



Koneru Lakshmaiah Education Foundation

(Category -1, Deemed to be University estd. u/s. 3 of the UGC Act, 1956)

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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 Electrical and Electronics Engineering
Program: B.Tech -Electrical and Electronics Engineering
Academic Year: 2018-2019

Course Code	Course Title	CO NO	Description of the Course Outcome
18SC1103	SINGLE VARIABLE CALCULUS AND MATRIX ALGEBRA	CO1	Model the physical laws and relations mathematically as a first order differential equations, solve by analytical and numerical methods also interpret the solution
		CO2	Model physical laws and relations mathematically as a second/higher order differential equations, solve by analytical method and interpret the solution
		CO3	Obtain the Fourier series expansions of periodic functions and use the series to solve ordinary differential equations
		CO4	Model physical problems mathematically as a system of linear equations and solve them by analytical and numerical methods. Also, determine the nature of Quadratic form using Eigen values
		CO5	Verify the solution of problems through MATLAB
18SC1104	FOUNDATIONS OF COMPUTATIONAL MATHEMATICS	CO1	Evaluate mathematical expressions by using different types of operations on numbers
		CO2	Simplify expressions and solve equations & inequations.
		CO3	Apply different types of arithmetic expressions to solve given problems.
		CO4	Apply methods to find areas, volumes and use graphs to reduce non-linear to linear forms
18MT1201	MULTIVARIATE CALCULUS	CO1	Determine extreme values for functions of several variables
		CO2	Determine area, volume moment of inertia through multiple integrals in Cartesian or polar co ordinates
		CO3	Apply the concepts of vector calculus to calculate the gradient, directional derivative, arc length, areas of surfaces and volume of solids in practical problems
		CO4	Obtain analytical and numerical solutions of Heat and wave equations
		CO5	Verify the solution of problems through MATLAB
18SC1105	LOGIC AND REASONING	CO1	Apply the fundamental principle of counting and use them to measure the uncertainty in random experiments
		CO2	Apply Venn diagrams to find the conclusion of statements, solve puzzles using binary logic and problems relating to cubes
		CO3	Apply the available models for Data sufficiency & redundancy and interpret it, when given, in tabular and graphical forms.
		CO4	Apply the Reasoning techniques to solve problems on arrangements, series, analogies, coding and decoding
18CY1001	ENGINEERING CHEMISTRY	CO1	Predict potential complications from combining various chemicals or metals
		CO2	Discuss fundamental aspects of electrochemistry and materials science
		CO3	Examine water quality and select appropriate purification technique
		CO4	Apply polymers, conducting polymers, green chemistry and nano chemistry

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		CO5	An ability to analyze & generate experimental skills
18SC1101	PROBLEM SOLVING AND COMPUTER PROGRAMMING	CO1	Illustrate how problems are solved using computers and programming.
		CO2	Illustrate and use Control Flow Statements in C.
		CO3	Interpret & Illustrate user defined C functions and different operations on list of data.
		CO4	Implement Linear Data Structures and compare them.
		CO5	Apply the knowledge obtained by the course to solve real world problems.
18SC1202	DATA STRUCTURES	CO1	Illustrate solving typical problems using Arrays, Strings and Lists.
		CO2	Demonstrate applications of stacks & queues and solving typical problems using recursion.
		CO3	Demonstrate use of sorting, Heaps and binary tree techniques in problem solving.
		CO4	Examine AVL trees and Hashing techniques.
		CO5	Apply the knowledge obtained by the course to solve real world problems.
18EE3201	Electrical Engineering Measurements	CO1	Understand the Basic fundamentals of a measurement system.
		CO2	Understand various Mechanical measuring parameters, and apply different measuring techniques on various mechanical parameters using simulation and experimentation tools.
		CO3	Understand various Electrical measuring parameters, and apply different measuring techniques on various Electrical parameters using simulation and experimentation tools.
		CO4	Understand various Electronic measuring parameters, and apply different measuring techniques on various Electronic parameters using simulation and experimentation tools.
		CO5	Apply the theoretical concepts to measure different parameters.
18UC2204	Aptitude Builder -1	CO1	Understand the concept of forces and apply the static equilibrium equations.
		CO2	Analyze co-planar and non co-planar system of forces.
		CO3	Apply the concept of centroid & centre of gravity to determine moment of inertia.
		CO4	Analyze the rigid bodies under translation and rotation with and without considering forces.
18EC1002	Engineering Graphics & Design for Electrical Engineers	CO1	Understand the principles of drawing and use of drafting instruments
		CO2	Draw engineering curves and scales.
		CO3	Draw the projections of points, lines, planes and solids
		CO4	Draw the surface sheath of solids by development of surfaces and the sections of Solids.
		CO5	Prepare 2D & 3D drawings of solids and their transformations.
18EE1003	WORKSHOP PRACTICE FOR ELECTRICAL ENGINEERS	CO1	prepare the different joints using carpentry trade by using wood as raw material
		CO2	prepare the different fits using fitting trade with Ms plates as raw material

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		CO3	prepare the different components using Tinsmithy trade by using GI sheet as raw material
		CO4	Apply basic electrical engineering knowledge for house wiring practice.
18UC3105	Aptitude Builder -2	CO1	Improve pronunciation skills and understand the method of identifying antonyms.
		CO2	Apply writing strategies for office/ formal communication
		CO3	Analyze types of reading techniques and improve reading speed.
		CO4	Analyze different cultures and the importance of empathy in cross-cultural communication.
18UC2103	Professional Communication Skills	CO1	Analyse the concept of Group Discussion and speak effectively during the discussion.
		CO2	Apply and analyze various concepts of writing strategies in professional communication skills like, reports, proposals and minutes of the meeting.
		CO3	Analyse vocabulary and apply the types of reasoning in comprehending the information.
		CO4	Apply the mechanics and application of presentation skills and apply people skills in various social organizational and corporate ambiances.
18UC3206	Campus to Corporate	CO1	Analyse the method of identifying synonyms and antonyms and analyze the meaning of a word from the context.
		CO2	Analyze various strategies involved in writing an essay and apply various styles in writing.
		CO3	Analyse the organization of the passage and also analyze the tone, attitude and style of the author.
		CO4	Acquire knowledge on various employability skills & analyze a situation and develop adaptability.
18PH1004	Solid State Physics	CO1	Understands structure of crystalline solids, kinds of crystal imperfections and appreciates structure-property relationship in crystals.
		CO2	Understands magnetic properties of materials and identifies their role in classification soft & hard magnetic materials having specific engineering applications.
		CO3	Understands thermal and mechanical properties of materials, heat treatment methods for changing the microstructure of materials and responses of materials subjected to load.
		CO4	Understands the role of electronic energy band structures of solids in governing various electrical and optical properties of materials.
		CO5	Apply the knowledge on structure and properties of materials while executing experiments and develop inter disciplinary projects.
18UC0009	ECOLOGY AND ENVIRONMENT	CO1	Understand the importance of Environmental education and conservation of natural resources.
		CO2	Understand the importance of ecosystems and biodiversity.
		CO3	Apply the environmental science knowledge on solid waste management, disaster management and EIA process.
		CO4	Apply the environmental science knowledge on solid waste management, disaster management and EIA process.

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18UC0010	Universal Human Values & Professional Ethics	CO1	Understand and identify the basic aspiration of human beings
		CO2	Envisage the roadmap to fulfil the basic aspiration of human beings.
		CO3	Analyze the profession and his role in this existence.
		CO4	Analyze the profession and his role in this existence.
18UC0008	Indian Constitution	CO1	Identify the evolution and application of Electrical Engineering
		CO2	Understand the principles of Power Engineering
		CO3	Recognize the necessity of electrical power conversion and control
		CO4	Acquired knowledge about the basic Electronics
18EE1202	ELECTROMAGNETIC FIELDS	CO1	Apply the vector algebra to analyse electrostatic field distributions
		CO2	Understand the importance of magneto static field and analyse its spatial distributions
		CO3	Analyse the Force generation due to static fields
		CO4	Analyse the importance of Electromagnetic fields and its distributions
18EM3201	SIGNAL PROCESSING	CO1	Understand the representation, manipulation and operations of Continuous-Time and Discrete Time signals and systems.
		CO2	Explore the Continuous-Time signals in Fourier domain and illustration of sampling theorem.
		CO3	Understand the Laplace Transforms and application to LTI systems.
		CO4	Analyze Discrete Time signals in in Fourier and Z-Transform domain.
		CO5	Apply and evaluate signals and systems concepts to various applications under transform domain.
18EE1201	NETWORK THEORY	CO1	Understand the circuit elements, Kirchhoff's law and theorems to solve the networks
		CO2	Analyze the steady state behaviour of AC networks
		CO3	Analyze the physical circuits with Two port network
		CO4	Understand the fundamentals of magnetic circuits and its analysis
18EC1101	DIGITAL SYSTEM DESIGN	CO1	Understand numerical and character representations in digital logic, number system, data codes and the corresponding design of arithmetic circuitry.
		CO2	Understanding Logic gates, Logic theorems, Boolean algebra and SOP/POS expressions.
		CO3	Combinational and sequential systems design using standard gates and flip-flops and minimization methods
		CO4	Verilog HDL design for logic gates, combinational and sequential Logic Functions.
		CO5	Concepts of Programmable Logic devices.
18EC2103	ANALOG ELECTRONIC CIRCUIT DESIGN	CO1	Understand the industrial processes and organizations connected with the profession and relate classroom learning with real life situation by taking into the consideration of various design concepts
		CO2	Understanding the concepts of various diodes and their applications.
		CO3	BJT concepts as operation, biasing and frequency response
		CO4	FET concepts as operation, biasing and frequency response
		CO5	Feedback concepts and their analysis
18EC2205	EMBEDDED CONTROLLERS	CO1	Able to understand and analyze the architectural features of CISC type of General purpose processor Intel 8086 Microprocessor.

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		CO2	Able to understand and analyze the architectural features of CISC type of microcontroller - Intel 8051 Microcontroller.
		CO3	Able to understand and analyze the architectural features of RISC type of microcontroller – PIC Microcontroller.
		CO4	Able to program 8086 microprocessor, 8051 and PIC microcontrollers in assembly language using TASM, KEIL, MPLAB and Proteus tools.
		CO5	Able to Develop a real time application using 8051 & PIC Microcontrollers through project based labs.
18SC2004	Object Oriented Programming	CO1	Design and Realization of Digital Filters
		CO2	Analyzing the Discrete Fourier Transform and Wavelets.
		CO3	Exploring Sampling rate conversion and applications of DSP.
		CO4	Implementation of design aspects leading to project based labs in Matlab.
18EE2101	ELECTRICAL CIRCUITS	CO1	Understand the concept of mutual inductance, series and parallel resonance, network topology to solve complex networks and 3- phase circuits voltage and current relations.
		CO2	Analyze the magnetic circuits, transient response for AC and DC excitation and two port network parameters
		CO3	Evaluate one port networks using Foster and cauer forms
		CO4	Design the prototype low and high pass filters.
18EE2102	DC MACHINES & TRANSFORMERS	CO1	Apply the basic principles of electro mechanical energy conversion to electrical machines
		CO2	Analyze operating characteristics of various types of DC generators.
		CO3	Identify various speed control methods of DC motor and evaluate this performance
		CO4	Evaluate the performance of a transformers and selecting it for particular application.
		CO5	Test the DC machines and transformers to evaluate their performance
18EE2201	AC ROTATING MACHINES	CO1	Select from all commercially available 3-φ IM for given application
		CO2	To understand the construction, operation and armature reaction of a 3-φ synchronous generator and identify the requirements for parallel operation.
		CO3	Understand and analyze the performance of synchronous motor by varying excitation and varying load.
		CO4	Evaluate the performance of a single phase motor and selecting it for particular application.
		CO5	Test the induction machine and synchronous machine to evaluate their performance
18EE2103	ELECTRICAL POWER GENERATION, TRANSMISSION & DISTRIBUTION	CO1	Understand various generating stations.
		CO2	Analyze the performance of overhead transmission lines and underground cables.
		CO3	Understand various types of substation layouts.
		CO4	Understand the power system protection schemes.

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18EE2202	CONTROL SYSTEMS	CO1	Students are able to understand control system concepts such as open, closed loop systems, transfer function approach, mathematical modeling of physical systems and can understand analyze the similarities between synchros and ac generators
		CO2	Students can be able to Analyze the time domain and frequency response of physical systems
		CO3	Students can be able to understand and analyze stability of given transfer functions in time and Frequency domain and can be able to analyze the process of Converting state space equations into transfer function for the given model.
		CO4	Students can be able to design and analyze controllers and lead, lag, lead-lag compensators
		CO5	
18EE2203	POWER SYSTEM ANALYSIS & STABILITY	CO1	Apply the network matrices for solution of power flow problems
		CO2	Apply the reactance diagrams for symmetrical short circuit faults in a power system
		CO3	Apply symmetrical components for unsymmetrical fault analysis in a power system
		CO4	Analyze rotor angle stability
		CO5	Test and Analyze various short circuit faults, load flows, economic dispatch problems, rotor angle stability problems using MATLAB
18EE3101	POWER ELECTRONICS	CO1	Select appropriate switch for a given power converter
		CO2	Evaluate the steady state performance of Basic DC-DC converters
		CO3	Evaluate the performance of Basic Switch-Mode PWM Inverter
		CO4	Understand and analyze the operation of Basic Phase controlled converters
		CO5	
18EE3102	POWER SYSTEM PROTECTION & CONTROL	CO1	Understand the principle of protective relays & circuit breakers
		CO2	Analyze over current, distance and differential protection schemes
		CO3	Analyze over voltage protection and economic operation of power system
		CO4	Analyze automatic generation control and voltage regulators
18EE3221	Solar PV and Thermal Technologies	CO1	Understanding the need of Solar PV and Solar Thermal systems
		CO2	Understanding the applications of solar thermal energy systems
		CO3	Understand the design aspects of Solar PV system
		CO4	Understand the operational issues of grid connected and isolated solar PV system
18EE3222	Wind & Micro Energy Sources	CO1	Understand the concepts of wind energy conversion and measurement system.
		CO2	Apply the concepts of wind energy system to electric power grid.
		CO3	Understand the concepts of geo-thermal energy systems.
		CO4	Understand the concepts of tidal, ocean and bio-mass energy systems.
18EE3223		CO1	Understand the energy auditing methods to meet the energy conservation and various tariffs

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	Energy Conservation & Audit	CO2	Apply the energy conservation techniques to power system elements
		CO3	Understand the energy conservation opportunities in industrial motors and lighting systems
		CO4	Understand the energy conservation opportunities in cooling systems and cogeneration
18EE4121	Energy Storage Systems	CO1	Interpret the significance of energy storage systems
		CO2	Demonstrate various devices for electrochemical, mechanical, elastic and hydro storage systems
		CO3	Demonstrate various electro-magnetic energy storage systems
		CO4	Apply energy storage technologies for smart electrical energy consumption
18EE4122	Energy Management Systems	CO1	Understand the need for energy management
		CO2	Understand the Energy conservation building codes and energy conservation opportunities in different types of buildings.
		CO3	Understand the energy conservation through cogeneration plants
		CO4	Understand the energy conservation opportunities in pumps and cooling systems
18EE3231	Energy Accounting and Management Systems	CO1	Understand the present power scenario in India.
		CO2	Understand the duties and responsibilities of Engineer Distribution.
		CO3	Analyze the energy accounting and billing.
		CO4	Analyze the energy management system and demand side management implementation strategies.
18EE3232	Substation Practice	CO1	Understand the concepts of power distribution system.
		CO2	Understand the substation erection and commissioning.
		CO3	Analyze the protection of distribution system.
		CO4	Understand the operation and maintenance of distribution system.
18EE3233	Distribution System Testing and Safety Practices	CO1	Apply the testing of the Equipment in Power Distribution
		CO2	Understand the use of basic Health & Safety practices for power related work
		CO3	Understand the documentation refers to the safety
		CO4	Understand the rescue techniques during fire hazards.
18EE4131	Smart Grid Communication and Cybersecurity	CO1	Understand the communication technology and standards in smart grid
		CO2	Apply the knowledge of information security in smart grids.
		CO3	Understand the Interoperability and Standards.
		CO4	Understand the hacking techniques and cyber-security in smart grid.
18EE4132	Smart Distribution Systems	CO1	Understand the evolution and various components of smart grids.
		CO2	Understand the smart sub-station operation and applications in smart grids.
		CO3	Analyze various load forecasting techniques in modern electrical power systems.
		CO4	Understand the Volt/Var control techniques in smart grid.
18EE3241	Introduction to Electric Vehicles	CO1	Understand the History, Economics and environmental issues of Electric Vehicles
		CO2	Analyze the power train components and dynamics of EV

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		CO3	Select and size the motor for power train of EV
		CO4	Select and size the converter for EV
18EE3242	Battery Modelling for Electric Vehicles	CO1	Understand the key components of Battery management systems
		CO2	Understand the key functions of Battery management systems
		CO3	Analyze the static battery models
		CO4	Analyze the dynamic battery models
18EE3243	Charging Stations for Electric Vehicle	CO1	Interpret Power electronic converters for electric vehicle charging
		CO2	Develop control algorithms for various electric vehicle charging modes
		CO3	Demonstrate charging station infrastructure
		CO4	Demonstrate installation of charging station
18EE4141	Battery States Estimation	CO1	Understand the basic SOC estimation techniques of Battery
		CO2	Apply Kalman filter for SOC estimation of Battery
		CO3	Understand the methods to estimate the SOH of a Battery
		CO4	Select different techniques used for Power management of battery
18EE4142	Electric Vehicle Fault Diagnosis and Control	CO1	Understand characteristics of sensors and actuators used for electric vehicle control
		CO2	Understand usage of microcontroller for digital control of electric vehicle
		CO3	Apply communication protocols for data communication in electric vehicle control system
		CO4	Model fault diagnosis system for electric vehicle
18TS601	Technical Skill - 3 (MATLAB)	CO1	Demonstrate MATLAB programming for electrical systems
		CO2	Apply MATLAB programming for electrical circuit simulation
		CO3	Apply MATLAB Control Tool Box for electrical systems
		CO4	Apply MATLAB Simscape Tool Box for electrical systems
18TS602	Technical Skill - 4 (MATLAB)	CO1	Apply AUTOUCAD Electrical
		CO2	Develop Electrical Drawings with AUTOCAD
		CO3	Apply Power System Analysis principles
		CO4	Develop Power World simulator schematics for power system analysis
18TS606	Technical Proficiency & Training-2	CO1	Apply serial communication protocols
		CO2	Apply wireless communication protocols
		CO3	Apply Engineering Design
		CO4	Apply Project Management
18OL40B2	SMART CITIES - MANAGEMENT OF SMART URBAN INFRASTRUCTURES	CO1	Demonstrate Smart Cities Characteristics
		CO2	Apply Smart Cities Models
		CO3	Apply Smart Cities Models
		CO4	Apply Smart Cities Models
18OL40A1	GRAPHIC DESIGN	CO1	Apply Graphic Design Principles
		CO2	Apply Graphic Design to Mechanical Components
		CO3	Apply Graphic Design
		CO4	Apply Graphic Design
18CE40A2		CO1	Understand the basic SOC estimation techniques of Battery


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	Environmental Pollution Control Methods	CO2	Apply Kalman filter for SOC estimation of Battery
		CO3	Understand the methods to estimate the SOH of a Battery
		CO4	Select different techniques used for Power management of battery
18CS40A6	Fundamentals of D B M S	CO1	Understand characteristics of sensors and actuators used for electric vehicle control
		CO2	Understand usage of microcontroller for digital control of electric vehicle.
		CO3	Apply communication protocols for data communication in electric vehicle control system
		CO4	Model fault diagnosis system for electric vehicle
18CE40A4	Remote Sensing & GIS	CO1	Understand the communication technology and standards in smart grid
		CO2	Apply the knowledge of information security in smart grids.
		CO3	Understand the Interoperability and Standards.
		CO4	Understand the hacking techniques and cyber-security in smart grid.
18BT40A1	I P R & Patent Laws	CO1	Understand the evolution and various components of smart grids.
		CO2	Understand the smart sub-station operation and applications in smart grids.
		CO3	Analyze various load forecasting techniques in modern electrical power systems.
		CO4	Understand the Volt/Var control techniques in smart grid.
18CE40A5	Disaster Management	CO1	Understand the History, Economics and environmental issues of Electric Vehicles
		CO2	Analyze the power train components and dynamics of EV
		CO3	Select and size the motor for power train of EV
		CO4	Select and size the converter for EV
18CE40A3	Solid and Hazardous waste management	CO1	Understand the key components of Battery management systems
		CO2	Understand the key functions of Battery management systems
		CO3	Analyze the static battery models
		CO4	Analyze the dynamic battery models
18EC40C9	Nano Electronics	CO1	Interpret Power electronic converters for electric vehicle charging
		CO2	Develop control algorithms for various electric vehicle charging modes
		CO3	Demonstrate charging station infrastructure
		CO4	Demonstrate installation of charging station
18IE2246	INDUSTRIAL TRAINING	CO5	Apply Principles of Industrial Training
18IE4048	PROJECT	CO5	Apply Principles of electrical engineering for project management


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