BLOWUP SYLLABUS

First Semester B.E.

RENEWABLE ENERGY SOURCES

(Emerging Technologies Course-I)

(22ETC15E)

(Effective from the academic year 2022-23)

Topics	Topics To Be Covered	Hours
Module-I: Introduction		
Introduction: Principles of Renewable Energy.	Introduction brief explanation of non-renewable (conventional) and renewable (non-conventional) energy sources. Article No:1.5 of Textbook 1	**02**
Energy and sustainable development, fundamentals and social implications. worldwide renewable energy availability, renewable energy availability in India, brief descriptions on solar energy, wind energy, tidal energy, wave energy, ocean thermal energy, biomass energy, geothermal energy.	Principles of Renewable Energy. Article No:1.5 of Textbook 1	**02**
	Availability of renewable energy in India and world Article No: 1.12.1 to 1.12.10 of Textbook 4	
Oil shale.	Article No: 1.13.1 to 1.13.4 of Textbook 4	**02**
Introduction to Internet of energy (IOE).	Introduction to Internet of energy (IOE). https://www.investopedia.com/terms/i/internet-energy From internet	**02**
	Total	**08**
Module-II: Solar Energy		
Solar Energy: Fundamentals; Solar Radiation.	Introduction Solar constant Article No: 2.1 & 2.2 of Textbook 1	**01**
Estimation of solar radiation on horizontal and inclined surfaces.	Solar radiation at the earth surface-beam diffuse solar radiation, solar radiation geometry, Article No: 2.3 & 2.4 of Textbook 1	**02**
Solar radiation Measurements-Pyrheliometers, Pyrometer, Sunshine Recorder.	Pyrheliometers, Pyrometer, Sunshine Recorder, Numerical Article No: 2.5 of Textbook 1	**01**
Solar Thermal systems: Flat plate collector. Solar distillation.	Typical liquid collector Article No: 3.3(A) of Textbook 1	**01**
Solar pond electric power plant.	Solar distillation. Article No: 5.8 of Textbook 1	**01**
Solar electric power generation- Principle of Solar cell, Photovoltaic system for electric power generation, advantages, Disadvantages and applications of solar photovoltaic system.	Solar pond electric power plant. Article No: 4.3.3 of Textbook 1	**01**
	Solar cell principle with schematic view of typical solar cell, A basic photo voltaic system for power generation, advantages, Disadvantages and applications Article No: 5.6 of Textbook 1	**01**
	Total	**08**

Topics	Topics To Be Covered	Hours
Module-III: Wind Energy, Biomass Energy		
Wind Energy: Properties of wind, availability of wind energy in India.	Introduction Article No: 6.1 of Textbook 1	**01**
Wind velocity and power from wind. Major problems associated with wind power.	Nature of the wind, power in the wind, definition of power coefficient Article No: 6.2.1 to 6.2.2 of Textbook 1	**01**
	Site selection consideration Article No: 6.4 of Textbook 1	**01**
Basic components of wind energy conversion system (WECS).	Basic components of wind energy conversion system (WECS). Article No: 6.5 of Textbook 1	**01**
Classification of WECS- Horizontal axis- single, double and muliblade system. Vertical axis- Savonius and darrieus types.	Horizontal axis- single, double and muliblade system. Vertical axis- Savonius and darrieus types Article No: 6.6,6.8.2 & 6.8.4 of Textbook 1	**02**
Biomass Energy: Introduction, Photosynthesis Process; Biofuels; Biomass Resources; Biomass conversion technologies -fixed dome; Urban waste to energy conversion; Biomass gasification (Downdraft) .	Introduction, Photosynthesis Process, thermo chemical conversion, fermentation, anaerobic digestion, Janata bio gas plant(fixed dome) Article No: 7.1,7.2,7.2.1,7.3,7.9 of Textbook 1	**02**
	Total	**08**
Module-IV: Tidal Power, Ocean Thermal Energy Conversion		
Tidal Power: Tides and waves as energy suppliers and their mechanics; fundamental characteristics of tidal power, harnessing tidal energy, advantages and limitations	Basic principle of Tidal power Article No: 9.3.2 of Textbook 1	**01**
	Single basin and double basin arrangement. Article No: 9.3.4 of Textbook 1	**02**
Ocean Thermal Energy Conversion: Principle of working, OTEC power stations in the world, problems associated with OTEC.	Advantages and limitations Article No: 9.3.9 of Textbook 1	**01**
	Principle of working, open cycle and closed cycle system. Problems associated with OTEC. Article No: 9.2.1,9.2.3,9.2.4, 9.2.7 & 9.2.8 of Textbook 1	**04**
	Total	**08**
Module-V: Green Energy		
Green Energy: Introduction, Fuel cells: Classification of fuel cells – H2; Operating principles, Zero energy Concepts. Benefits of hydrogen energy, hydrogen production technologies (electrolysis method only), hydrogen energy storage, applications of hydrogen energy, problem associated with hydrogen energy.	Introduction, fuel cells, Article No: 5.1 of Textbook 4	**01**
	Benefits of hydrogen energy Article No: 5.2 of Textbook 4	**01**
	Hydrogen production technologies Article No: 5.3 of Textbook 4	**01**
	Hydrogen energy storage Article No: 5.4 of Textbook 4	**02**
	Applications of hydrogen energy, problem Article No: 5.5 of Textbook 4	**01**
	Associated with hydrogen energy Article No: 5.8 of Textbook 4	**02**
	Total	**08**

Textbooks:

1. Nonconventional Energy sources, G D Rai, Khanna Publication, Fourth Edition,
2. Energy Technology, S.Rao and Dr. B.B. Parulekar, KhannaPublication.Solar energy, Subhas P Sukhatme, Tata McGraw Hill, 2nd Edition, 1996.
3. Principles of Energy conversion, A.W.Culp Jr. McGraw Hill, 1996
4. Non-Convention Energy Resources, ShobhNath Singh, Pearson, 2018

Reference books:

1. Principles of Energy conversion, A. W. Culp Jr.,, McGraw Hill, 1996 2. Non-Convention Energy Resources, Shobh Nath Singh, Pearson, 2018

Web links and Video Lectures:

https://www.investopedia.com/terms/i/internet-energy
E-book URL: https://www.pdfdrive.com/non-conventional-energy-sources-e10086374.html
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https://onlinecourses.nptel.ac.in/noc18_ge09/preview