GANPAT UNIVERSITY

FACULTY OF DIPLOMA ENGINEERING

Programme	Diploma in Electrical Engineering		
Semester	IV	Version	1.0.0.0
Effective from Academic Year	2026-27	Effective for the batch Admitted in	JULY 2025
Course code	1EE4105	Course Name	Electrical Energy Utilization

I. TEACHING-LEARNING AND ASSESSMENT SCHEME

Course Type	Course code	Course Title	Teaching & Learning Scheme									Examination Scheme							
			Credit				Actual Contact Hrs/week			SLH	Total Learning Hrs/Week	TH			PR			SLA	Total
			CL	TL	LL	Total	CL	TL	LL			CE	SEE	Total	CE	SEE	Total		
DSC	1EE4105	Electrical Energy Utilization	2	0	0	2	2	0	0	2	4	40	60	100	-	-	-	20	120

Abbreviation:			
	CL- Classroom Learning	**TL -** Tutorial Learning	**LL -** Laboratory Learning
	SLH - Self Learning Hours	**SLA -** Self Learning Assessment	**SA -** Summative Assessment
	CE – Continuous Evaluation		**SEE –** Semester End Examination

II. PRE-REQUISITES

Basic knowledge of electrical circuits, AC fundamentals, and electrical machines.

III. INDUSTRY / EMPLOYER EXPECTED OUTCOMES

The course aims to develop competency in efficient utilization of electrical energy in domestic, commercial, agricultural, and industrial applications with emphasis on energy saving and safety.

IV. COURSE LEARNING OUTCOMES

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

CO1 - Design simple lighting scheme.
CO2 - Select type of electric furnaces according to applications
CO3 - Operate the different electric welding system
CO4 - Select suitable electric drive for a particular application

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 Illumination	**TLO 1.1** Define the given term(s) as related to illumination. **TLO 1.2** Explain the construction and working of the given type of lamp(s) and lamp fittings. **TLO 1.3** State the laws of illumination **TLO 1.4** Select the relevant lamp for the specified application with justification. .	**1.1** Definitions of various illumination terminology-Luminous flux, Lumens, Candela, solid angle, luminous intensity, lux **1.2** Various types of Lamps: Fluorescent Tube, CFL, Metal Halide and LED. **1.3** Laws of illumination: Inverse squares and Lambert's Cosine law. **1.4** Various lighting schemes: Direct, Indirect, Semidirect and Semi indirect: features and application.	**15**	**5**
Unit-2 Electric Heating	**TLO 2.1** Explain construction, working principle and classification of the specified electrical heating system. **TLO 2.2** Recommend the relevant heating system for	**2.1** Concept of electrical heating, Advantages and classification of electric heating, modes of heat transfer. **2.2** Resistance Heating: Construction and Operation of Direct Resistance Heating - Salt Bath Furnace, Indirect	**10**	**5**

	the given application with proper justification. **TLO 2.3** Design the heating element of the given type of furnace from the specified data.	Resistance Heating: Resistance Ovens, Requirements of Heating Element, Applications of Resistance Heating. **2.3** Arc Heating - Construction and Operation of Direct Arc Furnace, Indirect Arc Furnace. Applications of Arc Heating.		
Unit-3 Electric Welding	**TLO 3.1** Select the relevant welding system for the specified application with justification. **TLO 3.2** Describe the working principle and construction of special type of transformer used in welding. **TLO 3.3** Describe the working principle of Electric Welding and its types **TLO 3.4** State the applications of modern welding techniques	**3.1** Electric Welding: Principles of electric resistance welding. **3.2** Methods of Electric Welding – Electric arc welding, resistance welding. **3.3** Resistance Welding – Principles, Advantages, types of resistance welding. **3.4** Electric Arc Welding- Formation and Characteristics of electric arc, effects of arc length.	**10**	**5**
Unit-4 Electric Drives and Elevators	**TLO 4.1** Differentiate the salient features between the given types of electric drives. **TLO 4.2** Recommend the relevant motor for the given application with justification. **TLO 4.3** Select the relevant enclosure for the given atmospheric condition with justification. **TLO 4.4** Select the power transmission drive of the electric motor for the given application with justification. **TLO 4.5** Estimate the relevant size and rating of electric motor for the specified load cycles. **TLO 4.6** Select relevant elevator machine and electric motor for the specified application with justification.	**4.1** Electric drives: Concept, factors governing selection of electric drives(motor). **4.2** Types of electrical drives: Individual and Group drive, Applications. **4.3** Mechanical features of drives: Types and applications various types of enclosures. **4.4** Transmission of Mechanical Power: Direct and Indirect drive (Belt, Rope, Chain, Gear), Vertical drives and its applications. **4.5** Bearing: Types and applications. **4.6** Elevators: Function, Application, types, safety and precautions.	**15**	**10**
Unit-5	**TLO 5.1** Define tariff and explain its role in electrical energy pricing.	**5.1** Introduction to Tariff, **5.2** Cost of Electrical Energy: Fixed cost, running cost, Total cost of	**10**	**5**

Tariff and Domestic Electricity Billing	**TLO 5.2** Explain fixed cost and running cost involved in electrical energy supply. **TLO 5.3** Describe factors affecting tariff such as load factor, maximum demand, and power factor. **TLO 5.4** Differentiate between various types of tariffs used in power systems **TLO 5.5** Demonstrate understanding of home electricity bill calculation principles and the concept of solar rooftop and without rooftop system and net metering	power supply **5.3** Factors Affecting Tariff **5.4** Types of Tariffs **5.5** Case Study: Home Light Bill Calculation: Home Light Bill charges and Calculation, Calculation of domestic electricity bill with solar rooftop system, Calculation of domestic electricity bill without solar rooftop system		

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

- Select any one electric drive. Explain its suitability for any one industrial application through power point presentation. (Electrical and Mechanical Characteristics)
- Micro project
- Prepare report on market survey of various types of lamps (specification, manufacturer, application and cost) and do the comparative analysis.
- Prepare a market survey of various drives (specification, manufacturer, application and cost).
- Design suitable lighting scheme for a laboratory or class room.
- Prepare market survey on Lift and Escalator (specification, manufacturer, application and cost)

VII. LIST OF REFERENCE BOOKS

Sr. No.	Title	Author	Publication
1	Art and Science of Utilization of Electrical Energy	H. Pratab	Dhanpat Rai & Sons, New Delhi, ISBN:9788177001440
2	Utilization of Electric power and Electric Traction	J.B. Gupta	S.K. Kataria & Sons, New Delhi, ISBN:978- 9350142585
3	Utilization of Electric power and Electric Traction	G. C. Garg	S.K. Kataria & Sons, 2012 or latest edition
4	Fundamentals of Electric Drive	G.K. Dubey	Narosa Publishing House, New Delhi, ISBN: 8173190410, 9788173190414
5	Utilization of Electric Energy	Tarlok Singh	S.K. Kataria & Sons, New Delhi, India ISBN: 9380027842

VIII. LINK OF LEARNING WEB RESOURCE

1	https://nptel.ac.in
2	https://lectures.gtu.ac.in/
3	https://www.electrical4u.com/

4	www.howstuffworks.com/

IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE

Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	Illumination	CO1	05	5	5	5	15
2	Electric Heating	CO2	05	4	4	2	10
3	Electric Welding	CO3	05	2	4	4	10
4	Electric Drives and Elevators	CO4	10	5	5	5	15
5	Tariff and Domestic Electricity Billing	CO5	05	4	4	2	10
		Grand Total	30	20	25	15	60

X. 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*