

SMS Lucknow
Department of Electrical Engineering
Session: 2020-21

A. Name of Subjects for Odd Semester

SN	Name of subjects	Subject Code
1	Basic Electrical Engineering	KEE101T
2	Electrical Engineering Lab	KEE151P
3	Electrical Measurements and Instrumentation	KEE302
4	Electromagnetic Field Theory	KEE301
5	Basic Signal System	KEE303
6	Electronics Engineering	KOE038
7	Technical Communication	KAS301
8	Computer System Security	KNC 301
9	Electrical Measurements and Instrumentation Lab	KEE352
10	Analog Electronics Lab	KEE351
11	Electrical Work shop	KEE353
12	Mini Project or Internship Assessment	KEE354
13	Power System-1	KEE501
14	Control System	KEE502
15	Electrical Machine-II	KEE503
16	Sensors and Transducers	KEE052
17	Optimization Techniques	KEE055
18	Constitution of India, Laws and Engineering	KNC501
19	Power System-1 Lab	KEE551
20	Control System Lab	KEE552
21	Electrical Machine-II Lab	KEE553
22	Mini Project or Internship Assessment	KEE554
23	Understanding the Human Being Comprehensibly -Human Aspiration and its Fulfilments	ROE074
24	Utilization of Electrical Energy and Electric Traction	REE 071
25	Energy Efficiency and conservation	REE076
26	Communication system	REN701
27	Power System & Protection	REE702
28	Industrial Automation & PLC Lab	REE751
29	Power System Lab	REE752
30	Industrial Training	REN753
31	Project-1	REN751

B. Name of Subjects for Even Semester

SN	Name of subjects	Code
1	Basic Electrical Engineering	KEE201T
2	Electrical Engineering Lab	KEE251P
3	Mathematics- IV	KAS402
4	Universal Human Value	KVE401
5	Digital Electronics	KEE401
6	Electrical Machine -1	KEE402
7	Network Analysis & Synthesis	KEE403
8	Python Programming	KNC402
9	Circuit Simulation Lab	KEE451
10	Electrical Machine-1 Lab	KEE452
11	Digital Electronics Lab	KEE453
12	Power System-II	KEE601
13	Microprocessor & Microcontroller	KEE602
14	Power Electronics	KEE603
15	Special Electrical Machine	KEE061
16	Understanding the Human Being Comprehensibly Human Aspiration and its Fulfilments	KOE069
17	Indian Tradition ,Culture and Society	KNC602
18	Power System –II Lab	KEE651
19	Microprocessor & Microcontroller Lab	KEE652
20	Power Electronics Lab	KEE653
21	Renewable Energy Resources	ROE086
22	Introduction to Power Quality & FACTS	REE081
23	EHVAC & DC Transmission	REE085
24	GD & Seminar	REN851
25	Project-II	REN852

Course Outcomes _Odd Semester Subjects

Session: 2020-21

1. Basic Electrical Engg (KEE-101T)

Course Outcomes: At the end of this course students will demonstrate the ability to:

Course Outcome		Knowledge Level, KL
CO1	Apply the concepts of KVL/KCL and network theorems in solving DC circuits.	K3
CO2	Analyze the steady state behavior of single phase and three phase AC electrical circuits	K4
CO3	Analyze the steady state behaviour of single phase and three phase AC electrical circuits	K4
CO4	Identify the application areas of a single phase two winding transformer as well as an auto transformer and calculate their efficiency. Also identify the connections of a three phase transformer	K2
CO5	Illustrate the working principles of induction motor, synchronous machine as well as DC machine and employ them in different area of applications.	K5
CO6	Describe the components of low voltage electrical power circuit.	K3

KL- Bloom's Knowledge Level (K1, K2, K3, K4, K5, K6) K1 – Remember K2 – Understand
K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create

2. Electrical Engineering Lab (KEE-151P)

Course Outcome		Knowledge Level, KL
CO1	Conduct experiments illustrating the application of KVL/KCL and network theorems to DC electrical circuits.	K3
CO2	Demonstrate the behavior of AC circuits connected to single phase AC supply and measure power in single phase as well as three phase electrical circuits	K4
CO3	Perform experiment illustrating BH curve of magnetic materials.	K6
CO4	Calculate efficiency of a single phase transformer and DC machine.	K5
CO5	Calculate efficiency of a single phase transformer and DC machine	K5
CO6	Perform experiments on speed measurement and reversal of direction of three phase induction motor and Identify the type of DC and AC machines based on their construction.	K5

KL- Bloom's Knowledge Level (K1, K2, K3, K4, K5, K6) K1 – Remember K2 – Understand
K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create

3. Electrical Measurements and Instrumentation (KEE-302)

Course Outcome		Knowledge Level, KL
CO1	Evaluate errors in measurement as well as identify and use different types of instruments for the measurement of voltage, current, power and energy	K1
CO2	Display the knowledge of measurement of electrical quantities resistance, inductance and capacitance with the help of bridges.	K2
CO3	Demonstrate the working of instrument transformers as well as calculate the errors in current and potential transformers.	K2
CO4	Manifest the working of electronic instruments like voltmeter, multi-meter, frequency meter and CRO.	K2
CO5	Display the knowledge of transducers, their classifications and their applications for the measurement of physical quantities like motion, force, pressure, temperature, flow and liquid level.	K3

KL- Bloom's Knowledge Level (K1, K2, K3, K4, K5, K6) K1 – Remember K2 – Understand K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create

4. Electromagnetic Field Theory (KEE-301)

Course Outcome		Knowledge Level, KL
CO1	Apply different coordinate systems and their application in electromagnetic field theory, establish a relation between any two systems and also understand the vector calculus.	K3
CO2	Understand the concept of static electric field. Understand the concept of current and properties of conductors. Establish boundary conditions and to calculate capacitances of different types of capacitors	K4
CO3	Understand the concept of static magnetic field, magnetic scalar and vector potential	K4
CO4	Understand the forces due to magnetic field, magnetization, magnetic boundary conditions and inductors.	K4
CO5	Understand displacement current, time varying fields, propagation and reflection of EM waves and transmission lines.	K3

KL- Bloom's Knowledge Level (K1, K2, K3, K4, K5, K6) K1 – Remember K2 – Understand K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create

5. Basic Signal System (KEE-303)

Course Outcome		Knowledge Level, KL
CO1	Represent the various types of signals & systems and can perform mathematical operations on them	K2
CO2	Analyze the response of LTI system to Fourier series and Fourier transform and to evaluate their applications to network analysis	K4
CO3	Analyze the properties of continuous time signals and system using Laplace transform and determine the response of linear system to known inputs	K4

CO4	Implement the concepts of Z transform to solve complex engineering problems using difference equations.	K3
CO5	Develop and analyze the concept of state-space models for SISO & MIMO system.	K4

KL- Bloom's Knowledge Level (K1, K2, K3, K4, K5, K6) K1 – Remember K2 – Understand
K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create

6. Electronics Engineering (KOE-038)

Course Outcomes		Knowledge Level, KL
CO1	Understand the concepts of PN Junction and special purpose diode	K2
CO2	Study the applications of conventional diode and semiconductor diodes	K2
CO3	Analyse the I-V characteristics of BJT and FET	K4
CO4	Analyze the Op Amp, Amplifiers, Integrator and Differentiators	K4
CO5	Understand the concepts of digital storage oscilloscope and compare of DSO with analog oscilloscope.	K2

KL- Bloom's Knowledge Level (K1, K2, K3, K4, K5, K6) K1 – Remember K2 – Understand
K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create

7. Technical Communication (KAS-301)

Course Outcomes		Knowledge Level, KL
CO1	Students will be enabled to understand the nature and objective of Technical communication relevant for the work place as engineers	K2
CO2	Students will utilize the technical writing for the purpose of technical communication and its exposer in various dimension.	K3
CO3	Students would imbibe inputs by presentation skills to enhance confidence in face of diverse audience.	K2
CO4	Technical communications skill will create a vast know how of the applications of the learning tp promote the technical competence.	K6
CO5	It would enable them to evaluate their efficacy as fluent and efficient communication by learning the voice dynamics.	K5

KL- Bloom's Knowledge Level (K1, K2, K3, K4, K5, K6) K1 – Remember K2 – Understand
K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create

8. Computer System Security (KNC-301)

Course Outcome		Knowledge Level, KL
CO1	To discover software bugs that poses cyber security threats and to explain how to fix the bugs to mitigate such threats	K1,K2
CO2	To discover cyber-attack scenarios to web browsers and web servers and to explain how to mitigate such threats	K2

CO3	To discover and explain mobile software bugs posing cyber security threats , explain and recreate exploits and to explain mitigation techniques.	K3
CO4	To articulate the urgent need for cyber security in critical computer systems , networks and world wide web and to explain various threats scenarios.	K4
CO5	To articulate the well-known cyber-attack incidents , explain the attack scenario and explain mitigation techniques.	K5,K6

KL- Bloom's Knowledge Level (K1, K2, K3, K4, K5, K6) K1 – Remember K2 – Understand
K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create

9. Electrical Measurements and Instrumentation Lab (KEE-352)

Course Outcome		Knowledge Level, KL
CO1	Evaluate errors in measurement as well as identify and use different types of instruments for the measurement of voltage, current, power and energy.	K1
CO2	Display the knowledge of measurement of electrical quantities resistance, inductance and capacitance with the help of bridges	K2
CO3	Demonstrate the working of instrument transformers as well as calculate the errors in current and potential transformers.	K2
CO4	Manifest the working of electronic instruments like voltmeter, multi-meter, frequency meter and CRO.	K2
CO5	Display the knowledge of transducers, their classifications and their applications for the measurement of physical quantities like motion, force, pressure, temperature, flow and liquid level.	K3

KL- Bloom's Knowledge Level (K1, K2, K3, K4, K5, K6) K1 – Remember K2 – Understand
K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create

10. Analog Electronics Lab (KEE-351)

Course Outcome		Knowledge Level, KL
CO1	Understand the characteristics and applications of the Semiconductor devices.	K2,K3
CO2	Draw the characteristics of BJT, FET and MOSFET.	K2,K4
CO3	Understand the parameters of Operational Amplifier and instrumentation Amplifier with their applications	K2,K4
CO4	Understand the V-I characteristics of Power devices like SCR, TRIAC.	K2,K4

KL- Bloom's Knowledge Level (K1, K2, K3, K4, K5, K6) K1 – Remember K2 – Understand
K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create

11. Electrical Work shop (KEE-353)

Course Outcome		Knowledge Level, KL
CO1	Perform various types of Electrical connections.	K3
CO2	Develop small circuits on PCB	K6

CO3	Differentiate between various electrical wires, cables and accessories.	K3
CO4	Demonstrate the layout of electrical substation & various safety measures	K2

KL- Bloom's Knowledge Level (K1, K2, K3, K4, K5, K6) K1 – Remember K2 – Understand
K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create

12. Mini Project and Internal Assessment (KEE-354)

Course Outcome		Knowledge Level, KL
CO1	Apply the knowledge within the chosen area of technology for project development.	K3
CO2	Evaluate the technical aspects of the chosen project with a comprehensive and systematic approach.	K5
CO3	Apply engineering solutions to complex problems utilizing a system approach	K3
CO4	Analyze the knowledge ,skills and attitudes of a professional engineer.	K4

KL- Bloom's Knowledge Level (K1, K2, K3, K4, K5, K6) K1 – Remember K2 – Understand
K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create

13. Power System-1 (KEE-501)

Course Outcome		Knowledge Level, KL
CO1	Describe the working principle and basic components of conventional power plants as well as the other aspects of power generation.	K2
CO2	Recognize elements of power system and their functions, as well as compare the different types of supply systems. Illustrate different types of conductors, transmission lines and various performance parameters of transmission line for short, medium and long transmission line.	K4
CO3	Calculate sag and tension in overhead lines with and without wind and ice loading. Classify different type of insulators, determine potential distribution over a string of insulator, string efficiency and its improvement	K4
CO4	Compute the inductance and capacitance of single phase, three phase lines with symmetrical and unsymmetrical spacing, Composite conductors-transposition, bundled conductors, and understand the effect of earth on capacitance of transmission lines.	K4
CO5	Elucidate different types of cables and assess the Resistance and capacitance parameters of cables, grading of cables and compare overhead lines and cables	K4

KL- Bloom's Knowledge Level (K1, K2, K3, K4, K5, K6) K1 – Remember K2 – Understand
K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create

14. Control System (KEE-502)

Course Outcome		Knowledge Level, KL
CO1	Obtain transfer functions to predict the correct operation of open loop and closed loop control systems and identify the basic elements, structures and the characteristics of feedback control systems	K3
CO2	Measure and evaluate the performance of basic control systems in time domain. Design specification for different control action.	K4
CO3	Analyze the stability of linear time-invariant systems in time domain using RouthHurwitz criterion and root locus technique.	K4
CO4	Determine the stability of linear time-invariant systems in frequency domain using Nyquist criterion and Bode plot.	K4
CO5	Design different type of compensators to achieve the desired performance of control System by root locus and Bode plot method. Develop and analyze the intermediate states of the system using state space analysis.	K5

KL- Bloom's Knowledge Level (K1, K2, K3, K4, K5, K6) K1 – Remember K2 – Understand
K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create

15. Electrical Machine-II (KEE-503)

Course Outcome		Knowledge Level, KL
CO1	Demonstrate the constructional details and principle of operation of three phase Induction and Synchronous Machines.	K3
CO2	Analyze the performance of the three phase Induction and Synchronous Machines using the phasor diagrams and equivalent circuits.	K4
CO3	Select appropriate three phase AC machine for any application and appraise its significance.	K4
CO4	Start and observe the various characteristics of three phase Induction & Synchronous Machines	K4
CO5	Explain the principle of operation and performance of Single-Phase Induction Motor & Universal Motor.	K3

KL- Bloom's Knowledge Level (K1, K2, K3, K4, K5, K6) K1 – Remember K2 – Understand
K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create

16. Sensors and Transducers (KEE-052)

Course Outcome		Knowledge Level, KL
CO1	Understand the working of commonly used sensors in industry for measurement of displacement, force and pressure.	K3
CO2	Recognize the working of commonly used sensors in industry for measurement of temperature, position, accelerometer, vibration sensor, flow and level.	K3
CO3	Identify the application of machine vision.	K2
CO4	Conceptualize signal conditioning and data acquisition methods.	K2

CO5	Comprehend smart sensors and their applications in automation systems	K4
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KL- Bloom's Knowledge Level (K1, K2, K3, K4, K5, K6) K1 – Remember K2 – Understand K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create

17. Optimization Techniques (KEE-055)

Course Outcome		Knowledge Level, KL
CO1	Understand the importance of optimization techniques in engineering applications	K2
CO2	Learn optimization methods for solving linear programming problems	K3
CO3	Learn optimization methods for solving nonlinear programming problems	K3
CO4	Be aware of the concept of simulation and modern methods of optimization	K3
CO5	Apply optimization techniques to electrical engineering problems	K4

KL- Bloom's Knowledge Level (K1, K2, K3, K4, K5, K6) K1 – Remember K2 – Understand K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create

18. Constitution of India, Laws and Engineering (KNC-501)

Course Outcomes		Knowledge Level, KL
CO1	Identify and explore the basic features and modalities about Indian constitution	K4
CO2	Differentiate and relate the functioning of Indian parliamentary system at the centre and state level.	K4
CO3	Differentiate different aspects of Indian Legal System and its related bodies.	K4
CO4	Discover and apply different laws and regulations related to engineering practices.	K5
CO5	Correlate role of engineers with different organizations and governance models	K4

KL- Bloom's Knowledge Level (K1, K2, K3, K4, K5, K6) K1 – Remember K2 – Understand K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create

19. Power System-1 Lab (KEE551)

Course Outcome		Knowledge Level, KL
CO1	Use programming tools /Software: Scilab, MATLAB or any C, C++ - Compiler and formulate a program/simulation model for calculation of various parameters related to transmission line.	K6

KL- Bloom's Knowledge Level (K1, K2, K3, K4, K5, K6) K1 – Remember K2 – Understand K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create

20. Control System Lab (KEE-552)

Course Outcome		Knowledge Level, KL
CO1	Determine the characteristics of control system components like ac servo motor, synchro, potentiometer, servo voltage stabilizer and use them in error detector mode.	K4
CO2	Compare the performance of control systems by applying different controllers / compensators.	K5
CO3	Analyze the behaviour of dc motor in open loop and closed loop conditions at various loads & determine the response of 1st& 2nd order systems for various values of constant K.	K5
CO4	Apply different stability methods of time & frequency domain in control systems using software & examine their stability.	K4
CO5	Convert the transfer function into state space & vice versa & obtain the time domain response of a second order system for step input and their performance parameters using software.	K5

KL- Bloom's Knowledge Level (K1, K2, K3, K4, K5, K6) K1 – Remember K2 – Understand K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create

21. Electrical Machine –II Lab (KEE-552)

Course Outcome		Knowledge Level, KL
CO1	Perform various tests and demonstrate the various characteristics of three phase induction motor.	K4
CO2	Demonstrate the working of three phase synchronous machine under different operating conditions.	K4
CO3	Evaluate the performance of single-phase induction motor under different operating conditions.	K5
CO4	Develop simulation models for Electrical Machines.	K6

KL- Bloom's Knowledge Level (K1, K2, K3, K4, K5, K6) K1 – Remember K2 – Understand K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create

22. Mini Project or Internship Assessment (KEE-554)

Course Outcome		Knowledge Level, KL
CO1	Apply the knowledge within the chosen area of technology for project development.	K3
CO2	Evaluate the technical aspects of the chosen project with a comprehensive and systematic approach.	K5
CO3	Apply engineering solutions to complex problems utilizing a system approach	K3
CO4	Analyze the knowledge ,skills and attitudes of a professional engineer.	K4

KL- Bloom's Knowledge Level (K1, K2, K3, K4, K5, K6) K1 – Remember K2 – Understand K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create

23. Understanding the Human Being Comprehensibly -Human Aspiration and its Fulfilments-Understanding the Human Being Comprehensibly -Human Aspiration and its Fulfilments (ROE-074)

Course Outcome		Knowledge Level, KL
CO1	To help the students having the clarity about human aspirations, goal, activities and purpose of life	K1
CO2	To felicitate the competence to understand the harmony in nature/existence and participation of human being in the nature/existence	K2
CO3	To help the students to develop the understanding of human tradition and its various components	K2

KL- Bloom's Knowledge Level (K1, K2, K3, K4, K5, K6) K1 – Remember K2 – Understand K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create

24. Utilization of Electrical Energy and Electric Traction (REE-071)

Course Outcome		Knowledge Level, KL
CO1	Understand the power electronics technology in efficient utilization of electrical power.	K2
CO2	Apply the power electronics technology in efficient utilization of electrical power	K3
CO3	Analyze the effective utilization of power electronics technology in electrical traction.	K4
CO4	Evaluate the power electronics technology in various process control.	K5

KL- Bloom's Knowledge Level (K1, K2, K3, K4, K5, K6) K1 – Remember K2 – Understand K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create

25. Energy Efficiency and conservation (REE-076)

Course Outcome		Knowledge Level, KL
CO1	Students will be able to apply the knowledge of the subject to calculate the efficiency if various thermal utilities.	K5
CO2	Students will be able to design suitable energy monitoring system to analyse and optimize the energy consumption in an organization.	K6
CO3	Students will be able to improve the thermal efficiency by designing suitable systems for heat recovery and cogeneration.	K3
CO4	Students will be able to use energy audit methods to identify the areas deserving tighter control to save energy expenditure.	K3
CO5	Students will be able to carry out the cost benefit analysis of various investment alternatives for meeting the energy needs for the organization.	K3
CO6	Students will be able to guide the employees of the organization about the need and the methods of energy conservation.	K3

KL- Bloom's Knowledge Level (K1, K2, K3, K4, K5, K6) K1 – Remember K2 – Understand K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create

26. Communication system (REN-071)

Course Outcome		Knowledge Level, KL
CO1	Apply the knowledge of theory of communication and explain the conventional digital communication system.	K3
CO2	Apply the knowledge of signals and evaluate the performance of digital communication system in presence of noise.	K3
CO3	Apply the knowledge of digital electronics and describe the error control codes like block code, cyclic codes etc.	K3
CO4	Evaluate the results to provide valid conclusions for different modulators and demodulators using hardware components.	K5
CO5	Analyze the digital communication system with spread spectrum modulations.	K4

KL- Bloom's Knowledge Level (K1, K2, K3, K4, K5, K6) K1 – Remember K2 – Understand
K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create

27. Power System & Protection (REE-721)

Course Outcome		Knowledge Level, KL
CO1	Students will be able to list various circuit breakers used in power system.	K1
CO2	Students will be able to identify different protection zones and protection schemes in power system.	K2
CO3	Students will be able to differentiate various including distance and differential protection scheme.	K4
CO4	Students will be able to explain the working principle of static relays .	K5
CO5	Students will be able to summarize the protection schemes for generator, transformer, motor, feeder and transmission lines.	K1
CO6	Students will be able to recall the protection against overvoltages and working of lightning arrester.	K3

KL- Bloom's Knowledge Level (K1, K2, K3, K4, K5, K6) K1 – Remember K2 – Understand
K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create

28. Industrial Automation and PLC Lab (REE-751)

Course Outcome		Knowledge Level, KL
CO1	Students will be able to design and implement automated system using pneumatics.	K3
CO2	Students will be able to provide hydraulic solutions design to automated system.	K2
CO3	Students will be able to devise assembly automated systems using feeders, orienteers, and escapement device.	K4

CO4	Students will be able to design and implement electro-pneumatic /hydraulic solutions for automated systems.	K2
CO5	Students will be able to apply PLC programming and implement on PLC kits.	K3

KL- Bloom's Knowledge Level (K1, K2, K3, K4, K5, K6) K1 – Remember K2 – Understand
K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create

29. Power System LabB(REE -752)

Course Outcome		Knowledge Level, KL
CO1	Apply and calculate settings for overcurrent relay, directional overcurrent relay, distance relay.	K3
CO2	Identify ,apply and calculate settings for power lines, transformer, generators and bus bar protection schemes	K3
CO3	Understand the main functions of the SCADA and EMS	K2
CO4	Select proper sets of relays and to measure characteristics of protection.	K4
CO5	Investigate current and voltage transformers and its impact on protection principles.	K5
CO6	Perform power system analysis subject to symmetrical and unsymmetrical faults.	K6

KL- Bloom's Knowledge Level (K1, K2, K3, K4, K5, K6) K1 – Remember K2 – Understand
K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create

30. Industrial Training (REN-753)

Course Outcome		Knowledge Level, KL
CO1	Capability to acquire and apply fundamental principle of engineering.	K3
CO2	Ability to communicate efficiently.	K3
CO3	Applying good technical knowledge ,management leadership and entrepreneurship skills .	K3
CO4	Create self-improvement through continuous professional development and life long learning.	K6
CO5	Awareness of the social ,cultural ,global and environmental responsibility as an engineer.	K2

KL- Bloom's Knowledge Level (K1, K2, K3, K4, K5, K6) K1 – Remember K2 – Understand K3 –
Apply K4 – Analyze K5 – Evaluate K6 – Create

31. Project-1(REN-751)

Course Outcome		Knowledge Level, KL
CO1	Analyze a sound technical knowledge of their selected projects.	K4
CO2	Understand the problem identification ,formulation and solutions	K2
CO3	Apply engineering solutions to complex problems utilizing a system approach	K3
CO4	Analyze the knowledge ,skills and attitudes of a professional engineer.	K4

KL- Bloom's Knowledge Level (K1, K2, K3, K4, K5, K6) K1 – Remember K2 – Understand K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create

Course Outcomes _Even Semester Subjects

Session: 2020-21

1. Basic Electrical Engineering (KEE-201T)

Course Outcome		Knowledge Level, KL
CO1	Apply the concepts of KVL/KCL and network theorems in solving DC circuits.	K3
CO2	Analyze the steady state behavior of single phase and three phase AC electrical circuits	K4
CO3	Analyze the steady state behaviour of single phase and three phase AC electrical circuits	K4
CO4	Identify the application areas of a single phase two winding transformer as well as an auto transformer and calculate their efficiency. Also identify the connections of a three phase transformer	K2
CO5	Illustrate the working principles of induction motor, synchronous machine as well as DC machine and employ them in different area of applications.	K5
CO6	Describe the components of low voltage electrical power circuit.	K3

KL- Bloom's Knowledge Level (K1, K2, K3, K4, K5, K6) K1 – Remember K2 – Understand K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create

2. Electrical Engineering Lab (KEE-251T)

Course Outcome		Knowledge Level, KL
CO1	Conduct experiments illustrating the application of KVL/KCL and network theorems to DC electrical circuits.	K3
CO2	Demonstrate the behaviour of AC circuits connected to single phase AC supply and measure power in single phase as well as three phase electrical circuits	K4
CO3	Perform experiment illustrating BH curve of magnetic materials.	K6
CO4	Calculate efficiency of a single phase transformer and DC machine.	K5
CO5	Calculate efficiency of a single phase transformer and DC machine	K5
CO6	Perform experiments on speed measurement and reversal of direction of three phase induction motor and Identify the type of DC and AC machines based on their construction.	K5

KL- Bloom's Knowledge Level (K1, K2, K3, K4, K5, K6) K1 – Remember K2 – Understand
K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create

3. Mathematics- IV (KAS-402)

Course Outcome		Knowledge Level, KL
CO1	Remember the concepts of partial differential equation and to solve partial differential equation	K1,k3
CO2	Analyze the concepts of partial differential equations to evaluate the problems corned with the partial differential equation	K4,k5
CO3	Understand the concepts of correlation ,moments ,skewness and kurtosis and curve fitting	K2
CO4	Remember the concepts of probability to evaluate probability distribution	K1,K5
CO5	Apply the concepts of hypothesis testing and statistical quality control to create control chart.	K3,K6

KL- Bloom's Knowledge Level (K1, K2, K3, K4, K5, K6) K1 – Remember K2 – Understand
K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create

4. Universal Human Value and Professional Ethics (KVE-401)

Course Outcome		Knowledge Level, KL
CO1	Understand the significance of value inputs in a classroom, distinguish between values and skills, understand the need, basic guidelines, content and process of value education, explore the meaning of happiness and prosperity and do a correct appraisal of the current scenario in the society	K2
CO2	Distinguish between the Self and the Body, understand the meaning of Harmony in the Self the Co-existence of Self and Body	K2
CO3	Analyze the value of harmonious relationship based on trust, respect and other naturally acceptable feelings in human-human relationships and explore their role in ensuring a harmonious society	K4
CO4	Understand the harmony in nature and existence, and work out their mutually fulfilling participation in the nature.	K2
CO5	Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.	K5

KL- Bloom's Knowledge Level (K1, K2, K3, K4, K5, K6) K1 – Remember K2 – Understand
K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create

5. Digital Electronics (KEE-401)

Course Outcome		Knowledge Level, KL
CO1	Apply concepts of Digital Binary System and implementation of Gates.	K3
CO2	Analyze and design of Combinational logic circuits	K4
CO3	Analyze and design of Sequential logic circuits with their applications.	K4
CO4	Implement the Design procedure of Synchronous & Asynchronous Sequential Circuits	K3
CO5	Apply the concept of Digital Logic Families with circuit implementation.	K3

KL- Bloom's Knowledge Level (K1, K2, K3, K4, K5, K6) K1 – Remember K2 – Understand K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create

6. Electrical Machine -1 (KEE-402)

Course Outcome		Knowledge Level, KL
CO1	Analyze the various principles & concepts involved in Electromechanical Energy conversion	K4
CO2	Demonstrate the constructional details of DC machines as well as transformers, and principle of operation of brushless DC motor, Stepper and DC Servo motors.	K2
CO3	Evaluate the performance and characteristics of DC Machine as motor and as well as generator.	K4
CO4	Evaluate the performance of transformers, individually and in parallel operation.	K4
CO5	Demonstrate and perform various connections of three phase transformers	K3

KL- Bloom's Knowledge Level (K1, K2, K3, K4, K5, K6) K1 – Remember K2 – Understand K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create

7. Network Analysis & Synthesis (KEE-403)

Course Outcome		Knowledge Level, KL
CO1	Apply the knowledge of basic circuit law, nodal and mesh methods of circuit analysis and simplify the network using Graph Theory approach.	K3
CO2	Analyze the AC and DC circuits using Kirchhoff's law and Network simplification theorems.	K4
CO3	Analyze steady-state responses and transient response of DC and AC circuits using classical and Laplace transform methods.	K4
CO4	Demonstrate the concept of complex frequency and analyze the structure and function of one and two port network. Also evaluate and analysis two-port network parameters.	K4
CO5	Synthesize one port network and analyze different filters	K4

KL- Bloom's Knowledge Level (K1, K2, K3, K4, K5, K6) K1 – Remember K2 – Understand K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create

8. Python Programming (KNC 402)

Course Outcome		Knowledge Level, KL
CO1	Apply the knowledge of basic circuit law, nodal and mesh methods of circuit analysis and simplify the network using Graph Theory approach.	K3
CO2	Analyze the AC and DC circuits using Kirchhoff's law and Network simplification theorems.	K4
CO3	Analyze steady-state responses and transient response of DC and AC circuits using classical and Laplace transform methods.	K4
CO4	Demonstrate the concept of complex frequency and analyze the structure and function of one and two port network. Also evaluate and analysis two-port network parameters.	K4
CO5	Synthesize one port network and analyze different filters	K4

KL- Bloom's Knowledge Level (K1, K2, K3, K4, K5, K6) K1 – Remember K2 – Understand K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create

9. Circuit Simulation Lab (KEE-451)

Course Outcome		Knowledge Level, KL
CO1	Apply the knowledge of basic circuit law, nodal and mesh analysis for given circuit.	K2
CO2	Analysis of the AC and DC circuits using simulation techniques.	K3
CO3	Analysis of transient response of AC circuits	K3
CO4	Evaluation and analysis of two-port network parameters	K2
CO5	Estimation of parameters of different filters	K2

KL- Bloom's Knowledge Level (K1, K2, K3, K4, K5, K6) K1 – Remember K2 – Understand K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create

10. Electrical Machine-1 Lab (KEE-452)

Course Outcome		Knowledge Level, KL
CO1	Analyze and conduct basic tests on DC Machines and single-phase Transformer	k2
CO2	Obtain the performance indices using standard analytical as well as graphical methods.	K3
CO3	Determine the magnetization, Load and speed-torque characteristics of DC Machines.	K3
CO4	Demonstrate procedures and analysis techniques to perform electromagnetic and electromechanical tests on electrical machines.	K2

KL- Bloom's Knowledge Level (K1, K2, K3, K4, K5, K6) K1 – Remember K2 – Understand K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create

11. Digital Electronics Lab (KEE-543)

Course Outcome		Knowledge Level, KL
CO1	Understanding of Digital Binary System and implementation of Gates.	K2 , K3
CO2	Design the Sequential circuits with the help of combinational circuits and feedback element	K3, K4
CO3	Design data selector circuits with the help of universal Gates	K3, K4
CO4	Design the counters with the help of sequential circuit and basic Gates.	K3, K4
CO5	Implement the projects using the digital ICs and electronics components	K3, K5

KL- Bloom's Knowledge Level (K1, K2, K3, K4, K5, K6) K1 – Remember K2 – Understand K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create

12. Power System-II (KEE-601)

Course Outcomes		Knowledge Level, KL
CO1	Identify power system components on one line diagram of power system and its representation including the behaviour of the constituent components and sub systems and Analyse a network under both balanced and unbalanced fault conditions and design the rating of circuit breakers.	K4
CO2	Perform load flow analysis of an electrical power network and interpret the results of the analysis	K4
CO3	Describe the concept of travelling waves in transmission lines and use the travelling wave theory to determine the over voltage caused by surge propagation in transmission networks.	K4
CO4	Assess the steady state and transient stability of the power system under various conditions	K4
CO5	Describe Operating Principle of a relay and classify them according to applications. Explain working principle of Circuit breaker and phenomenon of arc production and quenching.	K3

KL- Bloom's Knowledge Level (K1, K2, K3, K4, K5, K6) K1 – Remember K2 – Understand K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create

13. Microprocessor & Microcontroller (KEE-602)

Course Outcome		Knowledge Level, KL
CO1	Demonstrate the basic architecture of 8085 & 8086 microprocessors	K2
CO2	Illustrate the programming model of microprocessors & write program using 8085 microprocessor	K3
CO3	Interface different external peripheral devices with 8085 microprocessor	K3
CO4	Comprehend the architecture of 8051 microcontroller	K2

CO5	Compare advance level microprocessor & microcontroller for different applications	K4
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KL- Bloom's Knowledge Level (K1, K2, K3, K4, K5, K6) K1 – Remember K2 – Understand K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create

14. Power Electronics (KEE-603)

Course Outcome		Knowledge Level, KL
CO1	Demonstrate the characteristics as well as the operation of BJT, MOSFET, IGBT, SCR, TRIAC and GTO and identify their use in the power switching applications.	K4
CO2	Comprehend the non-isolated DC-DC converters and apply their use in different Power electronics applications.	K3
CO3	Analyze the phase controlled rectifiers and evaluate their performance parameters	K5
CO4	Apprehend the working of single-phase ac voltage controllers, cyclo-converters and their various applications.	K3
CO5	Explain the single-phase and three phase bridge inverters differentiate between CSI and VSI and apply PWM for harmonic reduction.	K4

KL- Bloom's Knowledge Level (K1, K2, K3, K4, K5, K6) K1 – Remember K2 – Understand K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create

15. Special Electrical Machine (KEE-061)

Course Outcomes		Knowledge Level, KL
CO1	Describe the working principle, Constructional Features of different types of electrical machines including the fractional kilowatt machines.	K2
CO2	Analyse torque- speed characteristics of different electrical machines and interpret their performance and identify the suitable machine for an operation.	K4
CO3	Study different types of control techniques for a machine and identify the best control strategy based upon different constraints.	K4
CO4	Illustrate the use of stepper, BLDCs, SRM, and other special machines in the area of the various industrial and domestic as well as commercial applications of various fractional kilowatt machines.	K3

KL- Bloom's Knowledge Level (K1, K2, K3, K4, K5, K6) K1 – Remember K2 – Understand K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create

16. Understanding the Human Being Comprehensibly Human Aspiration and its Fulfilments(KOE-069)

Course Outcomes		Knowledge Level, KL
CO1	To help the students having the clarity about human aspirations, goal, activities and purpose of life	K1
CO2	To felicitate the competence to understand the harmony in nature/existence and participation of human being in the nature/existence	K2
CO3	To help the students to develop the understanding of human tradition and its various components	K2

KL- Bloom's Knowledge Level (K1, K2, K3, K4, K5, K6) K1 – Remember K2 – Understand K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create

17. Indian Tradition, Culture and Society (KNC-602)

Course Outcome		Knowledge Level, KL
CO1	Ability to understand, connect up and explain basics of Indian Traditional knowledge modern scientific perspective.	K3

KL- Bloom's Knowledge Level (K1, K2, K3, K4, K5, K6) K1 – Remember K2 – Understand K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create

18. Power System –II Lab (KEE-651)

Course Outcome		Knowledge Level, KL
CO1	Test various relays for different characteristics and compare with the performance characteristics provided by manufacturers.	K4
CO2	Select the power system data for load-flow and fault studies and to develop a program to solve power flow problem using NR and GS methods	K6
CO3	Analyze various types of short circuit faults	K4
CO4	Demonstrate different numerical integration methods and factors influencing transient stability	K3
CO5	Determine the effect of load in long transmission line	K3

KL- Bloom's Knowledge Level (K1, K2, K3, K4, K5, K6) K1 – Remember K2 – Understand K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create

19. Microprocessor & Microcontroller Lab (KEE-652)

Course Outcome		Knowledge Level, KL
CO1	Study of microprocessor system	K2
CO2	Development of flow chart for understanding the data flow	K3
CO3	Learning assembly language to program microprocessor based system	K3
CO4	Interfacing different peripheral devices with the microprocessor	K4

CO5	Building logic for microprocessor based system	K4
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KL- Bloom's Knowledge Level (K1, K2, K3, K4, K5, K6) K1 – Remember K2 – Understand K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create

20. Power Electronics Lab (KEE-653)

Course Outcome		Knowledge Level, KL
CO1	Demonstrate the characteristics and triggering of IGBT, MOSFET, Power transistor and SCR.	K3
CO2	Analyze the performance of single phase fully controlled bridge rectifiers under different loading conditions.	K4
CO3	Develop simulation models of power electronic circuits.	K5

KL- Bloom's Knowledge Level (K1, K2, K3, K4, K5, K6) K1 – Remember K2 – Understand K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create

21. Renewable Energy Resources (ROE 086)

Course Outcome		Knowledge Level, KL
CO1	Remember the environmental aspects of non-conventional energy resources .	K1
CO2	Understand the need of renewable energy resources , historical and latest developments.	K2
CO3	Evaluate the use of solar energy and the various components used in the energy production with respect to applications like heating,cooling,desalination, power generation , drying ,cooking etc.	K5
CO4	Analyze the need of wind energy and various components used in energy generation and know the classifications.	K4
CO5	Analyze Solar,Wind and Bio energy system ,their prospects , advantages and limitations.	K4
CO6	Understand the applications of fuel cells, Sea wave energy, Tidal Power and Geo thermal energy.	K2

KL- Bloom's Knowledge Level (K1, K2, K3, K4, K5, K6) K1 – Remember K2 – Understand K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create

22. Introduction to Power Quality and FACTS (REE081)

Course Outcome		Knowledge Level, KL
CO1	Understand the standards of power quality parameters, the sources of the power quality problems and the definitions of power quality parameters	K2
CO2	Analyse computational methods to calculate active and reactive power and FFT for calculation of harmonic components.	K4
CO3	Understand the power quality monitoring systems	K2
CO4	Understand the shunt and series compensators in power system	K2
CO5	Design and evaluate active power filters and passive filters in power system for mitigation of harmonics.	K5

CO6	Understand Flexible AC Transmission Systems (FACTS) devices	K2
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KL- Bloom's Knowledge Level (K1, K2, K3, K4, K5, K6) K1 – Remember K2 – Understand K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create

23. EHVAC & DC Transmission (REE-085)

Course Outcome		Knowledge Level, KL
CO1	Understand the basic concepts of EHV AC and HVDC transmission. and identify the electrical requirements for HVDC lines	K2
CO2	To apply the components used in AC to DC conversion	K3
CO3	Understand the operation of HVDC conversion technology and fundamental requirements of HVDC transmission line design	K2
CO4	Students will understand the effects of corona like Audible noise	K2
CO5	Students can analyze travelling waves	K4
CO6	To analyse the factors affecting AC-DC transmission.	K4

KL- Bloom's Knowledge Level (K1, K2, K3, K4, K5, K6) K1 – Remember K2 – Understand K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create

24. GD & Seminar (REN-851)

Course Outcome		Knowledge Level, KL
CO1	Identify and analyse the real time system problems.	K4
CO2	Acquire awareness on latest technology and current trends in industry.	K1
CO3	Create documents and present technical reports.	K6
CO4	Participate in discussion for enhancement of knowledge.	K5
CO5	Apply professional ethics.	K3

KL- Bloom's Knowledge Level (K1, K2, K3, K4, K5, K6) K1 – Remember K2 – Understand K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create

25. Project –II (REN852)

Course Outcome		Knowledge Level, KL
CO1	Analyze a sound technical knowledge of their selected projects.	K4
CO2	Understand the problem identification ,formulation and solutions	K2
CO3	Apply engineering solutions to complex problems utilizing a system approach	K3

KL- Bloom's Knowledge Level (K1, K2, K3, K4, K5, K6) K1 – Remember K2 – Understand K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create

Department of Electrical Engineering

PROGRAMME OUTCOMES (POs)

B.Tech. in Electrical Engineering programmes are designed to prepare graduates to attain the following program outcomes:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.