Semester 2

Basics of Electrical and Electronics Engineering

Course Code	Teaching hours per week				Credits	Exam hours	Course type	CIE Marks	ESE Marks
	L	T	P	R					
26NNCES204	4	0	0	0	4	2.5	ESC	60	40

1. **Preamble:** This course introduces the fundamental concepts of electrical engineering including basic circuit laws, magnetic circuits, AC fundamentals, and three-phase systems. It provides the foundational knowledge required for all advanced electrical engineering subjects.
2. **Prerequisites:** NIL

Module Number	Syllabus Description	Contact Hours
1	**DC Circuits and Basic Laws** Ohm's Law, Series and parallel resistive circuits, Kirchhoff's Laws, Power and energy calculations in DC circuits, Resistance in Series and Parallel (numerical problems) **Alternating Current Fundamentals** Generation of AC voltage, Sinusoidal quantities - Cycle, frequency, time period, RMS and average values, Form factor and peak factor AC circuits: Purely resistive, inductive and capacitive circuits, RL, RC, RLC Series Circuit (numerical problems) Power in AC circuits – Power factor, Power Triangle (numerical problems) **Electromagnetic induction** Faraday's laws, Lenz's law, statically induced and dynamically induced emf, Self and mutual inductance, coefficient of coupling. (Overview)	11

2	**Generation of electrical energy** Conventional Sources: Hydro, thermal, nuclear plants (Block diagram description) Introduction to non-conventional energy sources: solar, wind, PV system for domestic application. **Transmission System** Purpose of electrical power transmission, Classification of transmission systems - AC transmission, DC transmission (introductory concepts), Advantages and disadvantages of AC and DC transmission **Distribution system**: Feeder, distributor, service mains **Electrical Machines** DC & AC Machines: DC Motor, Induction motor, Transformers - construction, principle of operation, types and applications **Electrical Safety** Single phase and three phase system – phase, neutral and earth Earthing - need for earthing, Types of earthing - pipe earthing, plate earthing Basic safety measures at home and industry	10
	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. Rectifiers (construction and working) - Half-wave, full-wave and bridge rectifiers. Ripple factor (with and without capacitor filter). Basics of Zener voltage regulator. Construction, working, and V-I Characteristics 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 Electronics:** Quality of measurements - accuracy, precision, sensitivity and resolution, General block diagram of Instrumentation systems.	11

	Introduction to CRO and Lissajous patterns. Working principle and applications of sensors. Temperature sensors – RTD, thermocouple. Proximity sensors – capacitive sensor, ultrasonic sensor. 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. Basic concepts of Wired and Wireless communication. 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	43

3. 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**

4. Course Outcomes

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

Course Outcomes		Blooms Taxonomy Level
CO1	Apply fundamental concepts and circuit laws to solve simple DC electric circuits	K3
CO2	Apply AC circuit principles and electromagnetic induction laws to solve basic engineering problems related to power, impedance, and inductance in electrical systems.	K3
CO3	Describe the working principles of basic electrical machines and understand the fundamentals of power generation and distribution systems.	K2
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

5. Mapping of Course Outcomes with Program Outcomes

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

6. 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	B L Thereja	S Chand & Co	2012
5	Basic Electronics and Linear Circuits	N N Bhargava, D C Kulshreshtha and S. C. Gupta	McGraw Hill	2/e 2017

6	Electronic Communication Systems	Kennedy and Davis	McGraw Hill	6/e 2017

7. 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

8. Video Links or any other Reference Materials

Sl No	Details Like Weblink, Publication Details	Module
1.	https://youtu.be/VXo0p_1z3Uw?si=fVysqcZ9V2bAGfQT	1,2,3
2.	https://youtu.be/t6nGiBzGLD8	4,5,6

MODEL QUESTION PAPER

FEDERAL INSTITUTE OF SCIENCE AND TECHNOLOGY(FISAT)
(Autonomous)
SECOND SEMESTER B. TECH DEGREE EXAMINATION <MONTH &YEAR>

BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING
(26NNCES204)

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

PART 1
ELECTRICAL ENGINEERING (30 Marks)

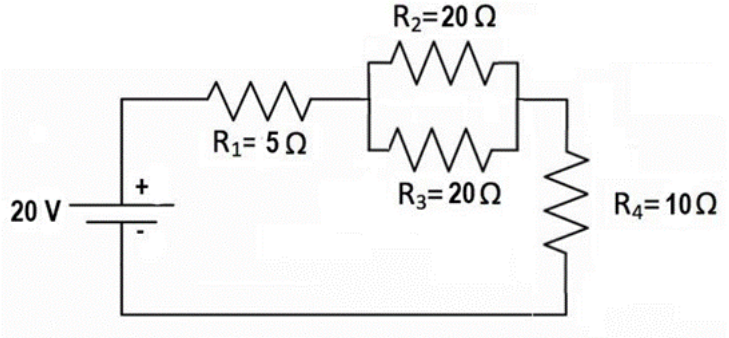
PART 1-A
(Answer all questions, each question carries 3 marks)

1		State and explain Kirchhoff's laws.	CO1	3
2.		Draw the power triangle for a load having 6 kW active power and 8 kVAR reactive power, and calculate the apparent power and power factor.	CO2	3
3.		Explain any three electrical safety practices followed in industries to prevent accidents.	CO3	3
4.		Differentiate between a feeder and a distributor.	CO3	3

PART 1-B
(Answer any one full question from each module, each question carries 9 marks)

Module 1

5.	a)	Explain the generation of AC voltage using a neat diagram.	CO1	4
	b)	For the circuit shown in figure, determine (i) the current drawn from the 20V source and (ii) the power dissipated in the 5 Ω resistor.	CO1	5



6.	a)	Differentiate between statically induced emf and dynamically induced emf with examples.	CO2	4
	b)	A series RLC circuit has: R = 15 Ω X_L = 25 Ω X_C = 10 Ω connected to a 230 V supply. Calculate: a) Impedance b) Current c) Power factor d) True power consumed	CO2	5

Module 2

7.		Draw a neat schematic of a Hydroelectric power plant and explain its working.	CO3	9
8.	a)	Compare AC transmission and DC transmission.	CO3	4
	b)	Classify DC motors and mention one application of each type.	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