

Course-Plan

School: Engineering
Department: Energy
Course Code: EN 550
Course Name: Energy and Society

Instructor: P. K. Choudhury

1. Abstract

This course deals with the trend of energy use with respect to the development of the human society. The need and the applications of various alternative sources to reduce the gap between energy supply and demand are briefly discussed. The course also gives overview on energy conservation opportunities and approaches along with cost benefit analysis for renewable energy systems.

2. Objectives

The primary objectives of this course are outlined as below.

- To understand the basics of work and energy, energy forms and energy conversion processes as well as trend of energy use with respect to the development of human society
- To understand the gap between demand and supply, formation and exploration of fossil fuels, role of renewable energy sources, energy conservation, energy auditing and common energy conservation and management practices.
- To understand the basics of the earth and the atmosphere, energy environment interaction, causes, impacts and mitigation of global warming and climate change

3. Course Outcomes

CO1: Explain classifications of energy sources, energy consumption and environmental impacts due to energy use

CO2: Use of energy conversion principles in renewable energy systems for supplementing human energy need

CO3: Analyse energy consumption pattern for energy conservation opportunities

4. Prerequisites of the course

Students having basic knowledge of science and mathematics along with interest in the area of environmental issues and power generation are preferred. This course is an interdisciplinary course and students from Departments apart from Department of Energy can register for this course.

5. Course outline

Unit	Topic	Learning Objectives
Unit 1:	Introduction	To understand the basics of energy, work, and power, units and calculations, energy forms and conversions, basics of thermal and electrical power
Unit 2:	Energy economy and society	To understand the trend of energy use with respect the development of human society, interaction between energy consumption and economic development
Unit3:	Fossil Fuels and Renewable Energy	To understand formation and exploration of fossil fuels, basic principles of exploitation of various renewable energy sources and their applications
Unit4:	Energy issues and policy	To understand the gap between demand and supply, importance of utilization of different energy sources, national and international policies
Unit 5:	Energy and Environment	To understand the basics of the earth and the atmosphere, causes, impacts and mitigation of global warming, other environmental issues and mechanisms for handling climate change

Unit 6:	Energy conservation and management	To understand importance of energy conservation, Energy auditing, common energy conservation and management practices
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6. (a)Time-Plan

Tentative Lectures	Topic to be covered	No. of Classes
1-8	Introduction <ol style="list-style-type: none"> 1. Course overview 2. Basics of energy, work, and power; 3. Energy resources, classifications, units and scales; 4. Fuels, Energy content & basics of combustion; 5. Basics of energy conversion, consumption and estimation 6. Concept of direct current, 1- phase and 3-phase Alternating current 7. Overview of power triangle, power factor and 1 phase/ 3 phase power calculations 8. Series parallel configurations of energy sources, energy storage devices and basic characteristics 	8
9-14	Energy economy and society <ol style="list-style-type: none"> 1. Global energy scenario –Energy demand and supply; 2. Overview of society and human energy need; 3. Features of human society and different classification 4. Energy consumption and economic development; 5. Pre-industrialization-Low energy societies and Industrialization -High energy societies; 6. Evolution of the modern energy economy 7. Energy pricing, energy statistics and analysis 	6
15-22	Fossil Fuels and Renewable Energy <ol style="list-style-type: none"> 1. Fossil fuels, Types, formation and exploration 2. Energy conversion principles, electric power generation, transmission and distribution 3. Socio-technical aspects of renewable energy systems 4. Solar thermal and electrical power generation 5. Biomass energy conversion routes and systems 6. Hydro power- technical aspects and power generation 7. Wind and other sources of energy 8. Overview of centralized and distributed systems 	8
23-26	Energy issues and policy <ol style="list-style-type: none"> 1. Energy issues and public opinion; 2. National energy policy; 3. Energy related social impact assessment 4. Energy Conservation Act. 	4
27-30	Energy and Environment <ol style="list-style-type: none"> 1. Anthropogenic activities and environmental effects, Air pollution and health hazards, 2. Green House Gas emissions and global warming, impacts and mitigation, 3. Climate change issue and international policies and mechanisms for mitigation and Sustainable development. 	4
31- 36	Energy conservation and management <ol style="list-style-type: none"> 1. Concept of energy conservation and management 2. Energy audit, types, steps and reporting 3. Energy conservation opportunities in household and 	6

	transport sectors 4. Electrical load management practices 5. Performance analysis of conventional energy based systems 6. Efficient lighting systems 7. Energy efficient devices, overview of automatic monitoring and control devices	
Total		36

(b) Evaluation plan

Tests	Types	*Date (Tentative)	Marks	Time
Sessional Test-I	Multiple choice/ Objective/ Quiz	7 th September	25	45 minutes
Mid-Semester Examination	Descriptive/ Objective	6 th October	40	2 hours
Sessional Test-II	Descriptive/ Objective/ Quiz/Assignment	9 th November	25	#
End-Semester Examination	Descriptive/ Objective	10 th December	60	3 hours
	Total		150	

*Exact Dates/Marks/Time will be as per Tezpur University academic calendar

Depends on the type of test

7. Pedagogy

Apart from the theory classes students will be exposed to lab visit in the department of energy where various renewable energy systems and equipment are installed. The objective of this visit is to make the students familiar with the existing renewable energy systems, their operations as well as applicability in the society. Students will be required to submit one assignment on this visit.

Teaching-learning methods to be used are

- Lecture and Discussion
- Assignment and Presentations
- Case studies
- Problem Solving

8. Expected outcome

Towards the end of the course the student would be able to know the trend of energy use corresponding to the development of human civilization, environmental impacts due to energy use, potential renewable energy sources, principles of some selected renewable energy systems and their applications in society. They are also expected to have knowledge on some basic energy conservation and management practices.

9. Text Book

1. B.K.Hodge. Alternative Energy Systems, Publisher: Wiley; New Edition ISBN-10:0470142502
2. Hinrichs&Kleinbach. Energy: Its Use and the Environment, Fourth edition, Thompson Learning, 2005

References

1. Johansson Thomas B. ed (1993); Renewable energy: sources for fuels and electricity, Earthscan
2. Craig R. Humphrey, Tammy L. Lewis, and Frederick H. Buttel Belmont. Environment, Energy, and Society: A New Synthesis. CA: Wadsworth Group, 2002.ISBN: 0-534-57955-8

3. Pietro Anthony San, (1980); Biochemical and Photosynthetic aspects of Energy Production, Academic Press, New York
4. Johnson G L, (1985) ; Wind Energy Systems, Prentice Hall Inc, New Jersey
5. Kandpal T.C., H. P. Garg (2003) ; Financial Evaluation of Renewable Energy Technology, Macmilan India Ltd. New Delhi
6. Berman, ER Geothermal Energy, Noyes Data Corporation, New Jersey
7. KaushikaN.D. and KaushikKshitij (2004) ; Energy, Ecology and Environment : A Technological Approach. New Delhi, Capital Publishing Company.
8. S.P. Sukhatme, Solar Energy: principles of Thermal Collection and Storage, Tata McGraw-Hill
