Course Code	21EES101J	Course Name	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	Course Category	S	Engineering Sciences	L	T	P	C
							3	0	2	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		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLR-1 :	Outline the fundamentals and theorem of DC electric circuits & DC machines			
CLR-2 :	Illustrate the basics of AC electric circuits, machines and power measurements			
CLR-3 :	Introduce wiring circuits and understand the various semiconductor devices			
CLR-4 :	Explain the working of transducers for measuring electrical quantities, displacement, temperature and light.			
CLR-5 :	Introduce the concepts of digital systems and their simplification methods			

Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*	Learning			Program Learning Outcomes (PLO)														
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual &Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	Apply the theorems to DC electric circuits and comprehend the operation of DC machines	2	75	75	H	M	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-2 :	Analyse AC circuits and interpret the working of AC machines	2	75	75	H	M	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-3 :	Gain knowledge on electrical wiring and various semiconductor devices	1	75	75	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-4 :	Acquire knowledge on different types of transducers and its applications	1	75	75	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO-5 :	Utilize the concepts of digital logic and K maps for digital system simplification	2	75	75	H	M	-	-	-	-	-	-	-	-	-	-	-	-	-

Unit-1

Introduction to DC circuit, Ohm's law, Power, Energy- Electrical Circuit elements, DC network Terminologies-Voltage and Current sources, source transformation- Series–Parallel Circuits, Voltage and Current division rules-Kirchhoff's Current law, Kirchhoff's Voltage law- Lab 1: Verification of Kirchhoff's Laws-Mesh Current Analysis-Numerical on electric circuit using Mesh Current Analysis- Nodal Voltage Analysis, Numerical on electric circuit using Nodal Voltage Analysis- Thevenin's Theorem, Numerical on electric circuit using Thevenin's Theorem- Lab 2: Verification of Thevenin's Theorem, Faraday's laws of Electromagnetic Induction, Lenz's law, Fleming's right and left hand rules, Introduction to DC Machines, working, construction of DC generator, Types of DC Generators, Applications of DC Generators, Working principle of a DC motor and its types, Applications, Need for starter, Lab 3: Demo of DC Machines

Unit-2

Fundamentals of AC-Generation of Alternating voltage in an Elementary Generator-Concept of Frequency, Cycle , Time period-Instantaneous values and Maximum value of an Alternating quantity- Concept of Average value and Root Mean Square (RMS) value of an Alternating quantity- RMS and Average values of Half-wave rectified Alternating Quantity- RMS and Average values of Full-wave rectified Alternating Quantity- Lab 4: Calculation of RMS Value, Average Value, Form Factor and Peak factor of Sinusoidal waveform- Representation of AC quantities in Rectangular and Polar forms-Single phase AC Circuits- Phasor diagram, Impedance, real power, reactive power, apparent power and power factor-Impedance triangle, power triangle-
Analysis of R-L series circuits-Analysis of R-C series circuit-Analysis of R-L-C series circuit-Lab 5: Measurement of Power and Power factor for a single phase R-L series circuit-
Working principle of a single phase Transformer-Construction details and EMF equation of a Transformer-Fundamental of three Phase AC System, Three-Phase Winding Connections-
Relationship of Line and Phase Voltages, and Currents in a Delta and Star-connected System-Introduction to Three Phase Induction Motor and its principle-Construction and working of three phase Inductor motor-Lab 6: Demo of three phase Induction motor

Unit-3

Safety measures in electrical systems-Basic principles of Earthing, Types of Earthing- House wiring – wiring materials and accessories- Types of wiring- Wiring Circuits -Fluorescent lamp, LED lamp- Staircase wiring, corridor wiring- Lab 7: Wiring Circuits (fluorescent lamp wiring, staircase wiring)- Overview of Semiconductors-PN junction diode, Characteristics, Zener diode, Characteristics- Diode circuits: rectifiers, half and full wave- Bridge type rectifier - Rectifiers with filter circuit- Lab 8: VI Characteristics of PN junction and Zener diode- Clipper- Positive and negative- Biased Clipper- Clamper- Positive and negative- BJT construction, operation - BJT characteristics (CB, CE and CC configurations)- Introduction to JFET and MOSFET-
Lab 9: Half-wave and full-wave rectifier

Unit-4

Basic principles and classification of Instruments- Moving Coil instruments -Moving Iron instruments- Transducer, Classification based on quantity measured and power supply requirement
Capacitive and Inductive transducers- Linear Variable Differential Transformer(LVDT), Applications- Lab 10: Demo of Moving coil and moving iron instruments, Advantages and disadvantages of LVDT- Thermistors, Thermocouple -Piezoelectric transducer -Photoelectric transducer-Hall effect transducers -Introduction to Opto-electronics Devices-Lab 11: Measurement of displacement using LVDT- Light Dependent Resistor (LDR)- Photodiodes- Photovoltaic cells (solar cells)- Phototransistors- Optocouplers- Seven segment display, Liquid crystal display
Lab 12: VI Characteristics of Light Dependent Resistor (LDR)

Unit-5

Number systems, decimal, binary, Octal, Hexadecimal conversions-Binary arithmetic operations- addition and subtraction- 1's complement and 2's complement- Boolean algebra, laws and De Morgan's theorems- Algebraic Simplification of Logical Expressions- Logic Gates- Lab 13: Verification of Boolean expression using logic gates- Realise the logic expression using basic gates- Simplification of the logic circuit using law's of Boolean algebra and De Morgan's theorem- Combinational logic design- Sum of Product form (SOP) and Product of Sum (POS) form-
Min-term and Max-term- Karnaugh Map (K-Map) representation of logical functions- Two variables K-Map- Lab 14: Reduction and implementation of Boolean expression using logic gates
Three variables K-Map- Four variables K-Map- Principles of Communication System, Block diagram-Basic Principles of Modulation- Amplitude Modulation, Frequency Modulation, Phase Modulation (Qualitative treatment only)- Demodulation-Lab 15: Study of Transmission and Reception

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. Dash.S.S, Subramani.C, Vijayakumar.K, Basic Electrical Engineering, Vijay Nicole, 1st ed., 2013	5. Charles Alexander, Matthew Sadiku, Fundamentals of electrical circuits, McGraw-Hill Education; 5th ed., 2012 6. Jegatheesan .R, Analysis of Electric Circuits, Tata McGraw-Hill, 2014 7. Moris M. Mano, Digital Design, 3rd ed.,Pearson Education, 2011 *8.* https://nptel.ac.in/courses/108/105/108105112/ *9.* https://nptel.ac.in/courses/108/102/108102097/

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (60% weightage)								Final Examination (40% weightage)	
		CLA – 1 (15%)		CLA – 2 (15%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember Understand	*20%*	*20%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
Level 2	Apply Analyze	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
Level 3	Evaluate Create	*10%*	*10%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*	*15%*
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper as specified in regulaation

Course Designers

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