

COURSE TITLE : **ALTERNATE ENERGY SOURCES AND MANAGEMENT**
COURSE CODE : **5018**
COURSE CATEGORY : **E**
PERIODS/WEEK : **4**
PERIODS/SEMESTER : **72**
CREDITS : **4**

TIME SCHEDULE

MODULE	TOPICS	PERIODS
1	Introduction of energy sources Energy Conservation Techniques	18
2	Solar Energy	18
3	Wind Energy Bio- Mass Energy	18
4	Geo thermal Energy MHD Fuel cells	18
	Total	72

OBJECTIVES

Students should be able to:

1. Develop awareness for effective utilization of alternative energy sources.
2. Identify different components of solar energy and wind energy devices.
3. Identify and analyze biomass plant.
4. Identify and apply energy conservation techniques for commonly used for absorbing and generating devices.
5. Appreciate the principles of energy conservation and energy management techniques.

CONTENT OUTLINE

MODULE I

Introduction to Energy Sources

- 1.1 Introduction
- 1.2 Major sources of energy: Renewable and Non-renewable
- 1.3 Primary and Secondary energy sources.
- 1.4 Energy scenario:
 - Prospects of alternate energy sources.
 - Need of alternate energy sources.

Energy Conservation Techniques

1. Distribution of energy consumption
2. Principles of energy conservation.
3. Energy audit
4. Types of audit
5. Methods of energy conservation
6. Cogeneration and its application
7. Combined cycle system
8. Concept of energy management
9. Study of different energy management techniques like
 - Analysis of input
 - Reuse and recycling of waste

- Energy education
- Conservative technique and energy audit.

MODULE II

Solar Energy

- 2.1 Solar Radiation: Solar radiations at earth's surface, Solar Radiation Geometry: Declination, hour angle, altitude angle, incident angle, zenith angle, solar azimuth angle
- 2.2 Principle of conversion of solar energy into heat and electricity
- 2.3 Construction and working of typical flat plate collector and solar concentrating collectors and their applications
- 2.4 Applications and limitations.
 - 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 * Solar Power Stations
Solar desalination plant.

MODULE III

Wind Energy

- 3.1 Power in wind, available wind power formulation, Power coefficient, Maximum Power
- 3.2 Basic Principle of wind energy conversion.
- 3.3 Main considerations in selecting a site for wind mills.
- 3.4 Advantages and limitations of wind energy conversion.
- 3.5 Classification of wind mills.
- 3.6 Construction and working of horizontal and vertical axis wind mills, their comparison
- 3.7 Main applications of wind energy for power generation, WEG, pumping and Wind Farm.

Energy from Biomass

- 3.8 Common species recommended for biomass.
- 3.9 Methods for obtaining energy from biomass
- 3.10 Pyrolysis, Gassification, Hydrogenation.
- 3.11 Application of gasifier
- 3.12 Bio diesel production and application
- 3.13 Agriculture waste as a biomass
- 3.14 Biomass digester
- 3.15 Comparison of Biomass with conventional fuels

MODULE IV

Geothermal Energy - Classification of Geothermal Energy, Dry rock system, Wet rock system, Geothermal Power plant, Principle parts and its function – Limitation - Applications
 MHD System – Magneto Hydro Dynamic – Principle Common Gases – MHD Power Plant – Main Components – Limitations – Application.
 Fuel Cells – H₂- O₂ fuel cell - working – different types - application – limitations

BOOKS

1. Non conventional Energy resources -Dr.B.H.Khan(Tata McGraw Hill)
2. Non conventional Energy sources -G.D.Rai (Khanna Publication)
3. Solar Energy -S.P.Sukhatme (Tata McGraw Hill)
4. Solar Energy -H.P,Garg (Tata McGraw Hill)
5. Power Plant Engineering - Arrora,Domkundwar(Dhanpat Rai & Co.)
6. Energy Resource Management -KrupalSing Jogi(Sarup & sons)