

FACULTY OF TECHNOLOGY & ENGINEERING
M & V PATEL DEPARTMENT OF ELECTRICAL ENGINEERING
EE141: BASICS OF ELECTRONICS & ELECTRICAL ENGINEERING

Credit Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	4	2	-	6	5
Marks	100	50	-	150	

A. Objectives of the Course:

This course covers the basic principles and laws of electrical and electronics engineering with emphasis on the analysis and application to simple practical engineering problems.

The course objectives (CO) are to:

1. Introduce basic terms and units related to electrical engineering
2. Understand the basic concepts in the field of electrical and electronics engineering
3. Focus on the fundamentals of electrostatic and electromagnetism
4. Analyze the series and parallel AC systems
5. Solve single phase and polyphase circuits
6. Comprehend electronic devices, digital numbers, logic gates and communication systems.

B. Outline of the course:

Sr. No.	Title of Units	Minimum Number of Hours
1.	Basic Electrical Terms and Units	06
2.	Electrical Circuit Analysis	08
3.	Electrostatic	08
4.	Electromagnetism	08
5.	AC and DC Fundamentals	06
6.	Single Phase AC Series and Parallel Circuits	07
7.	Polyphase Circuits	05
8.	Basic of Electronics	12

Total Hours (Theory): 60

Total Hours (Lab): 30

Total Hours: 90

C. Detailed Syllabus:

1	Basic Electrical Terms and Units	06 Hrs	10%
1.1	Basic terms related to electrical engineering, their definition, units and symbols, equations		
1.2	Ohm's law, resistor and its coding, properties, temperature coefficient of resistance, resistance variation with temperature, examples		
2	Electrical Circuit Analysis	08 Hrs	13%
2.1	Kirchoff's current and voltage law, mesh and nodal analysis, Examples		
2.2	Series-parallel network, Star-Delta transformations, potential divider		
3	Electrostatic	08 Hrs	13%
3.1	Capacitors, charge and voltage, capacitance, electric fields, electric field strength and electric flux density, relative permittivity, dielectric strength, Examples		
3.2	Capacitors in parallel and series, Calculation of capacitance of parallel plate and multi plate capacitor, examples		
3.3	Energy stored in capacitors, types of capacitor, charging and discharging of capacitors on DC, examples		
4	Electromagnetism	08 Hrs	13%
4.1	Magnetic field, its direction and characteristics, magnetic flux and flux density, magneto motive force and magnetic field strength, examples		
4.2	Faraday's law of electromagnetic induction, Fleming's left hand and right hand rule, Lenz law, force on a current carrying conductor, examples		
4.3	Self and mutual inductance, coefficient of coupling, series and parallel combination of inductances, rise and decay of current in an inductive circuit in DC, examples		
4.4	Comparison between electrical & magnetic circuits		
5	AC and DC Fundamentals	06 Hrs	10%
5.1	Generation of AC and DC voltage, Waveform and definition of its terms, relation between speed, frequency and pole		
5.2	Average and RMS value and its determination for sinusoidal and non-sinusoidal wave shapes, examples		
5.3	Phasor representation of alternating quantities		
6	Single Phase AC Series and Parallel Circuits	07 Hrs	13%
6.1	R –L and R-C series circuit, power in ac circuits, examples		

6.2	R-L-C series circuit, resonance in R-L-C series and parallel circuit, Q – factor and bandwidth, examples		
6.3	Solution of series and parallel circuits, phasor method, admittance method, complex algebra method, examples.		
7	Polyphase Circuits	05 Hrs	08%
7.1	Generation of three phase emf, phase sequence, Definitions		
7.2	Star and delta connection of three phase system, voltage and current relations in star and delta connected system, Examples		
8	Basics of Electronics	12 Hrs	20%
8.1	Electronic Systems: Basic amplifier, voltage, current and power gain, Basic attenuators, CRO		
8.2	Transmission and Signals: Analog and digital signals, bandwidth, modulation and demodulation, Filters		
8.3	Forward and reverse bias of PN junction diode, zener diode, Rectifiers: Half wave, full wave – bridge and centre tap, L and C filters for smoothing		
8.4	Transistor: Bipolar junction transistor, construction and biasing, configuration, transistor as a switch and amplifier		

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 5 Marks weightage.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weightage of 5 Marks as a part of internal theory evaluation.
- Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Student Learning Outcomes:

On the completion of the course one should be able to:

- Identify resistors, capacitors and inductors reacting
- Understand the basic electrical laws and apply these laws to solve electrical network
- Identify the property of magnetic materials and understand the laws of emf generation
- Solve the series and parallel AC and DC circuits for single and polyphase networks.
- Define different terms of alternating quantities
- Design AC-DC rectification circuits, operate basic electrical and electronics instruments
- Operate the circuits with logical gates and transistors

F. Recommended Study Material:

Text Books:

1. Elements of Electrical Engineering and Electronics by U.A. Patel and R.P. Ajwalia
2. A Text Book of Electrical Technology by B. L. Thareja, S. Chand
3. Principles of Electrical Engineering and Electronics by V.K. Mehta, S. Chand

Reference Books:

1. Hughes, Electrical Technology, Pearson Education
2. Electrical Engineering by Del Toro

Web Material:

1. Exploring Electrical Engineering

<https://www.facstaff.bucknell.edu/mastascu/eLessonsHTML/EEIndex.html>

2. Video lectures by Prof. Umanand, IISc Bangalore on Basic Electrical Technology

<http://nptel.ac.in/courses/108108076/#>