Hindustan College of Science and Technology
Farah-Mathura
(AICTE approved & affiliated to AKTU)

NAAC
CRITERIA-2

Metric No.- 2.6.1 (Q_iM)

Programme Outcomes (POs) and Course Outcomes (COs) for Electrical and Electronics Engineering

SEMESTER–III

SN	Subject Code	Subject	Type	Category	Periods			Sessional Component		Sessional(SW) (TS/PS)	EndSemester Examination (ESE)	TotalSW+ESE	Credit Cr
					L	T	P	CT	TA	CT+TA	TE/PE		
1	BOE3**/ BAS303	Science Based Open Elective/BSC(Maths-III/MathIV/MathV)	T	ES/BS	3	1	0	20	10	30	70	100	4
2	BVE301 / BAS301	UniversalHumanValueand Professional Ethics/ TechnicalCommunication	T	VA/HS	2	1	0	20	10	30	70	100	3
3	BEE301	ElectromagneticField Theory	T	PC	3	1	0	20	10	30	70	100	4
4	BEE302	ElectricalMeasurements &Instrumentation	T	PC	3	1	0	20	10	30	70	100	4
5	BEE303	BasicSignals&Systems	T	PC	2	1	0	20	10	30	70	100	3
6	BEE351	CircuitSimulationLab	P	PC	0	0	2		50	50	50	100	1
7	BEE352	Electrical Measurementsand InstrumentationLab	P	PC	0	0	2		50	50	50	100	1
8	BEE353	ElectricalWorkshop	P	PC	0	0	2		50	50	50	100	1
10	BCC301/ BCC302	CyberSecurity/Python programming	T	VA	2	0	0	20	10	30	70	100	2
11	BCC351	InternshipAssessment/Mini Project*	P							100		100	2
		Total			**15**	**5**	**6**						**25**

- **Mathematics–III** forCE/ENVandallied branches
- **Mathematics-IV** forComputer/Electronics/Electrical&alliedBranches,Mechanical&AlliedBranches Textile/Chemical & allied Branches
- **Mathematics-V**forBioTechnology/AgricultureEngineering

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ELECTRICAL&ELECTRONICSENGINEERING

SEMESTER–IV

SN	Subject Code	Subject	Type	Category	Periods			Sessional Component		Sessional(SW) (TS/PS)	EndSemester Examination (ESE)	Total SW + ESE	Credit Cr
					L	T	P	CT	TA	CT+ TA	TE/PE		
1	BAS403/ BOE4**	BSC(Maths-III/Math IV/ Math V)/ScienceBasedOpenElective	T	BS/ES	3	1	0	20	10	30	70	100	4
2	BAS401/ BVE401	TechnicalCommunication/Universal HumanValueandProfessionalEthics	T	HS/VA	2	1	0	20	10	30	70	100	3
3	BEE401	DigitalElectronics	T	PC	3	1	0	20	10	30	70	100	4
4	BEE402	ElectricalMachines-I	T	PC	3	1	0	20	10	30	70	100	4
5	BEE403	NetworksAnalysis& Synthesis	T	PC	2	1	0	20	10	30	70	100	3
6	BEE451	NetworkAnalysis&SynthesisLab	P	PC	0	0	2		50	50	50	100	1
7	BEE452	ElectricalMachines-ILab	P	PC	0	0	2		50	50	50	100	1
8	BEE453	DigitalElectronicsLab	P	PC	0	0	2		50	50	50	100	1
9	BCC402/ BCC401	PythonProgramming/CyberSecurity	P	VA	2	0	0	20	10	30	70	100	2
10	BVE451/ BVE452	SportsandYoga-II/NSS-II	P	VA	0	0	3			100		100	0
		Total			**15**	**5**	**9**						**23**
		MinorDegree/HonorsDegreeMT-1/HT-1											

*TheMiniProjectorinternship(4weeks)willbedoneduringsummerbreakafter4th Semesterandwillbeassessedduring V semester.

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ELECTRICAL&ELECTRONICSENGINEERING

3rd YEAR

(ELECTRICAL&ELECTRONICSENGINEERING)

SEMESTER V

Sl. No.	Subject Codes	Subject	Periods			EvaluationScheme				End Semester		Total	Credit
			L	T	P	CT	TA	Total	PS	TE	PE		
1	KEE501	PowerSystem -I	3	1	0	30	20	50		100		150	4
2	KEE502	ControlSystem	3	1	0	30	20	50		100		150	4
3	KEE503	ElectricalMachines-II	3	1	0	30	20	50		100		150	4
4	KE*051-KE*054	DepartmentalElective-I	3	0	0	30	20	50		100		150	3
5	KEE055-KEE058	DepartmentalElective-II	3	0	0	30	20	50		100		150	3
6	KEE551	PowerSystem-ILab	0	0	2				25		25	50	1
7	KEE552	ControlSystemLab	0	0	2				25		25	50	1
8	KEE553	Electrical Machines - IILab	0	0	2				25		25	50	1
9	KEN554	Mini Project or InternshipAssessment*	0	0	2				50			50	1
10	KNC501/ KNC502	Constitution of India,Law and Engineering /IndianTradition,Culture andSociety	2	0	0	15	10	25		50			
11		MOOCs(Essentialfor Hons.Degree)											
		Total	**17**	**3**	**8**							**950**	**22**

**TheMiniProjectorinternship(4 weeks)conductedduringsummerbreakafter IVsemesterand willbeassessedduringVsemester.*

DEPARTMENTELECTIVE- I

KEE051 Robotics
KEE052Sensorsand Transducers
KEE053Industrial Automation and ControlKEN051Bio-MedicalInstrumentation

DEPARTMENTELECTIVE- II

KEE055 Optimization TechniquesKEE056Neural Networks & Fuzzy SystemKEE057 Digital Signal ProcessingKEE058Analog&DigitalCommunication

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SEMESTER VI													
Sl. No.	Subject Codes	Subject	Periods			EvaluationScheme				End Semester		Total	Credit
			L	T	P	CT	TA	Total	PS	TE	PE		
1	KEE601	Power System-II	3	1	0	30	20	50		100		150	4
2	KEE602	Microprocessorand Microcontroller	3	1	0	30	20	50		100		150	4
3	KEE603	PowerElectronics	3	1	0	30	20	50		100		150	4
4	KE*06*	DepartmentalElective-III	3	0	0	30	20	50		100		150	3
5	KOE06*	OpenElective-I	3	0	0	30	20	50		100		150	3
6	KEE651	PowerSystem-IILab	0	0	2				25		25	50	1
7	KEE652	Microprocessorand MicrocontrollerLab	0	0	2				25		25	50	1
8	KEE653	PowerElectronicsLab	0	0	2				25		25	50	1
10	KNC601/ KNC602	Constitution of India,Law and Engineering /IndianTradition,Culture andSociety	2	0	0	15	10	25		50			
11		MOOCs(Essentialfor Hons. Degree)											
		Total	**17**	**3**	**6**							**900**	**21**

DEPARTMENTELECTIVE-III

KEE061SpecialElectricalMachinesK
EN 061 Linear Integrated
CircuitsKEE 063 Digital Control
SystemKEN 062EmbeddedSystems

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EVALUATION SCHEME - B.TECH 4th YEAR

SEMESTER- VII

Sl. No.	Subject Codes	Subject	Periods			Evaluation Scheme				End Semester		Total	Credit
			L	T	P	CT	TA	Total	PS	TE	PE		
1	KHU701 /KHU702	HSMC -1 #/ HSMC-2 #	3	0	0	30	20	50		100		150	3
2	KEE07X	**Departmental Elective-IV**	**3**	**0**	**0**	**30**	**20**	**50**		**100**		**150**	**3**
3	KEE07X	**Departmental Elective-V**	**3**	**0**	**0**	**30**	**20**	**50**		**100**		**150**	**3**
4	KOE07X	Open Elective-II	3	0	0	30	20	50		100		150	3
5	KEN751	Industrial Automation & PLC Lab	0	0	2				25		25	50	1
6	KEN752	Mini Project or Internship Assessment*	0	0	2				50			50	1
7	KEN753	Project I	0	0	8				150			150	4
8		MOOCs (Essential for Hons. Degree)											
		TOTAL	**12**	**0**	**12**							**850**	**18**

***The Mini Project or internship (4 - 6 weeks) conducted during summer break after VI semester and will beassessed during VII semester.**

Department Elective - IV	Department Elective - V
KEN070: Power System Operation & Control	KEN071: Electric & Hybrid Vehicles
KEE070: Advanced Micro processors & Micro Controllers	KEE075: Electric drives

SEMESTER- VIII

Sl. No.	Subject Codes	Subject	Periods			Evaluation Scheme				End Semester		Total	Credit
			L	T	P	CT	TA	Total	PS	TE	PE		
1	KHU801/ KHU802	HSMC-2#/HSMC-1#	3	0	0	30	20	50		100		150	3
2	KOE08X	Open Elective-III	3	0	0	30	20	50		100		150	3
3	KOE08X	Open Elective-IV	3	0	0	30	20	50		100		150	3
4	KEN851	Project II	0	0	18				100		300	400	9
5		MOOCs (Essential for Hons. Degree)											
		Total	**9**	**0**	**18**							**850**	**18**

Program Outcomes (POs)

Engineering Graduates will be able to:

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 teamwork**: 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.

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Program Specific Outcome (PSOs)

1. Design, Analyze, innovate and provide Electrical and Electronics Engineering solutions to problems encountered in power sector in particular and other sector in general.
2. Develop and apply concepts and tools of Electrical and Electronics Engineering for deploying control strategies of Power Electronics, Electrical Machines and other electrical installations.
3. Impart adequate practical skill in Electrical and Electronics Engineering and develop potential to work on its own in order to incorporate vocational and entrepreneurial attributes

Technical Communication	BAS301	CO1	Students will be able to UNDERSTAND the nature and objective of Technical Communication relevant for the work place as Engineers
		CO2	Students will be able to DEVELOP an understanding of key concepts of writing, designing and speaking.
		CO3	Students will be able to UTILIZE the technical writing skills for the purposes of Technical Communication and its exposure in various dimensions.
		CO4	Students will be able BUILD UP interpersonal communication traits that will make the transition from institution to workplace smoother and help them to excel in their jobs.
		CO5	Students will be able to APPLY technical communication to build their personal brand and handle crisis communication.
Maths IV	BAS303	CO1	The idea of partial differential equation and its different types of solution.
		CO2	The concept ofmethod of separation of variables and Fourier transform to solve partial differential equations.
		CO3	The basic ideas of statistics including measures of central tendency, correlation, regression and their properties.
		CO4	The idea of probability, random variables, discrete and continuous probability distributions and their properties.
		CO5	The statistical methods of studying data

			samples, hypothesis testing and statistical quality control.
Electromagnetic Field Theory	BEE301	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.
		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
		CO3	Understand the concept of static magnetic field, magnetic scalar and vector potential
		CO4	Understand the forces due to magnetic field, magnetization, magnetic boundary conditions and inductors.
		CO5	Understand displacement current, time varying fields, propagation and reflection of EM waves and transmission lines.
Electrical Measurements & Instrumentation	BEE302	CO1	Evaluate errors in measurement as well as identify and use different types of instruments for the measurement of voltage, current.
		CO2	Demonstrate the construction and working of different measuring instruments for Power, energy and frequency measurements.
		CO3	Demonstrate the construction and working of different AC and DC bridges, along with their applications.

		CO4	Demonstrate the working of instrument transformers as well as calculate the errors in current and potential transformers, Manifest the working of electronic instruments like voltmeter, multimeter, frequency meter and CRO and ability to measure electrical engineering parameters like voltage, current, power, phase difference and frequency.
		CO5	Display the knowledge of transducers, their classifications and their applications for the measurement of physical uantities like motion, force, pressure, temperature, flow and liquid level.
Basic Signals & Systems	BEE303	CO1	Represent the various types of signals & systems and can perform mathematical operations on them.
		CO2	Analyze the response of LTI system to Fourier series and Fourier transform and to evaluate their applications to network analysis.
		CO3	Analyze the properties of continuous time signals and system using Laplace transform and determine the response of linear system to known inputs.
		CO4	Implement the concepts of Z transform to solve complex engineering problems using difference equations.
		CO5	Develop and analyze the concept of state-space models for SISO & MIMO system.
Cyber Security	BCC301	CO1	Understand the basic concepts of cyber security and cybercrimes.

		CO2	Understand the security policies and cyber laws.
		CO3	Understand the tools and methods used in cyber crime
		CO4	Understand the concepts of cyber forensics
		CO5	Understand the cyber security policies and cyber laws
Circuit Simulation Lab	BEE351	CO1	Apply the knowledge of basic circuital law, nodal and mesh analysis for given circuit.
		CO2	Analysis of the AC and DC circuits using simulation techniques.
		CO3	Analysis of transient response of AC circuits.
		CO4	Evaluation and analysis of two-port network parameters.
		CO5	Estimation of parameters of different filters.
Electrical Measurements & Instrumentation Lab	BEE352	CO1	Understand the importance of calibration of measuring instruments.
		CO2	Demonstrate the construction and working of different measuring instruments.
		CO3	Demonstrate the construction and working of different AC and DC bridges, along with their applications.
		CO4	Ability to measure electrical engineering parameters like voltage, current, power & phase difference in industry as well as in power generation, transmission and distribution sectors.
		CO5	Capability to analyze and solving the

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			variety of problems in the field of electrical measurements.
Electrical Workshop Lab	BEE353	CO1	Perform various types of Electrical connections.
		CO2	Develop small circuits on PCB
		CO3	Differentiate between various electrical wires, cables and accessories.
		CO4	Demonstrate the layout of electrical substation & various safety measures.
		CO5	
Universal Human Values	BVE401	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
		CO2	Distinguish between the Self and the Body, and understand the meaning of Harmony in the Self and the Co-existence of Self and Body.
		CO3	Understand the value of harmonious relationships based on trust, respect, and other naturally acceptable feelings in human-human relationships and explore their role in ensuring a harmonious society
		CO4	Understand the harmony in nature and existence, and workout their mutually fulfilling participation in nature.
		CO5	Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious

			environment wherever they work.
Digital Electronics	BEE401	CO1	Perform number style arithmetic and logic simplification using various methods.
		CO2	Design and analyze modular combinational circuits with MUX / DEMUX, Decoder & Encoder
		CO3	Design & analyze synchronous sequential logic circuits
		CO4	Analyze various logic families and design circuits using PLDs.
		CO5	Design various ADCs and DACs according to the given specifications.
Electrical Machines-I	BEE402	CO1	Analyze the various principles & concepts involved in Electromechanical Energy conversion.
		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.
		CO3	Evaluate the performance and characteristics of DC Machine as motor and as well as generator.
		CO4	Evaluate the performance of transformers, individually and in parallel operation.
		CO5	Demonstrate and perform various connections of three phase transformers.
Networks Analysis & Synthesis	BEE403	CO1	Apply the knowledge of basic circuital law, nodal and mesh methods of circuit analysis and simplify the network using Graph Theory approach.
		CO2	Analyze the AC and DC circuits using

			Kirchhoff's law and Network simplification theorems.
		CO3	Analyze steady-state responses and transient response of DC and AC circuits using classical and Laplace transform methods.
		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.
		CO5	Synthesize one port network and analyze different filters.
Analog Electronics Circuits	BOE408	CO1	Understand the characteristics of diodes and transistors.
		CO2	Design and analyze various rectifier and amplifier circuits.
		CO3	Design sinusoidal and non-sinusoidal oscillators.
		CO4	Understand the functioning of OP-AMP and design OP-AMP based circuits.
		CO5	Design LPF, HPF, BPF, BSF
Python Programming	BCC402	CO1	Interpret the fundamental Python syntax and semantics and be fluent in the use of Python control flow statements.
		CO2	Express proficiency in the handling of strings and functions
		CO3	Determine the methods to create and manipulate Python programs by utilizing the data structures like lists, dictionaries, tuples and sets.
		CO4	Identify the commonly used operations involving file systems and regular

			expressions.
		CO5	Articulate the Object-Oriented Programming concepts such as encapsulation, inheritance and polymorphism as used in Python
Network Analysis & Synthesis Lab	BEE451	CO1	Understand basics of electrical circuits with nodal and mesh analysis.
		CO2	Appreciate electrical network theorems.
		CO3	Analyse RLC circuits.
		CO4	Determine the stability of an electrical circuit.
		CO5	Design network filters.
Electrical Machines-I Lab	BEE452	CO1	Analyze and conduct basic tests on DC Machines and single-phase Transformer
		CO2	Obtain the performance indices using standard analytical aswell as graphical methods.
		CO3	Determine the magnetization, Load and speed-torque characteristics of DC Machines.
		CO4	Demonstrate procedures and analysis techniques to perform electromagnetic and electromechanical tests on electrical machines.
Digital Electronics Lab	BEE453	CO1	Understanding of Digital Binary System and implementation of Gates.
		CO2	Design the Sequential circuits with the

			help of combinational circuits and feedback element.
		CO3	Design data selector circuits with the help of universal Gates.
		CO4	Design the counters with the help of sequential circuit and basic Gates.
		CO5	Implement the projects using the digital ICs and electronics components.
Power System I	KEE-501	CO1	Describe the working principle and basic components of conventional power plants as well as the other aspects of power generation.
		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.
		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.
		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.

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		CO5	Elucidate different types of cables and assess the Resistance and capacitance parameters of cables, grading of cables and compare overhead lines and cables.
Control System	KEE-502	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.
		CO2	Measure and evaluate the performance of basic control systems in time domain. Design specification for different control action.
		CO3	Analyze the stability of linear time-invariant systems in time domain using Routh- Hurwitz criterion and root locus technique.
		CO4	Determine the stability of linear time-invariant systems in frequency domain using Nyquist criterion and Bode plot.
		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.
Electrical Machines - II	KEE-503	CO1	Demonstrate the constructional details and principle of operation of three phase Induction and Synchronous Machines.
		CO2	Analyze the performance of the three phase Induction and Synchronous Machines using the phasor diagrams and

		CO2	Compare the performance of control systems by applying different controllers / compensators.
		CO3	Analyze the behavior 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.
		CO4	Apply different stability methods of time & frequency domain in control systems using software & examine their stability.
		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.
Electrical Machines - II Lab	KEE-553	CO1	Perform various tests and demonstrate the various characteristics of three phase induction motor.
		CO2	Demonstrate the working of three phase synchronous machine under different operating conditions.
		CO3	Evaluate the performance of single-phase induction motor under different operating conditions.
		CO4	Develop simulation models for Electrical Machines.
		CO5	
Mini Project or Internship Assessment	KEN-554	CO1	Understand research papers for exploring new fields and review reporting.
		CO2	Evaluate new directions of various cutting-edge technologies.
		CO3	Create various skills by preparing detailed project report including all the

Constitution of India, Law and Engineering	KNC-501	CO1	Identify and explore the basic features and modalities about Indian constitution
		CO2	Differentiate and relate the functioning of Indian parliamentary system at the center and state level.
		CO3	Demonstrate different aspects of Indian Legal System and its related bodies.
		CO4	Discover and apply different laws and regulations related to engineering practices.
		CO5	Interpret and evaluate the role of engineers with different organizations and governance models
Power System I lab	KEE-551	CO1	Formulate a program/simulation model for calculation of various parameters of transmission line
		CO2	Formulate a program to determine the ABCD constant of transmission line
		CO3	Formulate a program /simulation model to determine the Ferranti effect in transmission line
		CO4	Formulate a program /simulation model to determine the sag & tension and string efficiency of insulator of transmission line
		CO5	Formulate a program /simulation model to determine the skin effect, and ground clearance of transmission line
Control System Lab	KEE-552	CO1	Determine the characteristics of control system components like ac servo motor, synchro, potentiometer, servo voltage stabilizer and use them in error detector mode.

			equivalent circuits.
		CO3	Select appropriate three phase AC machine for any application and appraise its significance.
		CO4	Start and observe the various characteristics of three phase Induction & Synchronous Machines
		CO5	Explain the principle of operation and performance of Single-Phase Induction Motor & Universal Motor.
Sesnsors & Transducers	KEE-052	CO1	Understand the working of commonly used sensors in industry for measurement of displacement, force and pressure.
		CO2	Recognize the working of commonly used sensors in industry for measurement of temperature, position, accelerometer, vibration sensor, flow and level.
		CO3	Identify the application of machine vision.
		CO4	Conceptualize signal conditioning and data acquisition methods.
		CO5	Comprehend smart sensors and their applications in automation systems.
Analog & Digital Communication	KEE-058	CO1	Understand the Amplitude Modulation in communication system.
		CO2	Comprehend the Frequency & Phase modulation.
		CO3	Realize the Pulse Modulation Techniques.
		CO4	Get the Digital Modulation Techniques and their use in communication system.
		CO5	Apply the concept of Information Theory in Communication Engineering.

			microprocessors & write program using 8085 microprocessor.
		CO3	Interface different external peripheral devices with 8085 microprocessor.
		CO4	Comprehend the architecture of 8051 microcontroller.
		CO5	Compare advance level microprocessor & microcontroller for different Applications.
Power Electronics	KEE603	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.
		CO2	Comprehend the non-isolated DC-DC converters and apply their use in different Power electronics applications.
		CO3	Analyze the phase controlled rectifiers and evaluate their performance parameters.
		CO4	Apprehend the working of single-phase ac voltage controllers, cyclo-converters and their various applications.
		CO5	Explain the single-phase and three phase bridge inverters differentiate between CSI and VSI and apply PWM for harmonic reduction.
Special Electrical Machines	KEE061	CO1	Describe the working principle, Constructional Features of different types of electrical machines including the fractional kilowatt machines.
		CO2	Analyse torque- speed characteristics of different electrical machines and interpret their performance and identify the

			findings.
		CO4	Effective communication by making an oral presentation to show the findings.
		CO5	Create facts related knowledge by preparing detailed report including outcomes.
Power System - II	KEE601	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 nbalanced fault conditions and design the rating of circuit breakers.
		CO2	Perform load flow analysis of an electrical power network and nterpret the results of the analysis.
		CO3	Describe the concept of ravelling waves in transmission lines and use the travelling wave theory to determine the over voltage caused by surge propagation in transmission networks.
		CO4	Assess the steady state and transient stability of the power system under various conditions
		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.
Microprocessor and Microcontroller	KEE602	CO1	Demonstrate the basic architecture of 8085 & 8086 microprocessors.
		CO2	Illustrate the programming model of

			suitable machine for an operation.
		CO3	Study different types of control techniques for a machine and identify the best control strategy based upon different constraints.
		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 pplications of various fractional kilowatt machines.
		CO5	
Idea to Business Model	KOE060	CO1	This course can motivate students to have an overall idea how to start and sustain a business enterprise.
		CO2	The students will learn basics of choosing an idea of a business model
		CO3	The core areas of choosing a business model are encompassed with Entrepreneurship development, PPC & communication system. The students will thus develop basic competencies how to run a business enterprise.
Indian Tradition, culture and Society	KNC602	CO1	The course aims at imparting basic principles of thought process, reasoning and inference to identify the roots and details of some of the contemporary issues faced by our nation and try to locate possible solutions to these challenges by digging deep into our past.
		CO2	To enable the students to understand the importance of our surroundings and encourage the students to contribute

			towards sustainable development.
		CO3	To sensitize students towards issues related to 'Indian' culture, tradition and its composite character.
		CO4	To make students aware of holistic life styles of Yogic-science and wisdom capsules in Sanskrit literature that are important in modern society with rapid technological advancements and societal disruptions
		CO5	To acquaint students with Indian Knowledge System, Indian perspective of modern scientific world-view and basic principles of Yoga and holistic health care system.
Power System - II Lab	KEE651	CO1	Test various relays for different characteristics and compare with the performance characteristics provided by manufacturers.
		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
		CO3	Analyze various types of short circuit faults.
		CO4	Demonstrate different numerical integration methods and factors influencing transient stability.
		CO5	Determine the effect of load in long transmission line.
Microprocessor and Microcontroller Lab	KEE652	CO1	Study of microprocessor system
		CO2	Development of flow chart for understanding the data flow

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		CO3	Learning assembly language to program microprocessor based system
		CO4	Interfacing different peripheral devices with the microprocessor
		CO5	Building logic for microprocessor based system
Power Electronics Lab	KEE653	CO1	Demonstrate the characteristics and triggering of IGBT, MOSFET, Power transistor and SCR.
		CO2	Analyze the performance of single phase fully controlled bridge rectifiers under different loading conditions.
		CO3	Develop simulation models of power electronic circuits.
HVDC & AC Transmission	KEE-072	CO1	Describe the comparison of EHVAC and HVDC transmission while understanding various issues related to transmission.
		CO2	Calculate and study the corona loss and its impacts. Cite examples of the causes of switching overvoltage, Ferro-resonance.
		CO3	Explain the generation and measurement circuits for impulse, high DC & AC voltages. While considering the design parameters evaluate the effect on the performance of the EHV lines.
		CO4	Classify the DC links and choice of converter configuration to investigate the impact of inductance on operation of converters and identify different control schemes as well as starting and stopping methods of DC links.
		CO5	Describe the converter faults, protections

			including MTDC types and applications.
Power System Protection	KEE-077	CO1	Describe the relays and different protective schemes.
		CO2	Explain Relay types and its application.
		CO3	Describe types of faults and protection scheme for major components of power system.
		CO4	Describe the circuit breaker operation, testing and types.
		CO5	Explain the electronic relay, microprocessor and computer based protection schemes.
Renewable Energy Resources	KOE-074	CO1	Understand of renewable and non-renewable sources of energy
		CO2	Gain knowledge about working principle of various solar energy systems
		CO3	Understand the application of wind energy and wind energy conversion system.
		CO4	Develop capability to do basic design of bio gas plant.
		CO5	Understand the applications of different renewable energy sources like ocean thermal, hydro, geothermal energy etc.
Rural Development	KHU-701	CO1	Students can understand the definitions, concepts and components of Rural Development
		CO2	Students will know the importance, structure, significance, resources of Indian rural economy.
		CO3	Students will have a clear idea about the area development programmes

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			and its impact.
		CO4	Students will be able to acquire knowledge about rural entrepreneurship.
		CO5	Students will be able to understand about the using of different methods for human resource planning
Industrial Automation & PLC lab	KEN-751	CO1	Understand the basics of PLC programming.
		CO2	Understand the different parameters of PLC.
		CO3	Design different process control applications through ladder logic.
		CO4	Analyze & explain different functions of PLC.
		CO5	Build and experiment with PLC based SCADA systems for various industrial applications.
Mini Project or Internship Assessment	KEN-752	CO1	To learn the application of knowledge in real world problems..
		CO2	To get exposure to team-work and leadership quality
		CO3	To deal with industry-professionals and ethical issues in the work environment.
		CO4	Student is able to determine the challenges and future potential for his / her internship organization in particular and the sector in general.
		CO5	Student is able to apply various soft skills such as time management, positive attitude and communication skills during performance of the tasks assigned in internship organization.

Project I	KEN-753	CO1	In a specialization domain of his / her choice, student will be able to choose an appropriate topic for study
		CO2	Student will form group and will be able to clearly formulate & state a research problem
		CO3	For a selected research topic, student will be able to compile the relevant literature and frame hypotheses for research as applicable
		CO4	For a selected research topic, student will be able to plan a research design including the sampling, observational, statistical and operational designs if any
		CO5	For a selected research topic, student will be able to compile relevant data, interpret & analyze it and test the hypotheses wherever applicable
Electric Vehicles	KOE-090	CO1	Understand the Concepts and basics of Electric Vehicles.
		CO2	Understand Different types of Electric Motor Drives for EV applications.
		CO3	Manage EV Batteries and Battery Management System.
		CO4	Design Charging system technology for EV applications.
		CO5	Plan EV Charging Facility.
Project Management & Entrepreneurship	KHU-802	CO1	Learners will pick up about Foundation of Entrepreneurship Development and its theories
		CO2	Learners will explore entrepreneurial skills and management function of a company with special reference to SME

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			sector
		CO3	Learners will identify the type of entrepreneur and the steps involved in an entrepreneurial venture.
		CO4	Learners will understand various steps involved in starting a venture and to explore marketing methods & new trends in entrepreneurship.
		CO5	Learners will pick up about Foundation of Entrepreneurship Development and its theories
Quality Management	KOE-085	CO1	Realize the importance of significance of quality.
		CO2	Manage quality improvement teams.
		CO3	Identify requirements of quality improvement programs.
		CO4	Identify improvement areas based on cost of poor quality.
		CO5	Organize for quality and development of quality culture through small group activities.
Project II	KEN-851	CO1	Based on the analysis and interpretation of the data collected, student manager will be able to arrive at logical conclusions and propose suitable recommendations on the research problem
		CO2	Demonstrate a sound technical knowledge of their selected project topic. Undertake problem identification, formulation and solution.
		CO3	Design engineering solutions to complex problems utilising a systems approach.

			Conduct an engineering project.
		CO4	CO4: Student manager will be able to create a logically coherent project report and will be able to defend his / her work in front of a panel of examiners
		CO5	Communicate with engineers and the community at large in written an oral forms.Demonstrate the knowledge, skills and attitudes of a professional engineer.

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