GANPAT UNIVERSITY

FACULTY OF DIPLOMA ENGINEERING

Programme	Diploma in Electrical Engineering		
Semester	I	Version	1.0.0.0
Effective from Academic Year	2025-26	Effective for the batch Admitted in	JULY 2025
Course code	1EE1101	Course Name	Basics of Electrical Circuits

I. TEACHING-LEARNING AND ASSESSMENT SCHEME

Course Type	Course Code	Learning Scheme						Assessment Scheme										
		Actual Contact Hrs./Week			SLH	NLH	Credits	Theory				Practical				Based on SL		Total Marks
		CL	TL	LL				FA-TH	SA-TH	TOTAL		FA-PR	SA-PR	TOTAL		SLA		
								MAX	MAX	MAX	MIN	MAX	MAX	MAX	MIN	MAX	MIN	
DSC	1EE1101	4	-	4	2	10	5	40	60	100	40	60	40	100	40	20	8	220

Abbreviation:	**CL-** Classroom Learning	**TL -** Tutorial Learning	**LL -** Laboratory Learning
	SLH - Self Learning Hours	**NLH -** Notional Learning Hours	**SLA -** Self Learning Assessment
	FA - Formative Assessment (Term work +Mid Sem Exam +Attendance)		**SA -** Summative Assessment

II. PRE-REQUISITES

Basic knowledge of Physics.

III. INDUSTRY / EMPLOYER EXPECTED OUTCOMES

The purpose of this course is to help the student to learn about the basic concepts related to electrical engineering.

IV. COURSE LEARNING OUTCOMES

At the end of the course, students will be able to achieve the following course learning outcomes:

CO1. Identify electrical parameters with its characteristics.

CO2. Able to learn the concept of AC system.

CO3. Connect various basics circuits for measurement of different parameters like current, voltage, power etc.

CO4. Understand concept of Dielectric and Capacitive circuits.

CO5. Understand concept of Electrical and Magnetic circuits.

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT:

Name of Unit	Theory Learning outcomes (TLO's) aligned to CO's	Learning Content mapped with Theory Learning outcomes (TLO's) & CO's	Marks	Hours
Unit-1 Basics of Electrical Engineering	**TLO 1.1** History of Electricity. Define the various electrical parameters **TLO 1.2** Identify the commonly used materials and components used in electrical engineering **TLO 1.3** Define the terms work, power and energy **TLO 1.4** Understand about mechanical and electrical Units. **TLO 1.5** State joules law and its applications.	**1.1** History of Electricity with its basic terms- Charge, Current, Potential, voltage, power, Energy Electrical Resistance and its Unit, Ohms law: applications and limitations Specific Resistance and its unit. Parameters affecting the resistance, Effect of temperature on resistance and temperature co-efficient, potential difference; EMF **1.2** Conductors, Insulators, semiconductors, capacitors and inductors. **1.3** Definitions of Work, Power and Energy (both electrical and mechanical); **1.4** Joules law of heat and problems on Heating	**12**	**12**

Unit-2 AC Fundamentals	**TLO 2.1** Concepts of AC System. **TLO 2.2** Explain generation of alternating EMF. **TLO 2.3** Define various terms regarding alternating quantity. **TLO 2.4** Derive equation for RMS and average value of sinusoidal waveform. **TLO 2.5** Mathematical operations of alternating vector quantities **TLO 2.6** Solve numerical based on AC fundamentals	**2.1** Advantages and Limitations of AC System. **2.2** Principle of generation of alternating voltage **2.3** Cycle, Time period, Frequency, Amplitude, Instantaneous value, Average value, R.M.S. value, Form factor, Peak Factor Phase and Phase difference **2.4** Mathematical representation of Alternating Quantity and its Addition, subtraction, multiplication, and division by Analytical method. **2.5** Simple Numerical based on AC fundamentals	**12**	**10**
Unit-3 Concepts of DC System	**TLO 3.1** Understand various types of circuits. **TLO 3.2** Calculate voltage and current in the given resistive circuits using KCL and KVL. **TLO 3.3** Calculate voltage and current of resistive circuits using Series and Parallel Rules.	**3.1** Concept of Open circuit, closed circuit, short circuits **3.2** Definitions of node, branch, loop, mesh. **3.3** Kirchhoff's laws and simple numerical. **3.4** Kirchhoff's Voltage and Current law (KVL and KCL). **3.5** Basics of Series and Parallel circuits with numerical problems.	**10**	**12**
Unit-4 Electrostatics & Capacitors	**TLO 4.1** Define the terms related to electrostatics **TLO 4.2** Explain the working of capacitor and identify the different types of capacitors and their applications **TLO 4.3** Calculate the capacitance in electrical circuits **TLO 4.4** Calculate the energy stored in Capacitors	**4.1** Electric charge, Laws of electrostatics, Electric field, Electrostatic induction, Electric flux, Flux Density, Electric, field Intensity. **4.2** Types of Capacitors, Capacitors in series and parallel. **4.3** Energy stored in a Capacitor.	**12**	**12**
Unit-5 Electro-magnetic Induction	**TLO 5.1** Magnetic circuit and related terms and laws **TLO 5.2** Define phenomenon of electromagnetic induction **TLO 5.3** State and apply Faraday's law, Lenz's law, Fleming's right-hand rule, Fleming's left-hand rule **TLO 5.4** Differentiate Statically and dynamically induced EMF, self and mutual inductance **TLO 5.5** Identify the different types of inductor and explain its applications	**5.1** Magnetic Circuit Terms; MMF, Magnetic Field Intensity, Flux, Flux Density, Permeability, Reluctance **5.2** Magnetic field of current carrying conductor, Right hand rule, cork screw rule **5.3** Electromagnetic Induction. **5.4** Faraday's law, Lenz's law, Fleming's right-hand rule for Generators, Fleming's left-hand rule for Motors. **5.5** Statically and dynamically induced EMF. **5.6** Inductance: Self and Mutual inductance. **5.7** Types of Inductors. **5.8** Energy stored in Magnetic field.	**14**	**14**

	TLO 5.6 Calculate the energy stored in magnetic field **TLO 5.7** Study about Hysteresis losses from B-H curve.	**5.9** Hysteresis Loop		

VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL			
Sr. No.	**Practical/Laboratory Learning Outcome (LLO)**	**Practical Titles**	**Relevant COs**
1	**LLO 1.1** Basic terms of electrical circuits.	Study about the various terms of electrical circuits, like Charge, Current, Potential, voltage, power, Energy Electrical Resistance with its Unit.	CO1
2	**LLO 2.1** Verify Ohm's Law.	Study and verify the ohm's law.	CO1
3	**LLO 3.1** Basic operation of laboratory CRO.	Study the construction and working of CRO.	CO2
4	**LLO 4.1** Application of CRO for measurements of various electrical parameters.	Use CRO to measure peak value, RMS value, Period, and frequency of alternating quantity.	CO2
5	**LLO 5.1** Operation of different electrical meters for measurement of power.	Measure current and voltage in each linear electrical circuit.	CO1
6	**LLO 6.1** Verify equivalent resistance equation for series circuit.	Connect resistances in series to get required effective resistance and verify.	CO3
7	**LLO 7.1** Verify equivalent resistance equation for parallel circuit.	Connect resistances in parallel to get required effective resistance and verify.	CO3
8	**LLO 8.1** Verify equivalent capacitance for series connection of capacitors.	Connect capacitors in series to get required effective capacitance and verify.	CO4
9	**LLO 9.1** Verify equivalent capacitance for parallel connection of capacitors.	Connect capacitors in parallel to get required effective capacitance and verify.	CO4
10	**LLO 10.1** Verify Series-Parallel combined circuits.	Connect resistances in parallel and series to get required effective resistance and verify.	CO3
11	**LLO 11.1** Verify Series-Parallel combined circuits.	Connect capacitors in parallel and series to get required effective capacitance and verify.	CO4
12	**LLO 12.1** Evaluation of Kirchhoff's Current Law.	Measure current in a particular branch of the given electrical circuit using Kirchhoff's Current Law.	CO3
13	**LLO 13.1** Evaluation of Kirchhoff's Voltage Law.	Measure voltage drops in a closed loop of the given electrical circuit using Kirchhoff's Voltage Law.	CO3
14	**LLO 14.1** Comparison of B-H characteristics for different magnetic materials.	To study about Hysteresis Loop.	CO5

VII. SUGGESTED MICRO PROJECT / ASSIGNMENTS / ACTIVITIES FOR SELF LEARNING / SKILL DEVELOPMENT (SELF LEARNING)

- Collect an Information about the different types of Capacitors.
- Analyse the different series-parallel connections of Capacitors and effect of equivalent Capacitance.

- Collect an Information about different types of ferromagnetic, magnetic, and dielectric materials.
- Analyse the B-H curve of different magnetic materials.
- Collect an Information about the different types of Resistors.
- Analyse the different series-parallel connections of Resistors and effect of equivalent resistance.

Mini projects

- Compare energy stored in capacitors connected in series vs. parallel under the same voltage conditions.
- Light-Sensitive LED (Auto Night Lamp). (Learn how resistance varies with light and how to use transistors as switches.)
- Voltage Divider Circuit. (Understand Ohm's Law and voltage division.)

VIII. LIST OF INSTRUMENTS / EQUIPMENT / TRAINER BOARD	
1	Ammeter: 0A-1A/0A-5A/0A-10A
2	Voltmeter: 0V-50V/0V-150V/0V-300V/0V-500V
3	Wattmeter: 0-1000W(5A/10A,300V/600V)
4	Multimeter
5	CRO
6	Choke coil: 0- 80 mH, variable choke coil
7	Single phase variac: 0-300V/ 1KVA

IX. LIST OF REFERENCE BOOKS

Sr. No.	Title	Author	Publication
1	A text book of Electrical Technology Volume-I (Basic Electrical Engineering)	B. L. Theraja & A.K. Theraja	S. Chand and Co., New Delhi, 23 edition or Latest edition (ISBN : 9788121924405)
2	Elements of Electrical Engineering	U.A. Patel	Atul Prakashan, Ahmedabad 2010 edition or latest edition
3	A Course in Electrical Technology Vol. I	J.B. Gupta	S.K. Kataria & Sons, 2012 or latest edition
4	Fundamentals of Electrical Engineering	Tarlok Singh	S. K. Katariav & Sons, New Delhi, Latest edition (ISBN: 9789350140680)
5	A text book of Electrical Engineering	S.L. Uppal	Khanna Publishers

X. LINK OF LEARNING WEB RESOURCE	
1	https://nptel.ac.in/courses/108/105/108105112/
2	https://nptel.ac.in/courses/108/105/108105053/
3	https://lectures.gtu.ac.in/
4	https://circuitglobe.com/
5	https://www.electrical4u.com/electrical-engineering-articles/basic-electrical/
6	www.khanacademy.org

XI. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE

Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	Basics of Electrical Engineering	CO1	12	4	4	4	12
2	AC Fundamentals	CO2	10	4	5	3	12

3	Concepts of DC System	CO3	12	2	4	4	10
4	Electrostatics & Capacitors	CO4	12	2	5	5	12
5	Electromagnetic Induction	CO5	14	4	5	5	14
		Grand Total	60	16	23	21	60

XII. COs AND POs AND PSOs MAPPING

Course outcome (Cos)	**Programme Outcomes (POs)**							**Programme Specific Outcomes (PSOs)**		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	1	2	3	2	0	3	2	1
CO2	3	1	3	3	0	3	1	2	3	1
CO3	3	3	1	2	0	1	3	3	2	3
CO4	2	2	3	0	1	3	2	1	3	2
CO5	3	1	2	0	3	2	2	3	1	2

Legends: - *3- High* *2-Moderate/Medium* *1-Slight/Low* *0-None*