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Energy Conservation and Audit — Complete Syllabus

BTEUP Diploma in Electrical Engineering • 5th Semester • Session 2026-27
Subject 5.3 (Practicum) • Total 100 Marks • 4 Credits • L 2 - P 4

Note: In the PDF the unit headings give Unit III as 06 periods and Unit IV as 08 periods, but the Suggested Distribution of Marks table gives Unit III as 08 periods and Unit IV as 06 periods (total 28 either way). The unit headings are used here.

Examination Scheme

Code	Paper	Type	L - P	Credits	Internal	External	Total
5.3	Energy Conservation and Audit	Practicum	2 - 4	4	60	40 (3 hrs)	100
Energy Conservation and Audit Total				4	60	40	100

What This Subject Aims To Do

To help students undertake energy conservation and energy audit.

Unit-Wise Complete Topic List

Unit	Topic	Periods	Marks Share
I	Energy Conservation	02	14%
II	Energy Conservation in Electrical Machines	06	24%

III	Energy conservation in Electrical Installation systems	06	24%
IV	Energy conservation through Cogeneration and Tariff	08	24%
V	Energy Audit of Electrical System	06	14%

Unit - I: Energy Conservation (02 Periods, 14%)

Topics: Basics Energy Scenario: Primary and Secondary Energy, Energy demand and supply, National scenario; Energy conservation and Energy audit; concepts and difference; Indian Electricity Conservation Act 2001 and its latest amendments; relevant clauses of energy conservation; BEE and its Roles; Star Labelling: Need and its benefits.

Unit - II: Energy Conservation in Electrical Machines (06 Periods, 24%)

Topics: Need for energy conservation in induction motor and transformer; Energy conservation techniques in induction motor by: Improving Power quality, Motor survey, Matching motor with loading, Operating in star mode, Replacement by energy efficient motor; Energy conservation techniques in Transformer; Replacement by energy efficient transformers; Energy Conservation Equipment: Soft starters, Automatic star delta convertor, Variable Frequency Drives, Automatic p.f. controller (APFC), Intelligent p.f. controller (IPFC); Energy efficient motor; significant features, advantages, applications and limitations.

Unit - III: Energy conservation in Electrical Installation systems (06 Periods, 24%)

Topics: Energy Conservation in HVAC and Refrigeration System: Introduction, Concept of Energy Efficiency Ratio (EER), Energy saving opportunities in Heating, Ventilation and Air Conditioning (HVAC) and Refrigeration Systems; Energy Conservation in Lighting System: a) Replacing Lamp sources, b) Using energy efficient luminaries, c) Using light-controlled gears, d) Installation of separate transformer / servo stabilizer for lighting; Energy Conservation techniques in fans, electronic regulators.

Unit - IV: Energy conservation through Cogeneration and Tariff (08 Periods, 24%)

Topics: Co-generation: concept, significance for energy conservation, Types of cogeneration basis of technology (Steam turbine cogeneration, Gas turbine cogeneration); Factors governing the selection of cogeneration system; Advantages of cogeneration; Tariff: Types of tariff structure, Transformers Tariff structure, Special tariffs; Time-off-day tariff, Peak-off-day tariff, Power factor tariff, Maximum Demand tariff, Load factor tariff; Application of tariff system to reduce energy bill; Concept of sanctioned load, maximum demand, contract demand and monthly minimum charges (MMC).

Unit - V: Energy Audit of Electrical System (06 Periods, 14%)

Topics: Energy audit (definition as per Energy Conservation Act); Energy audit instruments and their use; Questionnaire for energy audit projects; Energy flow diagram (Sankey diagram); Simple payback period, Energy Audit procedure (walk through audit and detailed audit); Energy Audit report format.

Practical Work

- Unit I — Identify star labelled electrical apparatus and compare the data for Three-star ratings.
- Unit I — Identify star labelled electrical apparatus and compare the data for Four-star ratings.
- Unit I — Identify star labelled electrical apparatus and compare the data for Five-star ratings.
- Unit II — Demonstrate that power factor of an induction motor load is improved by connecting capacitor bank.
- Unit II — Conduct a survey on installed motor and assess the matching of motor with its load. Determine the reduction in power consumption in star mode operation of Induction motor compared to delta mode.
- Unit II — Connect Soft starter with suitable rating Induction Motor and Observe its operation during starting and running. Also measure the current and power consumption.
- Unit III — To measure energy efficiency ratio (EER) of an air conditioner.
- Unit III — Compare power consumption of different types of Tube light with choke, electronic ballast and LED lamps by direct measurements.
- Unit III — Measure the Current, Power and Energy consumption of Modern BLDC Ceiling Fan.
- Unit III — Measure the Current, Power and Energy consumption of Ceiling Fan.
- Unit IV — Collect electricity bill of a commercial consumer and suggest suitable tariff for conservation and reduction of its energy bill.

- Unit IV — Collect electricity bill of a residential consumer and suggest suitable means for conservation and reduction of the energy bill.
- Unit IV — Collect Electricity bills of typical residential or College service connections for the period of 1 year and prepare the bar chart of energy consumption and energy cost. Discuss the result.
- Unit V — Carrying out Mini Energy Audit of Institute's lab/classroom (lighting, fans and ACs) and preparation of sample energy audit report format.
- Unit V — Prepare a sample energy audit questionnaire for the given industrial facility.

Reference Books (as listed in the syllabus)

- Guidebooks No. 1 and 3 for National Certification Examination for Energy Managers and Energy Auditors, Bureau of Energy Efficiency (BEE), Bureau of Energy Efficiency (A Statutory body under Ministry of Power, Government of India) (Fourth Edition 2015)
- O.P. Gupta, Energy Technology, Khanna Publishing House, New Delhi
- Henderson, P. D., India - The Energy Sector, University Press, Delhi, 2016. ISBN: 978-0195606539
- Turner, W. C., Energy Management Handbook, Fairmount Press, 2012, ISBN 9781304520708
- Sharma, K. V., Venkateshaiah; P., Energy Management and Conservation, I K International Publishing House Pvt. Ltd; 2011 ISBN 9789381141298
- Mehta, V. K., Principles of Power System, S. Chand & Co. New Delhi, 2016, ISBN 9788121905947
- Singh, Sanjeev; Rathore, Umesh, Energy Management, S K Kataria & Sons, New Delhi ISBN-13: 9789350141014
- Desai, B. G.; Rana, J. S.; A. Dinesh, V.; Paraman, R., Efficient Use and Management of Electricity in Industry, Devki Energy Consultancy Pvt. Ltd.
- Chakrabarti, Aman, Energy Engineering and Management, e-books Kindle Edition
- Dr. Vijay Mittal, Dr. T.D.Bisht, Anil Kumar Kukreja, Ravindra Patel, Asian Publishers, Muzaffarnagar, ISBN No. 978-93-91541-11-8

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 Source: BTEUP 3rd Year curriculum (folder2627), approved in C.D.C. meeting held on 16.07.2026. Topic lists follow the official syllabus; short explanations are the author's own plain-English summaries, not syllabus text.
 Please confirm with your own polytechnic for any local changes.