IV B.Tech I Semester **L T P C**

18MEC414A NON-CONVENTIONAL ENERGY RESOURCES 3 0 0 3

Course Educational Objectives:

1. Describing the current energy scenario in terms of conventional renewable energy and future plan
2. To describe the solar energy sources for electricity generation
3. To understand the functions of wind turbine and Ocean Thermal Energy conversion process
4. To describe the types bio-energy for electricity generation and advancement in geothermal Energy
5. To educate the various new and alternative sources such as MHD Power and fuel cells

UNIT – 1: ENERGY SCENARIO

Indian energy scenario in various sectors of domestic, industrial, commercial, agriculture, transportation and others – Present conventional energy status – Present renewable energy status – Potential of various renewable energy sources – Global energy status – Per capita energy consumption in various countries – Future energy plans.

UNIT – 2: SOLAR ENERGY

Solar radiation – Measurements of solar radiation and sunshine – Solar thermal collectors – Flat plate and concentrating collectors – Solar thermal applications – Solar thermal energy storage – Fundamentals of solar photo voltaic conversion – Solar cells – Solar PV Systems – Solar PV applications.

UNIT – 3: WIND ENERGY AND OCEAN THERMAL ENERGY

Wind Energy: Wind data and energy estimation – Betz limit – Site selection for wind farms – Characteristics – Horizontal and vertical axis wind turbine – Wind turbine generators and its performance – Hybrid systems – Environmental issues – Applications. **Ocean Thermal Energy:** Tidal energy – Wave energy – Open and closed OTEC cycles.

UNIT – 4: BIOMASS ENERGY AND GEOTHERMAL ENERGY

Biomass Energy: Bio resources – Biomass direct combustion – Thermochemical conversion – Biochemical conversion – Mechanical conversion – Biomass gasifier – Types of biomass gasifiers – Cogeneration – Carbonisation – Pyrolysis – Biogas plants – Digesters – Biodiesel production – Ethanol production – Applications. **Geothermal Energy**: Geothermal energy sources – Types of geothermal power plants – Applications – Environmental impact – Small hydro.

UNIT – 5: NEW AND ALTERNATIVE ENERGY SOURCES

Fuel cell: Principle – Types of fuel cells – Hydrogen energy – Properties – Hydrogen production – Storage – Transport and utilization – Safety issues. **Magneto Hydro Dynamic Power:** Principles of magneto hydro dynamic (MHD) power generation – MHD systems – MHD accelerator – MHD engine, power generation systems – Electron gas dynamic conversion.

Course Outcomes: On successful completion of the course, students will be able to:

Course Outcomes		POs related to COs
CO1	Explain the current energy scenario in terms of conventional renewable energy and future plan	**PO1,PO2, PO6, PO12**
CO2	Describe the types solar thermal collectors and solar energy sources for electricity generation	**PO1,PO2,PO6, PO7, PO12**
CO3	Understand the functions of wind turbine and Ocean Thermal Energy conversion process	**PO1,PO6,PO7, PO12**
CO4	Illustrate the bio-energy for electricity generation and advancement in geothermal Energy	**PO1, PO6, PO7, PO12**
CO5	Demonstrate the various new and alternative sources such as MHD Power and fuel cells	**PO1, PO7, PO12**

QUESTION BANK

Question No.	QUESTIONS
	UNIT – 1: ENERGY SCENARIO
	PART-A (Two Marks Questions)
1	Classify the types of the energy available on the earth?
2	Briefly mention about primary sources of energy?
3	What is renewable energy and list at least three renewable energy sources?
4	Name the five states in India, where coal production is concentrated.
5	Define Reserve to 'Production Ratio'?
6	How do you define 'Final Energy Consumption'?
7	Why developed countries have been able to maintain low ratio of energy to GDP?
8	What is Energy intensity and what it indicates?
9	Mention the parameters on which the high tension and low tension consumers are charged by electricity boards
10	What is main objective of Electricity Act, 2003?
11	List down the major sources of pollutants in Air?
12	What is greenhouse gas effect?
13	What are the key greenhouse gases driving global warming?
14	What are the two major anthropogenic causes for the generation of Carbon dioxide in the atmosphere?
15	List down at least three effects of acid rain?
16	What is the basis for aim of Energy Security for any country?
17	Differentiate between Energy Conservation and Energy Efficiency?
18	How a nation benefits from Energy Efficiency programs?
19	How Bureau of Energy Efficiency (BEE) facilitates energy efficiency programs in India?
20	List down at least five designated consumers specified by the BEE?
	PART – B (Ten marks questions)
1	List the strategies for better energy security of the nation?
2	Mention some of the long-term energy strategies available for the better energy secured nation?
3	How do an Industry, nation and globe would benefit from energy efficiency programs?
4	How energy pricing is done in India?
5	Briefly describe the economic reforms in Coal, oil and natural gas and electricity sectors.
6	Explain in brief about the following. a) Primary and secondary energy sources b) Renewable and non-renewable energy sources Commercial and non-commercial energy sources
7	Write a short note on Indian energy scenario
8	Discuss in brief energy conservation act 2001 and its features
9	Define energy conservation. Explain the long term energy scenario for India.
10	Describe Renewable Energy Scenario in Andhra Pradesh.

Question No.	QUESTIONS
	UNIT – 2: SOLAR ENERGY
	PART-A (Two Marks Questions)
1	What are conventional and non-conventional energy source?
2	what are meant by renewable energy sources?
3	What are the advantages and disadvantages of conventional & non-conventional energy source?
4	Explain the importance of non-conventional energy sources in the present context?
5	What is the status of non-conventional energy sources in India, and what are their future prospect?
6	What are limitations of solar energy?
7	What are the indirect forms of solar energy?
8	How is the energy being continuously being produce in the sun?
9	How does the collection of solar energy is affected by tilting a flat plate collector with respect to ground?
10	What are major advantages and disadvantages of solar PV system?
11	Explain mechanism of photoconduction in a PV cell?
12	Define solar constant?
13	Define solar energy?
14	What is diffuse radiation?
15	What is global radiation?
16	What are the instruments used for measuring solar radiation and sunshine?
17	What are the applications of solar energy?
18	Define photo voltaic effect?
19	What are the different applications of solar photo voltaic system in rural area?
	PART – B (Ten marks questions)
1	How can energy resources be classified?
2	Explain (i) Extraterrestrial radiation, (ii) Solar constant , and (iii) Terrestrial radiation.
3	Differentiate between beam and diffusion radiation
4	Explain the working of pyrometer with the help of neat sketch
5	Explain the working of pyrheliometer with the help of neat sketch
6	How are solar collector classified? What are the important features of solar collector?
7	With the help of schematic diagram, explain the working of solar pond electric power plant
8	Explain the construction of a solar cell, module, panel and array
9	What are the advantages and disadvantages of PV system over conventional power system
10	Explain the main features of different types of solar cells on the basis of materials used in fabrication

Question No.	QUESTIONS
	UNIT-3 WIND ENERGY AND OCEAN THERMAL ENERGY
	PART-A (Two Marks Questions)
1	How the Wind mills are classified?
2	What are the advantages and disadvantages of Wind Power?
3	What is the type of generator used in wind power plant?
4	What are wind farms?
5	How the wind mills are classified?
6	Explain the concept of drag and lift?
7	What is meant by pitch angle?
8	What is meant by pitch control?
9	What are the different types of horizontal axis wind turbines?
10	Explain the different types of vertical axis wind turbines?
11	What is ocean thermal energy and how is it harnessed?
12	What is OTEC? What is the minimum requirement to operate the OTEC system?
13	How is electricity generated from Ocean Thermal Energy?
14	Differentiate tide and wave.
15	Give the advantages of tidal power plant.
16	Name a few projects harnessing tidal power.
17	What are the advantages and disadvantages of Tidal Power plant?
18	Define Tidal energy?
19	Differentiate tide and wave.
20	What are the main types of OTEC power plants?
	PART-B (Ten Marks Questions)
1	Explain briefly about the horizontal Wind mills with neat sketches?
2	Explain briefly about Vertical Wind mills with neat sketches?
3	Explain the principle and application of wind electric system. State the basic. Components and their working in wind electric system.
4	Explain the terms i. Yaw control ii. Pitch control iii. Teethering control
5	With a neat diagram, explain how wind energy can be converted into electrical energy.
6	Sketch and explain single basin type tidal power plant operation.
7	Discuss the technology Ocean Thermal Energy Conversion (OTEC). What are possible environmental effects as a result of an operation of an OTEC plant?
8	Explain how ocean tides are generated and how the power can be tapped?
9	What is the basic principle of ocean thermal energy conversion (OTEC)?
10	(a) What are the different methods of hydrogen storage ? (b) Distinguish between wave and tidal energy.

Question No.	QUESTIONS
UNIT-4 BIOMASS ENERGY AND GEOTHERMAL ENERGY	
PART-A (Two Marks Questions)	
1	Write any two items used as biomass fuels
2	What are the constituents of biogas?
3	Mention some organic materials used in bio-mass plant.
4	What are the different methods of energy extraction from biomass?
5	What is gasification?
6	Explain the process of photosynthesis.
7	What are the conditions necessary for photosynthesis?
8	Define Biogas energy?
9	What are the benefits of Bio gas technology?
10	What is Bio Mass?
11	Write the Percentage compositions of Bio gas?
12	What are the social benefits of Bio gas Utilization?
13	What is geothermal power?
14	Discuss the disadvantages of geothermal plant.
15	Discuss the advantages of geothermal plant.
16	Classify the geothermal sources
17	How is electricity generated from Geo-thermal energy?
18	What is Geo-thermal energy?
19	What are the advantages and disadvantages of Geo-thermal energy?
20	Name a few cites where geothermal energy is harnessed?
PART-B (Ten Marks Questions)	
1	What are the biomass resources for the production of bio mass energy?
2	What are advantages and disadvantages of biomass energy?
3	Explain the process of production of biogas from biomass. What are the main advantages of anaerobic digestion of biomass?
4	Write note on fixed dome type biogas plant with neat sketch
5	Write note on floating drum type biogas plant with neat sketch
6	Write the advantages and disadvantages of floating drum type and fixed dome type biogas plants
7	Explain the difference between fixed dome type and floating drum type biogas plants.
8	Explain the working of geothermal power plants. Discuss the various technical development
9	Describe a hot dry rock geothermal resource power plant
10	What are the advantages and disadvantages of geothermal energy over other energy forms?

Question No.	QUESTIONS
	UNIT – 5: NEW AND ALTERNATIVE ENERGY SOURCES
	PART-A (Two Marks Questions)
1	Explain the combustion reaction process?
2	What do you understand by oxidation and reduction.
3	Comment on environmental effect of fuel cell.
4	What is the fuel cell and what are its main advantages?
5	What are the different combination of the fuel and oxidant used in fuel cell?
6	What are primary and secondary fuel cells?
7	List any two types of fuel cells.
8	What are the Molten carbonate fuel cell includes
9	What are the solid oxide fuel cell includes
10	Briefly explain magneto hydrodynamic power conversion
11	Why is ionizing of carrier gas necessary? How can ionizing of carrier gas be achieved?
12	What are the factors which reduce the efficiency of MHD converter
13	How is the energy for motion of the conducting gas derived? Is MHD converter or heat engine more suited to fossil fuels?
14	What are the requirements of materials used in an MHD generator?
15	What are the major advantages?
	PART-B (Ten Marks Questions)
1	What are the major advantages and limitations of the MHD generating system?
2	Describe an MHD open cycle system.
3	Describe an MHD closed cycle system.
4	a)Explain the electrochemical conversion of fuel and oxidant in a Fuel Cell? b)Explain the combustion reaction process?
5	Explain the basic principle of fuel cell with reference to hydrogen-oxygen fuel cell
6	What are the difference between fuel cell and primary battery?
7	Explain the working of a polymer electrolyte or photon exchange membrane fuel cell
8	Explain the principle of operation of an alkaline fuel cell
9	Describe solid oxide fuel cell
10	What are the advantages of Fuel Cells?

*****ALL THE BEST*****