

**NIRMA UNIVERSITY**  
**Institute of Technology**  
**Electrical Engineering Department**  
**B.Tech Programme (Open to All)**

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<b>Course Code</b>	<b>Open Elective (OEXXX)</b>
<b>Course Title</b>	<b>Energy Management and Audit</b>

**Course Learning Outcomes (CLO):**

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

1. describe the concept of energy management and various regulations related to energy conservation
2. demonstrate the significance of energy audit, types of instruments required for energy audit and procedure to conduct energy audit
3. apply the different methods used for the economic analysis of energy projects
4. appraise the significance of energy efficient use of electricity.

**Syllabus:**

**Teaching Hours: 45**

**Unit-1: Energy Scenario and Management**

**04**

An overview of Indian Energy Scenario, Sectorwise Energy Consumption in India, Energy needs of Growing Economy, Long Term Energy Scenario for India. Reasons to save energy (both financial and environmental), Energy Conservation and its importance, Energy Conservation Act and related policies, Bureau of Energy Efficiency (BEE) Regulations. Need to Manage Energy, Definition and objectives of Energy Management, Components of Energy Management program and their explanation.

**Unit-2: Energy Audit**

**10**

Energy audit concepts, Scope of energy audit, types of energy audit, general procedure for a detailed energy audit, various energy audit methodologies, instruments and metering for energy audit, general procedure for a detailed energy audit, preparation of detailed energy audit report, benefits of energy audit. Case study of energy audit in different industrial organisations / electrical utilities.

**Unit-3: Utility Rate Structures and Financial Analysis**

**12**

Understanding Energy Costs, Innovative rates – Time – of - Use rates, Real Time Pricing Rates, Financial Incentive Rates, Energy Purchase Rates. Basic concept of Economic Analysis – Interest rate, Inflation rate, Single Payment, Uniform – Series' Payment. Economic Evaluation Methods – Net Present Worth, Rate of Return, Benefit – Cost Ratio, Payback period. Comparison of Various Economic Evaluation Methods.

**Unit-4 Energy Efficiency in Electrical Systems**

**12**

Introduction, Energy Efficient Motor, Adjustable Speed Drives, Energy Saving Calculations, Energy Efficient Lighting Systems – High Efficiency Fluorescent Lamps, Compact Fluorescent Lamps, Cost Effectiveness of Efficient Lightning Technologies, Automatic Power factor Controllers, HVAC system, Role of New Equipment and Technology in Industrial Energy Efficiency.

**Unit-5: Demand Side Management**

**07**

Introduction to Demand Side Management, Integrated Resource Planning Concepts, Relation between Demand Side Management and Integrated Resource Planning, Demand Side Management Programs, Cost Benefit Analysis of Demand Side Management.

**Self-Study Component:**

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

**Suggested Readings:**

1. Smith C. B. Energy Management Principles, Pergamon Press, New York.
2. Wayne C. Turner, Steve Doty, Energy Management Handbook, Taylor and Francis Ltd., CRC Press.
3. Frank Kreith, Goswami D. Yogi, Energy Management and Conservation Handbook, Taylor and Francis Ltd., CRC Press.
4. Albert Thumann, Terry Niehus, William J. Younger, Handbook of Energy Audits, Taylor and Francis Ltd., CRC Press.
5. Rajiv Shanker, Energy Auditing in Electrical Utilities, Viva Book Pvt. Limited, New Delhi.
6. Bureau of Energy Efficiency, General Aspects of Energy Management and Energy Audit. New Delhi.

L = Lecture, T = Tutorial, P = Practical, C = Credit

w.e.f. academic year 2020-21 and onwards

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