Course Code	**21EES101T**	Course Name	**ELECTRICAL AND ELECTRONICS ENGINEERING**		Course Category		S		ENGINEERING SCIENCE			L	T	P	C
												3	1	0	4
Pre-requisite Courses	*Nil*	Co-requisite Courses	*Nil*				Progressive Courses	*Nil*							
Course Offering Department		*Electrical and Electronics Engineering*			Data Book / Codes / Standards			*Nil*							

Course Learning Rationale (CLR):	*The purpose of learning this course is to:*	Learning			Program Outcomes (PO)														PSO-1	PSO-2	PSO-3
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12				
CLR-1 :	Outline the concepts and theorem of DC and AC electric circuits	Level of Thinking	Expected Proficiency	Expected Attainment	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design,	Modern Tool Usage	Society & Culture	Environment &	Ethics	Individual & Team	Communication	Project Mgt. & Finance	Life Long Learning				
CLR-2 :	Gain knowledge on analog and digital electronics																			
CLR-3 :	Familiarize the concept of DC / AC machines and drives																			
CLR-4 :	Illustrate the working of different sensors and transducers																			
CLR-5 :	Acquire the knowledge on Power Engineering																			
At the end of this course, the learners will be able to:																				
CO-1 :	Analyze and solve Problems in DC and AC electric circuits	4	75	75	H	M														
CO-2 :	Apply the analog and digital electronics to real time problem	3	75	75	H	M														
CO-3 :	Describe the working principle of machines and interpret its application to drives	2	75	75	H															
CO-4 :	Summarize the working of various sensors and transducers	1	75	75	H															
CO-5 :	Disseminate the latest trends in power engineering and its application to electric vehicle	1	75	75	H															

Unit-1 -Electric Circuits
Introduction to basic terminologies in DC circuit, Kirchhoff's Current law, Kirchhoff's Voltage law, Mesh Current Analysis, Nodal Voltage Analysis, Thevenin's Theorem, Maximum power transfer Theorem, Superposition Theorem.
Basic terminologies of AC - RMS and Average value of halfwave and Full wave alternating quantity, Fundamentals of single-phase AC circuits- Analysis of R-L, R-C, R-L-C series circuits- Fundamentals of three phase AC system, Three-Phase Winding Connections, Relationship of Line and Phase Voltages, and Currents in a Delta and Star-connected System
Practice on Theorems, Halfwave, Full wave bridge rectifier circuits.

Unit-2- Electronics
Overview of Semiconductors, Diodes and Transistors, Introduction to JFET and MOSFET. Construction and working of power devices-SCR, BJT, MOSFET, IGBT -Switching Characteristics of SCR- Types of power converters- Natural and force commutation, Linear voltage Regulator, SMPS
Realize the logic expression using basic logic gates, Combinational logic design-Sum of Product form (SOP) and Product of Sum (POS) form, Minterm and Maxterm, Karnaugh Map (K-Map) representation of logical functions, Two variables K-Map, Three variables K-Map, Four variables K-Map. Introduction to FPGA.
Practice on realization of logical expression, combinational circuits, PCB design, soldering and testing

Unit-3- Machines and Drives
Construction and working principle of DC machines- Construction and Working principle of a single-phase Transformer- Construction and working of three phase Inductor motor, BLDC motor, PMSM, Stepper and Servo motor -Introduction to Electrical Drives-Block diagram explanation of chopper fed DC drives, Selection of drives for real time applications (cranes/EV/ Pumping applications)
Practice on chopper applications, Demo on DC& AC machines

Unit-4 – Transducers and Sensors

Basic principles and classification of Instruments- Moving Coil instruments, Moving Iron instruments, Digital Multimeter, Digital storage Oscilloscope. Transducer- Classification- Capacitive and Inductive transducers, Linear Variable Differential Transformer (LVDT), Thermistors, Thermocouple, Piezoelectric transducer, Photoelectric transducer, Hall effect transducers, Introduction to Opto-electronics Devices, Light Dependent Resistor (LDR), Photodiodes, Phototransistors, Photovoltaic cells (solar cells), Optocouplers, Liquid crystal display, Proximity sensor, IR sensor, Pressure sensor, Introduction to Bio sensor, Sensors for smart building.
Practice on capacitive and inductive transducer, thermistor and LVDT using virtual lab

Unit-5– Power Engineering

Electrical supply system- simple layout of Generation, transmission and Distribution of power, Typical AC and DC power supply schemes, overview on substation equipment with key diagram of 11kV/400 V indoor substation- Introduction to smart grid.
Safety Measures in Electrical systems- Basic Principle and importance of Earthing- precautions for Electric shock- safety devices
Introduction to renewable energy resources: Solar Photovoltaic -Introduction to energy storage systems-overview of battery, Fuel cell technologies- HEVs, PHEVs and EVs – EV Charging station
Practice session on different types of wiring circuits and safety measures

Learning Resources	1. Edward Hughes, John Hiley, Keith Brown, Ian McKenzie Smith, Hughes Electrical and Electronics Technology, Pearson Education, 12th ed., 2016 2. S. K. Bhattacharya, Basic Electrical and Electronics Engineering, Pearson Education, 2011 3. R. Muthusubramanian, S. Salivahanan, Basic Electrical and Electronics Engineering, Tata McGraw-Hill, 2012	4. Charles Alexander, Matthew Sadiku, Fundamentals of electrical circuits, McGraw-Hill Education; 5th ed., 2012 5. Morris M. Mano, Digital Design, 3rd ed.,Pearson Education, 2011 6. Ernest Doebelin, Dhanesh Manik, Measurement systems, Fourth Edition,McGraw Hill, July 2017.

	Bloom's Level of Thinking	Continuous Learning Assessment (CLA) - By the Course Faculty				By The CoE	
		Formative CLA-1 Average of unit test (50%)		Life Long Learning CLA-2 (10%)		Summative Final Examination (40% weightage)	
		Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	30 %	-	30 %	-	30 %	-
Level 2	Understand	30 %	-	30 %	-	30 %	-
Level 3	Apply	20 %	-	20 %	-	20 %	-
Level 4	Analyze	20 %	-	20%	-	20%	-
Level 5	Evaluate	%	-	%	-	%	-
Level 6	Create	%	-	%	-	%	-
	Total	100%		100%		100%	

CLA – 2 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper as specified in regulation

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
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