNET OF THINGS (WTIoT)	CO1	identify and summarize the important features of wireless communication and TCP/IP network protocols.
		CO2	develop software applications running on IoT modules
		CO3	describe the sensor data processing with MQTT (a machine-to machine (M2M)
		CO4	Build Wireless Internet of Things (IoT) Applications
		CO5	Develop IoT applications using EM simulation software to visualize electromagnetic fields and understand the characteristics of antennas for wireless communication
23SDIN04R	Cloud Computing for IoT	CO1	To understand the cloud computing services, deployment models, enabling technology and architecture
		CO2	understand and apply different cloud infrastructures virtualization and storage in different virtualization
		CO3	Analyze the concept of Data security and privacy in a virtual machine
		CO4	Analyze the different case studies on healthcare, agriculture and parking system
		CO5	To analyze and integrate sensors reading values and uploading to Azure.
23EC2210R	NETWORK PROTOCOLS AND SECURITY	CO1	Apply the knowledge of communication to understand and analyze the physical and data link layers in networks
		CO2	Analyze different Network layer protocols and Routing algorithms
		CO3	Analyze different Transport Layer, Session Layer, Presentation Layer and Application Layer Protocols
		CO4	Analyze different cryptography algorithms

Dr. P. SATYANARAYANA
Professor & Head
Department of IoT
K L E F
Green Fields, Vaddeswaram
Guntur Dist., A.P. Pin-522 502.

		CO5	Analyze different enterprise network Protocols
		CO6	Analysis of different protocols with different topologies in networks
23IN3104R	REALTIME OPERATING SYSTEMS	CO1	Understand subsystem components of the Kernel
		CO2	Understand memory and process virtualization and Paging, apply Page Replacement Algorithms
		CO3	Understand and apply the threading issues for RTOS and Scheduling algorithms
		CO4	Understand and Apply the memory management concepts in RTOS
		CO5	Able to perform experimentation Real-Time Operating Systems Other Basic Operating System Functions
23IN2105	Deep Learning	CO1	Able to understand and remember the concepts of Perception, Back Propagation, PCA, Singular Value Decomposition
		CO2	Able to understand autoencoders- and apply Regularization, Denoising, Sparse, Contractive, and Vectoral Representations of words Convolutional Neural Networks, LeNet, VGGNet, GoogleNet, ResNet, Fast RCNN, Faster RCNN, YOLO
		CO3	Apply Long Short-Term Memory (LSTM) Restricted Boltzmann Machines, Deep Dream, GRU, Neural style transfer, and 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), how to train DCGAN, limitations of deep learning
		CO5	Implement basic Neural Networks, optimization algorithms, engine vector decomposition, various types of autoencoders, batch normalization, convolutional neural networks
23IN2106	Big data Analytics	CO 1	Ability to find and transmit data emanating from different embedded and IoT devices
		CO 2	Ability to use HADOOP and MAP reduce tools in the process of undertaking Analytics
		CO 3	Ability to develop data Modelling, Structuring, and Analytics using "R" Language
		CO 4	Ability to conduct various kinds of analytics on big data especially using text
23IN3054	Industrial IoT	CO1	Apply the theory and practice related to Industrial IoT Systems
		CO2	Identify, formulate, and solve engineering problems by using Industrial IoT
		CO3	Design and analysis of Cyber-Physical System
		CO4	Implement real field problems by gaining knowledge of Industrial applications with IoT capability.
23IN3065	Edge Computing	CO1	understand an IoT application using Edge computing
		CO2	Apply the Fog computing process and data analytics on
		CO3	Understand the data analytic tools
		CO4	Analyse and choose the right Data Analytic/ Machine learning tool for various IoT applications

Dr. P. SATYANARAYANA
Professor & Head
Department of IoT
K L E F
Green Fields, Vaddeswaram
Guntur Dist., A.P. Pin-522 50

		CO5	Design and implementation of IoT systems with edge computing

Academic Professor I/C

HOD-IOT

Dr. P. SATYANARAYANA
Professor & Head
Department of IoT
K L E F
Green Fields, Vaddeswaram
Guntur Dist., A.P. Pin-522 502.