COURSE CODE	COURSE NAME	L	T	P	CREDIT	YEAR OF INTRODUCTION
101908/CO900F	BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING	3	1	0	4	2021

1. Preamble

This course aims to (1) equip the students with an understanding of the fundamental principles of electrical engineering (2) provide an overview of evolution of electronics, and introduce the working principle and examples of fundamental electronic devices and circuits (3) provide an overview of evolution of communication systems, and introduce the basic concepts in radio communication.

2. Prerequisite

Physics and Mathematics (Pre-university level).

3. Syllabus

Section 1: Basics of Electrical Engineering (Modules 1, 2 and 3)

Module 1 : Elementary Concepts of Electric Circuits

Elementary concepts of DC electric circuits: Basic terminology including voltage, current, power, resistance, EMF; Resistances in series and parallel; Current and voltage division rules. Ohm's Law and Kirchhoff's laws-Problems; Star-delta conversion (resistive networks only-derivation
not required)-problems.

Analysis of DC electric circuits: Basic Network terminology including network element, branch, junction point, node, mesh, loop. Mesh current method - Matrix representation - Solution of network equations. Node voltage methods-matrix representation-solution of network equations by matrix methods. Numerical problems.

Module 2 : Elementary Concepts of Magnetic Circuits, Electromagnetic Induction and AC Fundamentals

Magnetic Circuits: Basic Terminology: MMF, field strength, flux density, reluctance - comparison between electric and magnetic circuits- Numerical problems on series magnetic circuits.
Electromagnetic Induction: Faraday's laws, problems, Lenz's law- statically induced and dynamically induced emfs - Self-inductance and mutual inductance, coefficient of coupling.
Alternating Current Fundamentals: Generation of alternating voltages-Representation of sinusoidal waveforms: frequency, period, Average, RMS values and form factor of periodic waveforms (sinusoidal)-Numerical Problems.

Module 3 : AC Circuits

AC Circuits: Phasor representation of sinusoidal quantities. Trigonometric, rectangular, polar and complex forms. Analysis of simple AC circuits: Purely resistive, inductive & capacitive circuits; Inductive and capacitive reactance, concept of impedance. Average Power, power factor. Analysis of RL, RC and RLC series circuits-active, reactive and apparent power. Simple numerical problems.

Three phase AC systems: Generation of three phase voltages; advantages of three phase systems. Power generation, transmission and distribution - one line diagram.

Section 2: Basics of Electronics Engineering (Modules 4, 5 and 6)

MODULE 4 :

Evolution of electronics – Vacuum tubes to nano electronics. Resistors, Capacitors and Inductors (constructional features not required): types, specifications. Standard values, color coding. PN Junction diode: Principle of operation, V-I characteristics, principle of avalanche breakdown. Bipolar Junction Transistors: PNP and NPN structures, Principle of operation, relation between current gains in CE, CB and CC, input and output characteristics of common emitter configuration.

MODULE 5 :

Rectifiers and power supplies: Block diagram description of a dc power supply, Working of half wave rectifier and full wave bridge rectifier, capacitor filter (no analysis), working of simple zener voltage regulator. Amplifiers: Block diagram of Public Address system, Circuit diagram and working of common emitter (RC coupled) amplifier with its frequency response, Concept of voltage divider biasing. Electronic Instrumentation: Block diagram of an electronic instrumentation system.

MODULE 6 :

Evolution of communication systems – Telegraphy to 5G. Radio communication: principle of AM & FM, frequency bands used for various communication systems, block diagram of super heterodyne receiver. Mobile communication: basic principles of cellular communications, principle and block diagram of GSM.

4. Text Books

(for Section 1)

1. D P Kothari and I J Nagrath, "*Basic Electrical Engineering*", Tata McGraw Hill, 2010.
2. D C Kulshreshtha, "*Basic Electrical Engineering*", Tata McGraw Hill, 2010.
3. M.S.Sukhija and T.K.Nagsarkar, *Basic Electrical and Electronics Engineering*, Oxford University Press, 2012.

(for Section 2)

4. Mitchel Schultz, *Grob's Basic Electronics*, 12th edition, McGraw-hill education, 2015.
5. N.N. Bhargava, *Basic Electronics and Linear Circuits*, Tata McGraw-hill Publishing Company Limited, 2008.

6. Wayne Tomasi, *Advanced Electronic Communications Systems*, 5 th edition, Pearson Education Asia, 2007.

5. Reference Books (Minimum 5)

(for Section 1)

1. Del Toro V, "*Electrical Engineering Fundamentals*", Pearson Education.
2. T. K. Nagsarkar, M. S. Sukhija, "*Basic Electrical Engineering*", Oxford Higher Education.
3. Hayt W H, Kemmerly J E, and Durbin S M, "*Engineering Circuit Analysis*", Tata McGraw-Hill
4. Hughes, "*Electrical and Electronic Technology*", Pearson Education.
5. V. N. Mittle and Arvind Mittal, "*Basic Electrical Engineering*," Second Edition, McGraw Hill.
6. Parker and Smith, "*Problems in Electrical Engineering*", CBS Publishers and Distributors.
7. S. B. Lal Saksena and KaustuvDasgupta, "*Fundamentals of Electrical Engineering*", Cambridge University Press.

(for Section 2)

8. Anant Agarwal, Jeffrey Lang, *Foundations of Analog and Digital Electronic Circuits,* Morgan Kaufmann Publishers, 2005.
9. Wayne Tomasi and Neil Storey, *A Textbook On Basic Communication and Information Engineering*, Pearson, 2010.
10. A. Bruce Carlson, Paul B. Crilly, *Communication Systems: An Introduction to Signals and Noise in Electrical Communication*, Tata McGraw Hill, 5th Edition.
11. George Kennedy, Bernard Davis, S. R. M Prasanna, *Kennedy's Electronic Communication Systems*, 6th edition, McGraw Hill Education (India) Private Limited, 2017.
12. Thomas L Floyd, *Electronic Devices*, 9 th edition, Pearson Education Asia, 2015.
13. Wayne Tomasi, *Electronic Communications Systems: Fundamentals Through Advanced*, 5 th edition, Pearson Education, 2008.

6. Course Outcomes

After the completion of the course the student will be able to

CO1: Apply fundamental concepts and circuit laws to solve simple DC electric circuits.
CO2: Develop and solve models of magnetic circuits.
CO3: Apply the fundamental laws of electrical engineering to solve simple ac circuits in steady state.
CO4: Describe working of a voltage amplifier.
CO5: Outline the principle of an electronic instrumentation system.

CO6: Explain the principle of radio and cellular communication.

7. Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1										2
CO2	3	1										2
CO3	3	1										2
CO4	2											
CO5	2											2
CO6	2											2

8. Assessment Pattern

Learning Objectives	Section1: Basics of Electrical Engineering			Section 2: Basics of Electronics Engineering		
	Continuous Internal Evaluation (CIE)		End Semester Examination (ESE out of 50)	Continuous Internal Evaluation (CIE)		End Semester Examination (ESE out of 50)
	Internal Examination 1 (25)	Internal Examination 2 (25)		Internal Examination 1 (25)	Internal Examination 2 (25)	
Remember	0	0	10	10	10	20
Understand	12.5	12.5	20	15	15	30
Apply	12.5	12.5	20			
Analyze						
Evaluate						

9. Mark Distribution

Total	CIE				ESE
	Attendance	Internal Examination	Assignment/Quiz/ Course Project	Total	
150	10	25 (Average of two scores)	15	50	100

10. End Semester Examination Pattern

There will be two parts: Section 1 – Basics of Civil Engineering and Section 2 – Basics of Mechanical Engineering. Section 1 and Section 2 carries 50 marks each. For the end semester examination, Section 1 contains 2 parts - Part A and Part B. Part A contains 5 questions carrying 4 marks each (not exceeding 2 questions from each module). Part B contains 2 questions from each module out of which one to be answered. Each question carries 10 mark and can have maximum 2 sub-divisions. The pattern for end semester examination for Section 2 is same as that of Section 1. **However, student should answer both part I and part 2 in separate answer booklets.**

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