

NIRMA UNIVERSITY

Institute:	Institute of Technology, School of Engineering
Name of Programme:	B. Tech. in Electrical Engineering
Semester:	VII
Course Code:	4EE201ME25
Course Title:	Utilization of Electric Power
Course Type:	Department Elective-III
Year of Introduction:	2025-26

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Course Learning Outcomes (CLOs):

At the end of the course, the students will be able to –

1. apply different techniques to use electrical energy to obtain heating, welding, refrigeration process (BL4)
2. design illumination scheme to obtain required lux level at given location (BL6)
3. identifying and differentiate various types of services of traction system, apply appropriate speed control and braking techniques (BL3)
4. design and propose solution complying with energy efficient and green building requirements (BL5)

Unit	Contents	Teaching hours (Total 45)
Unit-1	Electric Heating and Welding Types of electric furnaces resistance, arc, induction, and dielectric - concept and operation of each type, temperature control of furnaces. Types of welding: arc and resistance, electric supply for arc welding, choice of welding time	09
Unit-2	Electric Traction General features of electrical traction, Mechanics of train movement, Nature of traction load, Speed-time curves, Calculations of traction drive rating and energy consumption, Train resistance, Adhesive weight and coefficient of adhesion, Tractive effort for acceleration and propulsion, Power and energy output from driving axles, Methods of speed control and braking of motors for traction load	09
Unit-3	Illumination Nature of light, terminologies and units, basic laws of illumination, determination of luminous flux, light sources and their characteristics, light production by excitation and ionization, sources of light, halogen lamp, LED lamp technologies and their applications, LED drivers, energy considerations, design of energy efficient lighting scheme, photometry, direct, diffused and mixed reflection, reflection factor, transmission factor, refractors, light fittings, street lighting, flood lighting, factory lighting, interior lighting, sports lighting	09

Unit-4	Refrigeration and Air-Conditioning	09
	Introduction, terminology, refrigeration system, domestic refrigerator, troubleshooting and maintenance of domestic refrigerator, refrigeration components and controls, comfort air conditioning, industrial air conditioning, room air conditioners, central air conditioning system, smart air conditioning, rating of electrical equipment in air conditioning	
Unit-5	Energy Efficient Buildings	09
	Significance of energy efficiency in residential and non-residential usage, estimate for electrical energy consumption in existing building, strategies involved in management of electrical energy consumption at consumer end, application of adjustable speed drive and energy efficient motor in energy saving for residential and industrial sector, smart appliances and application of IoT in buildings, Load Shifting and use of Battery Energy Storage Systems, Concepts of green building and role of Electrical Engineers	

Self-Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Tutorial Work:

This shall consist of at least 06 tutorials based on the above syllabus.

Suggested Reading:

1. S. Sivanagaraju, M. Balasubba Reddy and D. Srilatha, *Generation and Utilization of Electrical Energy*, Pearson.
2. H. Pratab, *Art and Science of Utilisation of Electrical Energy*, Dhanpat Rai & Son
3. Frank Kreith and Ronald E. West, *Handbook of Energy Efficiency*, CRC Press.
4. Jack L. Lindsey, Scott C. Dunning, *Applied Illumination Engineering*, Fairmont Press
5. C. L. Wadhwa, *Generation Distribution and Utilization of Electrical Energy*, New Age International
6. J. B. Gupta, *Utilization of Electric Power and Electric Traction*, S. K. Kataria & Sons
7. Er. R. K. Rajput, *Utilisation of Electric Power*, Laxmi Publications
8. J. Nanda and M.L. Kothari, *Emerging Trends in Power System, Proceedings of the Eight NPSC*.