Andhra Loyola Institute of Engineering and Technology

Approved by AICTE, Accredited by NAAC & NBA, Affiliated to JNTUK

Department of EEE

Teacher/Instructor: Dr. G Naveen Kumar, Professor

Micro Lesson Plan

Course Name: ENERGY AUDIT
Year/Semester: IV / II

Academic Year: 2022 - 2023

Course Objectives

- To understand energy efficiency, scope, conservation and technologies.
- To design energy efficient lighting systems.
- To estimate/calculate power factor of systems and propose suitable compensation techniques.
- To understand energy conservation in HVAC systems.
- To calculate life cycle costing analysis and return on investment on energy efficient technologies.

Course Outcomes

After the completion of the course the student should be able to:

- Explain energy efficiency, conservation and various technologies.
- Design energy efficient lighting systems.
- Calculate power factor of systems and propose suitable compensation techniques.
- Explain energy conservation in HVAC systems.
- Calculate life cycle costing analysis and return on investment on energy efficient technologies

Textbooks:

1. Energy management by W.R. Murphy & G. Mckay Butter worth, Elsevier publications. 2012
2. Hand Book of Energy Audit by Sonal Desai- Tata McGraw hill.

Reference Books:

1. Electric Energy Utilization and Conservation by S C Tripathy, Tata McGraw hill publishing company Ltd. New Delhi.

UNIT–I: **Energy sources**

Contents/Activities

1	Factual	Reading Prerequisite concepts- concepts of **Utilization of Electrical Energy and electrical machines** and Basic definitions
2	Conceptual	Video Lectures NPTEL Lectures Subject experts forum (Ex. www.linkedin.com)
3	Procedural	Some reference books Simulations IEEE Journal papers Discussion forums/blogs Quiz
4	Applied	Solving Exercises Simulations & Analysis Assignments Awareness programs Writing research articles

Schedule and Sequence: Day Plan for **Unit-1- Energy sources**

Unit- 1– Total Classes 10

Session/ week/ Lesson-1 Total Classes-10	Topic	Objectives	Before Class - Videos, e-Books, Case studies	In-Class – Activities, Quiz (Micro teaching)	Post Class - Assignment, Discussion Forum

Day-1	Introduction of Energy sources	To introduce the Energy sources	**Softcopy of Textbook, PPT material. Video link:** noc19-ee65-lec01 - YouTube	Discussion on pre-requisites (10 Min) PPT presentation (30 Min) Discussion or **Poll activity** (5 min) Summary (5min) Doubts clarification (10 min)	**Learning outcomes –** ❖ To understand the necessity of Energy sources.
Day-2	Energy consumption	To study Fundamentals of Energy consumption	**Softcopy of Textbook, PPT material. Video link:** noc19-ee65-lec01 - YouTube	Revise previous class – (10 mins) PPT presentation – (30 min) quiz(10 min) Doubts clarification (10 min)	**Learning outcomes –** Students should be able to: Understand Fundamentals of Energy consumption.
Day -3	world energy reserves	To know the world energy reserves	Text Book : Text Book: Pdf (e-book uploaded in Google Classroom). **Video link:** noc19-ee65-lec01 - YouTube	Revise previous class – (10 mins) PPT presentation – (30 min) Doubts clarification (10 min)	**Learning outcomes –** Students should be able to: ● Know the world energy reserves

Day - 4	Energy prices — alternative sources	To know the Energy prices and alternative sources	Text Book: Text Book: Pdf (e-book uploaded in Google Classroom). NPTEL Video lecture.	Revise previous class – (10 mins) PPT presentation – (30 min) Doubts clarification (10 min)	
Day-5	power — energy policies and choice of fuels.	To know power and energy policies and choice of fuels.	Text Book: Pdf (e-book uploaded in Google Classroom). Video lectures.	Revise previous class – (10 mins) PPT presentation – (30 min) Doubts clarification (10 min)	**Learning outcomes –** Students should be able to: ● Learn power and energy policies and choice of fuels.
Day-6	Energy Auditing	To know the Energy Auditing definition and requirements	Text Book: Pdf (e-book uploaded in Google Classroom). NPTEL Video lecture.	Revise previous class – (10 mins) PPT presentation – (30 min) Doubts clarification (10 min)	**Learning outcomes –** Students should be able to: ● Know Energy Auditing definition and requirements .
Day-7	Energy conservation schemes:	To know different Energy conservation schemes:	Text Book: Pdf (e-book uploaded in Google Classroom). Video lectures.	Revise previous class – (10 mins) PPT presentation – (30 min) Doubts clarification (10 min)	**Learning outcomes –** Students should be able to: Understand Four quadrant operation of drive (hoist control)
Day-8	Industrial energy use - Energy index — Cost index	To know the concepts of Industrial energy use -	Text Book: Pdf (e-book uploaded in Google Classroom). Video lectures.	Revise previous class – (10 mins) PPT presentation – (30 min) Doubts clarification (10 min)	**Learning outcomes –** Students should be able to understand the concepts of Industrial energy use - Energy index — Cost index

		Energy index — Cost index			
Day-9	Pie charts - Sankey diagrams — Load Profile.	To know about Pie charts - Sankey diagrams — Load Profile	Text Book: Pdf (e-book uploaded in Google Classroom). NPTEL Video lecture.	Revise previous class – (10 mins) PPT presentation – (30 min) Doubts clarification (10 min) Quiz (5 min)	**Learning outcomes –** Students should be able to understand Pie charts - Sankey diagrams — Load Profile.
Day-10	Energy auditing: General Auditing, Detailed Energy Audit.	To know about General Auditing, and Detailed Energy Audit	Text Book: Pdf (e-book uploaded in Google Classroom). Video lectures.	Revise previous class – (10 mins) PPT presentation – (30 min) Doubts clarification (10 min) Quiz (5 min)	**Learning outcomes –** Students should be able to understand General Auditing, and Detailed Energy Audit.

UNIT–II: Heat Transfer Theory

Contents/Activities

1	Factual	Reading Prerequisite concepts- concepts of **Heat Transfer Theory**
2	Conceptual	Video Lectures NPTEL Lectures
3	Procedural	Some reference books Simulations IEEE Journal papers Discussion forums/blogs Quiz

4	Applied	Solving Exercises Simulations & Analysis Assignments Miniprojects Writing research articles

Schedule and Sequence: Day Plan for **UNIT–II** **Heat Transfer Theory**

Lesson 2 – Total Classes 11

Day-11	Heat transfer	To learn about Heat transfer	Text Book: Pdf (e-book uploaded in Google Classroom). Video lecture.	Discussion on pre-requisites (10 Min) PPT presentation (30 Min) Discussion or **Poll activity** (5 min) Summary (5min) Doubts clarification (10 min)	**Learning outcomes –** Students should be able to: ❖ Know Heat transfer
Day-12	Heat content	To know about Heat content process	Text Book: Pdf (e-book uploaded in Google Classroom).	Revise previous class – (10 mins) PPT presentation – (30 min) Doubts clarification (10 min)	**Learning outcomes –** Students should be able to: ❖ Explain about Heat content process.

Day-13	Rate of heat transfer — Heat transfer coefficient	To derive rate of heat transfer — Heat transfer coefficient	Text Book: Pdf (e-book uploaded in Google Classroom).	Revise previous class – (10 mins) PPT presentation – (30 min) Doubts clarification (10 min)	**Learning outcomes –** Students should be able to: ❖ Explain the Rate of heat transfer — Heat transfer coefficient
Day-14	Conduction, Convention and Radiation.	To know the Conduction, Convention and Radiation process	Text Book: Pdf (e-book uploaded in Google Classroom). Video lecture.	Revise previous class – (10 mins) PPT presentation – (30 min) Doubts clarification (10 min)	**Learning outcomes –** Students should be able to: ❖ Explain the Conduction, Convention and Radiation process.
Day-15	Thermal insulation & its importance	To understand about Thermal insulation & its importance	Text Book: Pdf (e-book uploaded in Google Classroom). Video lecture.	Revise previous class – (10 mins) PPT presentation – (30 min) quiz(10 min) Doubts clarification (10 min)	**Learning outcomes –** Students should be able to: ❖ Explain Thermal insulation & its importance
Day-16	Space heating	To learn about Space heating	Text Book: Pdf (e-book uploaded in Google Classroom). Video lecture.	Revise previous class – (10 mins) PPT presentation – (30 min) Doubts clarification (10 min)	**Learning outcomes –** Students should be able to: ❖ Explain the Space heating
Day-17	HVAC system	To know about HVAC system	Text Book: Pdf (e-book uploaded in Google Classroom). Video lecture.	Revise previous class – (10 mins) PPT presentation – (30 min) Doubts clarification (10 min)	**Learning outcomes –** Students should be able to: ❖ Explain about HVAC system

Day-18	Heating of Buildings	To know about Heating of Buildings	Text Book: Pdf (e-book uploaded in Google Classroom).	Revise previous class – (10 mins) PPT presentation – (30 min) Doubts clarification (10 min)	**Learning outcomes –** Students should be able to: ❖ Explain about Heating of Buildings.
Day-19	District heating	To understand the District heating	Video Link https://www.youtube.com/watch?v=3c_uDCnnBXc	Revise previous class – (10 mins) PPT presentation – (30 min) Doubts clarification (10 min)	**Learning outcomes –** Students should be able to: ❖ Explain the District heating.
Day-20	Factors affecting the choice of district heating	To understand the Factors affecting the choice of district heating	Video Link https://www.youtube.com/watch?v=GuJ58ZThMM8	Revise previous class – (10 mins) PPT presentation – (30 min) Doubts clarification (10 min)	**Learning outcomes –** Students should be able to: Analyze the Factors affecting the choice of district heating
Day-21	Slip test	To solve Numerical problems.	Video Link https://www.youtube.com/watch?v=GuJ58ZThMM8	Revise previous class – (10 mins) PPT presentation – (30 min) Doubts clarification (10 min)	**Learning outcomes –** Students should be able to: ❖ Analyze and solve Numerical problems.

UNIT - 3- Energy Efficient Instruments

Contents/Activities

1	Factual	Reading Prerequisite concepts- concepts of **Energy Efficient Instruments**

2	Conceptual	Video Lectures NPTEL Lectures
3	Procedural	Some reference books Simulations IEEE Journal papers Discussion forums/blogs Quiz
4	Applied	Solving Exercises Simulations & Analysis Assignments Miniprojects Writing research articles

Schedule and Sequence: Day Plan for **Unit-3- Energy Efficient Instruments**

Lesson 3 – Total Classes 09

Day-22	Digital Energy Meter	To introduce Digital Energy Meter	Text Book: Pdf (e-book uploaded in Google Classroom). Video lecture.	Discussion on pre-requisites (10 Min) PPT presentation (30 Min) Discussion or Summary (5min) Doubts clarification (10 min)	**Learning outcomes –** Students should be able to: understand the operation of Digital Energy Meter.