

COURSE TITLE : ALTERNATIVE ENERGY SOURCES & MANAGEMENT
COURSE CODE : 5024
COURSE CATEGORY : E
PERIODS/ WEEK : 4
PERIODS/ SEMESTER : 60
CREDIT : 4

TIME SCHEDULE

MODULE	TOPIC	PERIODS
1	Introduction to energy source. Energy conservation techniques. Concept of energy management	15
2	Solar energy	15
3	Wind energy. Energy from biomass	15
4	Geothermal energy. Fuel cells	15
TOTAL		60

COURSE OUTCOME :

sl.no.	sub	student will be able to
1	1	Understand the different energy sources and energy conservation methods, energy management techniques.
	2	Understand the solar energy and its uses.
	3	Understand the wind energy and biomass energy.
	4	Understand the renewable energy sources and working of Nuclear power plants.
	5	Understand the geothermal energy and its sources.

SPECIFIC OUTCOME

MODULE I

1.1.0 Introduction to Energy Sources

- 1.1.1 Understand the Major sources of energy: Renewable and Non-renewable
- 1.1.2 Define Primary and Secondary energy sources.
- 1.1.3 Explain the Energy scenario:
- 1.1.4 Understand the Prospects of alternate energy sources.
- 1.1.5 Understand the Need of alternate energy sources.

1.2.0 List the Energy Conservation Techniques

- 1.2.1 Understand the Distribution of energy consumption
- 1.2.2 List the Principles of energy conservation.
- 1.2.3 Define Energy audit and give its classifications
- 1.2.4 Define Cogeneration and its application
- 1.2.5 Define Combined cycle system

1.3.0 Understand the Concept of energy management

- 1.3.1 Explain the different energy management techniques like

- Analysis of input
- Reuse and recycling of waste
- Energy education
- Conservative technique and energy audit.

MODULE II

2.1.0 Understand the Solar Energy

- 2.1.1 Define Solar Radiation: Solar radiations at earth's surface, Solar Radiation Geometry: Declination, Hour angle, altitude angle, incident angle, zenith angle, solar azimuth angle
- 2.1.2 Understand the Principle of conversion of solar energy into heat and electricity
- 2.1.3 Explain the Construction and working of typical flat plate collector and solar concentrating collectors and their applications
- 2.1.4 Explain the Applications of solar energy
 - Space heating and cooling.
 - Photovoltaic electric conversion.
 - solar distillation, Solar cooking and furnace.
 - solar pumping and Green house.
 - Agriculture and Industrial process heat.(No derivations and numerical)
- 2.1.5 Illustrate the solar Power Stations and solar desalination plants
- 2.1.6 List their limitations

MODULE III

3.1.0 Understand the Wind Energy and its uses

- 3.1.1 Define power in wind, available wind power formulation, Power coefficient, Maximum Power
- 3.1.2 Understand the basic principle of wind energy conversion.
- 3.1.3 List the main considerations in selecting a site for wind mills.
- 3.1.4 List the advantages and limitations of wind energy conversion.
- 3.1.5 Classify the wind mills.
- 3.1.6 Explain the Construction and working of horizontal and vertical axis wind mills, their comparison
- 3.1.7 List the main applications of wind energy like power generation, WEG, pumping and wind farm.

3.2.0 Understand the Energy from Biomass

- 3.2.1 List the Common species recommended for biomass.
- 3.2.2 Understand the methods for obtaining energy from biomass
- 3.2.3 Define Pyrolysis, Gasification, Hydrogenation.
- 3.2.4 List the applications of gasifier
- 3.2.5 Explain the bio diesel production and its applications
- 3.2.6 Illustrate agriculture waste as a biomass
- 3.2.7 Explain the biomass digester
- 3.2.8 Compare biomass with conventional fuels

MODULE IV

4.1.0 Understand the use of Geothermal Energy

- 4.1.1 Explain the Geothermal Energy- Dry rock system, Wet rock system,
- 4.1.2 Explain the Geo thermal Power plant and its function
- 4.1.3 List the principal parts and limitations
- 4.1.4 Understand the Applications of MHD System - Magneto Hydro Dynamic –
- 4.1.5 State its Principle

- 4.1.6 List the Common Gases –
- 4.1.7 Explain the MHD power plant and its components
- 4.1.8 List their limitations and applications
- 4.2.0 Explain the working of Fuel Cells - H₂- O₂ fuel cell**
- 4.2.1 List the advantages, limitations and applications

CONTENT DETAILS

MODULE I

Energy Sources

Major sources of energy - Renewable and Non-renewable - Primary and Secondary energy sources - Energy scenario - Need of alternate energy sources.

Energy Conservation Techniques

Distribution of energy consumption - Principles of energy conservation. - Energy audit – classifications- Cogeneration – application - Combined cycle system

Concept of energy management

Energy management techniques - Analysis of input - Reuse of waste - recycling of waste - Energy education - Conservative technique - energy audit.

MODULE II

Solar Energy

Solar radiations at earth's surface - solar radiation geometry – declination - hour angle - altitude angle - incident angle - zenith angle - solar azimuth angle - principle of conversion of solar energy into heat and electricity - construction and working of typical flat plate collector and solar concentrating collectors – applications - solar energy - applications - space heating – cooling - photovoltaic electric conversion - solar distillation solar cooking - furnace - solar pumping - green house - agriculture industrial process heat.(No derivations and numerical) - solar power stations - solar desalination plants - limitations

MODULE III

Wind Energy - uses

Wind power - wind power formulation - power coefficient - maximum power - principle of wind energy conversion - considerations in selecting a site for wind mills - advantages - limitations – classification horizontal wind mills - vertical axis wind mills - construction – working – comparison - applications - power generation WEG - wind farm.

Energy from Biomass

Common species recommended for biomass - methods – pyrolysis - gasification - hydrogenation.

Applications of gasifier - Bio diesel production – applications - agriculture waste as a biomass - biomass digester - compare

MODULE IV

Geothermal Energy

Geothermal energy - dry rock - wet rock - geo thermal power plant –function - principal parts - limitations

Understand the applications of MHD system - magneto hydro dynamic –principle - common gases –
MHD power plant - components - limitations - applications

Fuel Cells - H₂- O₂ fuel cell

Advantages - limitations - applications

TEXT BOOKS

1. Non conventional Energy resources - Dr.B.H.Khan(Tata McGraw Hill)
2. Energy Resource Management - KrupalSing Jogi(Sarup & sons)

REFERENCE

1. Non conventional Energy sources - G.D.Rai (Khanna Publication)
2. Solar Energy - S.P.Sukhatme (Tata McGraw Hill)
3. Solar Energy - H.P,Garg (Tata McGraw Hill)
4. Power Plant Engineering - Arrora, Domkundwar (Dhanpat Rai & Co.)