Subject Code: 01EE1101
Subject Name: Basics of Electrical & Electronics Engineering
B. Tech. Year - I (Semester - 2)

Objective : Students are expected to learn basics of Electrical Engineering which will help them to apply these concepts in day to day life. The course is divided into two parts: Electrical Circuits and Electrical Components. Keeping in view wide applications of batteries, a special unit of battery is introduced. To understand the construction and operation of various components and electronics circuits based on Diodes, BJT & OpAmp.

Rationale : The course aims to impart skills required in pattern making and mold making for metal casting

Course Outcome :
After learning the course, the students will be competent

1. Analyze electrical circuits with different elements. (Analyze)
2. Apply principle of electromagnetic for electromechanical energy conversion in machines. (Apply)
3. Choose a semiconductor circuit based on a given application. (Apply)
4. Describe the operation of various Op-Amp circuits. (Understand)
5. Define the role of electrical apparatus used in household applications. (Knowledge)

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
				Theory Marks			Practical Marks		
THEORY	TUTORIAL	PRACTICAL	C	ESE(E)	IA	CSE	Viva (V)	Term Work (TW)	
4	0	2	5	50	30	20	25	25	150

Content:

Sr. No.	Content	Total Hrs
1	Fundamental of DC Circuits Definition of Current, Voltage, e.m.f., Power Energy, Resistance, Open circuit and Short circuit, Kirchoff's Laws, Nodal Analysis, Mesh Analysis of Electrical Networks	06
2	Electromechanical Energy Conversion Principle, singly excited magnetic system and doubly excited magnetic system, physical concept of torque production, electromagnetic torque and reluctance torque. Principle and operation of DC machine, Induction motor and transformer..	10

3	AC Circuits Introduction to AC quantities, Phasor representation of alternating quantities, Analysis of series RL circuit, RC circuit, RLC circuit, Parallel and series-parallel AC circuits, phasor method, admittance method. Polyphase system Introduction, terminology, phase sequence, voltage and current relationship in star and delta connection	**10**
4	Semiconductor Diodes Energy Band Diagram of conductor, semiconductor and insulator; Crystal Structure of Semiconductor Materials, Intrinsic and Extrinsic Semiconductor Materials. Symbol and Construction, Operating Characteristics in Forward and Reverse Bias, Applications of Diode as Switch, Clipper, Clamper and Rectifier; Special Purpose Diodes : Zener Diode; Optical Diodes like LED, Photo Diode, Seven Segment Display	**08**
5	Transistors Bipolar junction transistor: History of BJT invention; Types, Symbol and Construction of BJT; Basic Operation of BJT; BJT Configurations: Common Base, Common Emitter, Common Collector with Operation, Input/output Characteristics; Applications of Transistors as Switch and Amplifier. Field effect transistor: Types, Symbol, Construction, Operation, Input/output Characteristics and Applications of Junction Field Effect Transistor (JFET), Metal Oxide Semiconductor Field Effect Transistor (MOSFET)	**10**
6	Operational Amplifiers Introduction to OpAmp, Differential and Common Mode Operation, OpAmp Basics, Practical OpAmp Circuits, Negative feedback in OpAmp, inverting and non-inverting amplifier, OpAmp Applications as Comparator, Summer, Integrator and Differentiator	**06**
7	Batteries Electric cell, types of cells, Equivalent circuits, grouping of cells, batteries, Important terminologies of battery, charging method, Application of battery.	**03**
8	Safety and Protection Electric Shock, First aid for electric shock, importance of grounding, Fuse, MCB, ELCB.	**03**

Distribution of Theory Marks

R Level	**U** Level	**A** Level	**N** Level	**E`** Level	**C** Level
10	**20**	**25**	**25**	**10**	**10**

Legends: R: Remember**; U:** Understand**; A:** Apply**; N:** Analyze**; E:** Evaluate**; C**: Create

List of Experiments:

1. Measurement of power in a single phase RL circuit using wattmeter

Department of Mechanical Engineering

2. Determination of parameters in series RLC circuit.
3. Relate line quantity and phase quantity in 3-phase circuit.
4. Verify the operation of Clipper circuits using silicon diode.
5. Verify the operation of Clamper circuits using silicon diode.
6. Observe the output of half wave rectifier circuit using silicon diode.
7. Observe the output of full wave rectifier circuit using silicon diode.
8. Analyze the performance of BJT as an amplifier.
9. Design an amplifier using OpAmp.
10. Identify the use of OpAmp as comparator, summer, Integrator and Differentiator.
11. Verify the operation of ELCB.
12. Demonstrate the use of number of cells to get desired output.

Reference books :

1. E. Hughes, 'Electrical and Electronic Technology', Prentice Hall India, 10th edition, 2008.
2. V.N. Mittal, 'Basic Electrical Engineering', Tata Mcgraw-Hill, 2nd edition, 2006.
3. V. Del Toro, 'Electrical Engineering Fundamentals', Prentice - Hall India, 2nd edition, 2006.
4. D. P. Kothari and I. J. Nagrath, 'Theory and Problems in Basic Electrical Engineering', Prentice Hall India.
5. A. Chakrabarti, S. Nath, C. Chanda, 'Basic Electrical EngineeringTata McGrawHill EducationIndia Pvt. Ltd, 2013.
6. B. L. Theraja, 'Electrical Technology', S. Chand Publication, 2012.
7. U. A. Patel, 'Elements of Electrical Engineering', Atul Prakashan, 8th edition, 2009.
8. Albert Malvino and David Bates, "Electronics Principles" Tata McGraw-Hill, 7th Edition, 2006
9. Robert Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory", Pearson Education,10thEdition,2009. 10. S Salivahanan and N Suresh Kumar,
10. "Electronics Device and Circuits" Tata McGraw-Hill Education Private Limited 2nd Edition, 2008.
11. Jacob Milman and Christos C. Halkias, "Electronics Device and Circuits", Tata McGraw-Hill, 3rd Edition, 2008

Open Base Software/learning website :

1. .http://nptel.ac.in/courses/108108076/
2. http://nptel.ac.in/downloads/108105053/4. https://www.facstaff.bucknell.edu/mastascu/eLessonsHTML/EEIndex.html
3. http://www.electrical4u.com/nature-of-electricity/
4. http://vlab.amrita.edu/index.php
5. http://textofvideo.nptel.iitm.ac.in/video.php?courseId=117103063

Department of Mechanical Engineering

Marwadi University
Marwadi Chandarana Group

Syllabus for Bachelor of Technology
Department of Mechanical Engineering

Department of Mechanical Engineering