Semester 1

Introduction to Electrical & Electronics Engineering

Course Code	Teaching hours per week				Credits	Exam hours	Course Type	CIE Marks	ESE Marks
	L	T	P	R					
26ABNES102	4	0	0	0	4	2.5	Theory	40	60

1. **Preamble:** This course provides a comprehensive introduction to the fundamentals of Electrical and Electronics Engineering. It begins with the essential principles of electrical engineering, including basic circuit laws, magnetic circuits, AC fundamentals, and three-phase systems, thereby laying the groundwork for all advanced electrical engineering subjects. Building on this foundation, the course also introduces the basic concepts of electronic components and devices, explains the principles of instrumentation and communication systems, and highlights the key applications of modern electronics in today's world.

2. **Prerequisites:** Nil

Module Number	Syllabus Description	Contact Hours
	Part1: Electrical Engineering	
1	**Elementary Concepts of DC electric circuits:** Resistance in series and parallel, current and voltage division rule. Capacitors and Inductors: V–I relations and energy stored. Ideal and practical sources. Ohm's Law, Kirchhoff's Laws - Simple numerical problems. Star–delta transformations - problems (resistive networks only, derivation not required). **Analysis of DC Circuits:** Mesh Analysis - matrix representation - numerical problems. Nodal Analysis - matrix representation - numerical problems. **Magnetic circuits:** Basic terminology - MMF, flux density, reluctance, permeability, magnetic field strength. Comparison between electric and magnetic circuits. Series and parallel magnetic circuits. (numerical problem not required).	11

2	**Electromagnetic induction:** Faraday's laws, Lenz's law. Statically induced and dynamically induced emf. Self and mutual inductance, coefficient of coupling. **AC fundamentals:** Representation of sinusoidal waveforms: frequency, period, Average value, RMS value, form factor and peak factor - Average value, RMS values, form factor and peak factor of triangular wave and square wave. Simple numerical problems. Phasor representation of sinusoidal quantities - Trigonometric, Rectangular and Polar forms. **Analysis of AC Circuits**: Single phase circuits: R, L, C circuits; RL, RC, RLC series circuits - simple numerical problems. Power in AC circuits – active, reactive and apparent power - simple numerical problems. Three phase circuits: Three phase generation, advantages of three phase system, star and delta connections (balanced only), relation between line and phase quantities, three phase power - simple numerical problems.	11
	Part 2: Electronics Engineering	
3	**Introduction to Electronic Components, Devices and Circuits:** PN Junction diode - Construction, working, and V-I characteristics. Zener diode and avalanche breakdown. Block diagram of a DC power supply. Half-wave rectifier, centre-tapped full-wave rectifier and bridge rectifier (construction and working). Ripple factor(with and without capacitor filter). Capacitor Filter. Basics of Zener voltage regulator. Construction and working of BJT (NPN), input-output characteristics of CE configuration, comparison of CE, CB, and CC configurations, current gains, relation between the current gains. Concept of voltage-divider biasing and load line. Transistor as a switch. Transistor as an amplifier (circuit diagram and working). RC coupled amplifier (circuit diagram, working and frequency response)	11
4	**Electronic Instrumentation, Communication and Modern**	11

	Electronics: Quality of measurements -accuracy, precision, sensitivity and resolution, General block diagram of Instrumentation systems. Introduction to CRO and Lissajous patterns. Working principle and applications of sensors. Temperature sensors–RTD, Thermocouple. Proximity sensors–capacitive and ultrasonic. Accelerometer. General block diagram of a communication system. Concept of AM and FM (Derivation not required). Block diagram of AM and FM super-heterodyne receiver. Introduction to Cellular Communication. Block diagram of GSM, comparison of 3G, 4G, 5G and 6G communication technologies. Internet of Things (IoT): Introduction, architecture of IoT, IoT-based smart homes, healthcare and agriculture (Case study only)	
	Total hours	44

3. Course Outcomes

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

Course Outcome	Description	Bloom Level
CO1	Apply fundamental concepts and circuit laws to solve simple DC / AC circuits.	K3
CO2	Describe the fundamental terminology of magnetic circuits and compare electric and magnetic circuits.	K2
CO3	Apply basic concepts in solving balanced three phase circuits.	K3
CO4	Describe the fundamental concepts of electronic components and devices.	K2
CO5	Outline the basic principles of electronic instrumentation systems and communication systems.	K2
CO6	Identify various applications of modern electronics in the contemporary world.	K2

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

4. Mapping of Course Outcomes with Program Outcomes

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11
CO1	3	2	-	-	-	-	-	-	-	-	2
CO2	2	-	-		-	-	-	-	-	-	2
CO3	3	2	-	-	-	-	-	-	-	-	2
CO4	3	1	-	-	-	-	-	-	-	-	2
CO5	3	-	-	-	-	-	-	-	-	-	2
CO6	3	-	-	-	-	2	1	-	-	-	2

1. Text Books

Sl No	Title of Book	Name of Author/s	Publisher	Edition and Year
1	Basic Electrical Engineering	D P Kothari and I J Nagrath	Tata McGraw Hill	4/e 2019
2	Basic Electrical and Electronics Engineering	S.K. Bhattacharya	Pearson Education India	2/e 2017
3	Electrical and Electronic Technology	Edward Hughes	Pearson Education India	12/e 2016
4	Basic Electronics: Principles and Applications	Chinmoy Saha, Arindham Halder and Debarati Ganguly	Cambridge University Press 1/e 2018	1/e 2018
5	Basic Electrical and Electronics Engineering	D. P. Kothari and I. J. Nagrath	McGraw Hill	2/e 2020
6	The Internet of Things: How Smart TVs, Smart Cars, Smart Homes, and Smart Cities Are Changing the World	Michael Miller	QUE	1/e 2015
7	Basic Electronics	B L Thereja	S Chand & Co	2012
8	Basic Electronics and Linear Circuits	N N Bhargava, D C Kulshreshtha and S. C. Gupta	McGraw Hill	2/e 2017
9	Electronic Communication Systems	Kennedy and Davis	McGraw Hill	6/e 2017

2. Reference Books

Sl No	Title of Book	Name of Author/s	Publisher	Edition and Year
1	Basic Electrical Engineering	D. C Kulshreshtha	Tata McGraw Hill	2/e 2019
2	Basic Electrical Engineering	T. K. Nagsarkar, M. S. Sukhija	Oxford Higher Education	3/e 2017
3	Electrical Engineering Fundamentals	Del Toro V	Pearson Education	2/e 2019
4	Principles of Electrical Engineering and Electronics	V. K. Mehta & Rohit Mehta	S. Chand Publishing (India)	2019
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

3. Video Links or any other Reference Materials

Sl No	Details Like Weblink, Publication Details	Module
1.	https://youtu.be/VXo0p_1z3Uw?si=JtzCnGyaTlQvkXMz	1, 2
2.	https://nptel.ac.in/courses/122106025	3
2.	https://youtu.be/t6nGiBzGLD8	4

4. 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 subdivisions. (4x9 = 36 marks)	60

MODEL QUESTION PAPER

FEDERAL INSTITUTE OF SCIENCE AND TECHNOLOGY(AUTONOMOUS)
FIRST SEMESTER B.TECH DEGREE EXAMINATION

Introduction to Electrical & Electronics Engineering (26ABNES102)

Max Marks: 60 **Duration: 2 Hours 30 minutes**

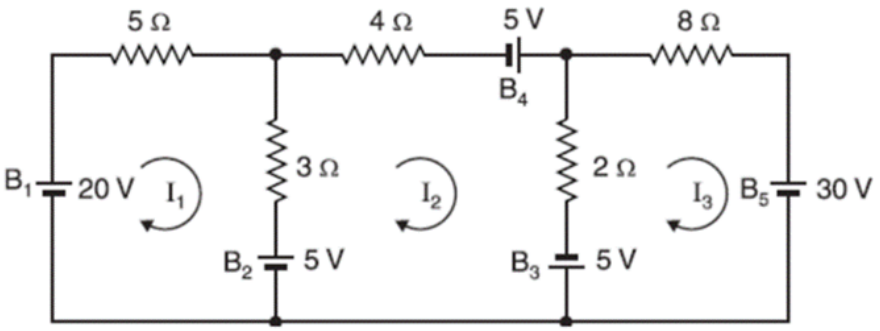
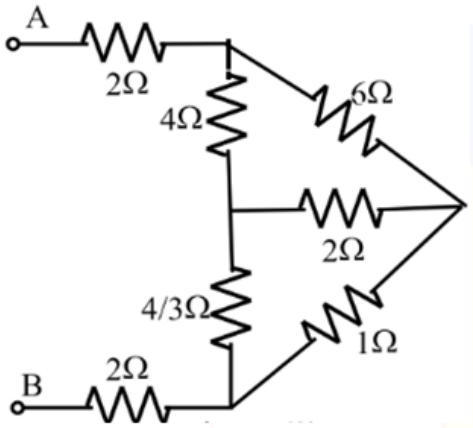
PART 1
ELECTRICAL ENGINEERING (30 Marks)

PART-1-A
(Answer all Questions, Each Question Carries 3 Marks)

1		State and explain Kirchhoff's laws.	CO1	3
2.		Compare magnetic circuit and electric circuit.	CO2	3
3.		Differentiate between statically induced emf and dynamically induced emf with an example for each.	CO2	3
4.		Show that for a sinusoidal voltage RMS value is 0.707 times its maximum value.	CO1	3

PART-1- B
(Answer any one full Question from each Module, Each Question Carries 9 Marks)

5		In the circuit shown, find the mesh currents I_1, I_2 and I_3	CO1	9

				
6		**Use star-delta transformation technique to find the equivalent resistance between A and B in the circuit shown in figure.** 	**CO1**	**9**
		Module 2		
7.	**a)**	**Derive the expression for RMS value, average value, form factor and peak factor of a sinusoidal voltage $v(t)=V_m Sin(\omega t)$**	**CO1**	**4**
	b)	**A series RLC circuit with R = 5Ω, L = 0.1H and C = 5mF is supplied from a 100V, 50 Hz supply. Find the impedance, power factor, current drawn from the supply, active power, reactive power and apparent power.**	**CO1**	**5**
8.	**a)**	**Derive the expression for coupling coefficient of a coupled coil with self-inductances L_1 and L_2 and mutual inductance M.**	**CO2**	**4**
	b)	**A balanced 3-phase star-connected load is supplied with a line voltage of 415 V. The phase impedance is 20 Ω. Calculate phase voltage, phase current and line current if the load is** · **Star Connected** · **Delta connected**	**CO3**	**5**
		PART 2		

ELECTRONICS ENGINEERING (30 Marks)				
PART 2-A (Answer all questions, each question carries 3 marks)				
1		**Differentiate between Zener breakdown and Avalanche breakdown**	**CO4**	**3**
2.		**Explain how a transistor behaves as a switch**	**CO4**	**3**
3.		**With necessary block diagram, explain an electronic instrumentation system.**	**CO5**	**3**
4.		**Compare Amplitude modulation and Frequency modulation**	**CO5**	**3**
PART 2-B (Answer any one full question from each module, each question carries 9 marks)				
Module 3				
5.	**a)**	**Draw the block diagram of a DC power supply and explain the function of each block.**	**CO4**	**4**
	b)	**Draw and explain the input and output characteristics of a transistor in a common emitter configuration.**	**CO4**	**5**
6.	**a)**	**Define Line regulation and load regulation. Explain how a zener voltage regulator provides line and load regulation**	**CO4**	**5**
	b)	**Explain the working of an RC coupled amplifier with a neat diagram**	**CO4**	**4**
Module 4				
7.	**a)**	**Explain the working of CRO with necessary block diagram**	**CO5**	**5**
	b)	**Describe with a neat diagram the working of a capacitive proximity sensor**	**CO5**	**4**
8.	**a)**	**Draw the block diagram of GSM. Explain its working.**	**CO5**	**5**
	b)	**Draw the block diagram of AM Superheterodyne Receiver. Explain its working.**	**CO5**	**4**

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