SEMESTER S1

INTRODUCTION TO ELECTRICAL AND ELECTRONICS ENGINEERING

(Common to Group A & B)

Course Code	**GXEST104**	**CIE Marks**	40
Teaching Hours/Week (L: T:P: R)	4:0:0:0	**ESE Marks**	60
Credits	4	**Exam Hours**	2 Hrs. 30 Min
Prerequisites (if any)	None	**Course Type**	Group Core-Theory

Course Objectives:

1. Apply fundamental concepts and circuit laws to solve simple DC/AC electric circuits
2. Classify series and parallel magnetic circuits
3. Analyse three phase AC systems
4. Describe the fundamental concepts of electronic components and devices
5. Outline the principles of communication systems
6. Identify various applications of modern electronics in the contemporary world

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	**Elementary concepts of DC electric circuits:** Current and Voltage Division Rule - Relative potential Capacitors & Inductors: V-I relations and Energy stored. Ohms Law and Kirchhoff's laws - numerical problems. Star-delta conversion *(resistive networks only - derivation not required)* - numerical problems. **Analysis of DC Electric circuits:** Mesh current method – matrix representation - Solution of network equations.	**11**

	Node voltage methods-matrix representation-solution of network equations by matrix methods - numerical problems. **Elementary Concepts of Magnetic circuits:** Magnetic Circuits: Basic Terminology: MMF, field strength, flux density, reluctance - Comparison between electric and magnetic circuits - Series and parallel magnetic circuits with composite materials (*numerical problems not needed*)	
2	**Electromagnetic Induction**: Faraday's laws, Lenz's law- statically induced and dynamically induced emf – Self-inductance and mutual inductance, coefficient of coupling *(numerical problems not needed)* **Alternating Current fundamentals:** Generation of alternating voltages - Representation of sinusoidal waveforms: frequency, period, average value, RMS value and form factor - numerical problems 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 - numerical problems. RL, RC and RLC series circuits- power factor, active, reactive and apparent power. Simple numerical problems. Three phase AC systems: Generation of three phase voltages, advantages of three phase systems, star and delta connections (balanced only), relation between line and phase voltages, line and phase currents- numerical problems	**11**
3	**Introduction to Electronic devices:** Passive and active components in electronics Working of PN junction diode, V-I characteristics of PN Junction diode Zener diode and avalanche breakdown. Basics of Zener voltage regulator	**13**

	Block diagram of DC power supply, circuit and working of half wave, full wave and bridge rectifiers, ripple factor (with and without capacitor filters) Construction, working and V-I Characteristics of BJT, Input output characteristics of CE configuration, Comparison of CE, CB and CC configurations Concept of biasing and load line Transistor as a switch, Transistor as an amplifier (Circuit Diagram and working) RC coupled amplifier - Circuit diagram and frequency response Introduction to FET, Construction and working of N-channel and P-Channel MOSFETs	
4	**Modern Electronics and its applications:** General block diagram of a Communication system, Block diagram of Fiber optic Communication system Concept of AM and FM (No derivation required), Block diagram of AM and FM super-heterodyne receiver Basic concepts of Wired and Wireless communication, Block diagram of GSM Comparison of 3G, 4G, 5G and 6G communication technologies Block diagrams of Electronic instrumentation system, Digital Multimeter, Function generator Introduction to CRO and Lissajous patterns Applications of modern electronics – IoT based smart homes, healthcare and agriculture *(Case study only)*	**9**

Course Assessment Method
(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	15	10	10	40

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
• 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks **(8x3 =24marks)**	• Each question carries 9 marks. • Two questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 sub divisions. **(4x9 = 36 marks)**	**60**

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Apply fundamental concepts and circuit laws to solve simple DC/AC electric circuits	**K2**
CO2	Classify series and parallel magnetic circuits	**K2**
CO3	Analyse three phase AC systems	**K2**
CO4	Describe the fundamental concepts of electronic components and devices	**K2**
CO5	Outline the principles of communication systems	**K2**
CO6	Identify various applications of modern electronics in the contemporary world	**K2**

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

CO-PO Mapping Table:

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

Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Basic Electrical Engineering	D P Kothari and I J Nagrath	Tata McGraw Hill	4/e 2019
2	Schaum's Outline of Basic Electrical Engineering	J.J.Cathey and Syed A Nasar	Tata McGraw Hill	3/e 2010
3	Basic Electronics: Principles and Applications	Chinmoy Saha, Arindham Halder and Debarati Ganguly	Cambridge University Press	1/e 2018
4	Basic Electrical and Electronics Engineering	D. P. Kothari and I. J. Nagrath	McGraw Hill	2/e 2020
5	The Internet of Things: How Smart TVs, Smart Cars, Smart Homes, and Smart Cities Are Changing the World	Michael Miller	QUE	1/e 2015
6	Basic Electronics and Linear Circuits	N N Bhargava D C Kulshreshtha and S. C. Gupta	McGraw Hill	2/e 2017
7	Electronic Communication SYstems	Kennedy and Davis	McGraw Hill	6/e 2017

Reference Books				
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1	Basic Electrical Engineering	D C Kulshreshtha	Tata McGraw Hill	2/e 2019
2	Electrical Engineering Fundamentals	Del Toro V	Pearson Education	2/e 2019
3	Basic Electrical Engineering	T. K. Nagsarkar, M. S. Sukhija	Oxford Higher Education	3/e 2017
4	Electronics: A Systems Approach	Neil Storey	Pearson	6e 2017
5	Electronic Devices and Circuit Theory	Robert L. Boylestad and Louis Nashelsky	Pearson	11e 2015
6	Principles of Electronic Communication Systems	Frenzel, L. E	MGH	4e 2016
7	Internet of Things: Architecture and Design Principles	Raj Kamal	McGraw Hill	1/e 2017
8	Electronic Communication	Dennis Roddy and John Coolen	Pearson	4/e 2008