

M.Sc. Physics Semester II
Open Elective – I
Sources of Energy – I

Theory Marks: 80
Internal Assessment: 20
Time: 3 hours

COURSE OUTCOMES

- CO1 Students will be able to understand the importance of solar cell and its applications
- CO2 Students will be able to understand the thermal energy storage for solar heating and cooling
- CO3 Students will be acquainted with geothermal sources of energy and geothermal plants
- CO4 Students will be able to appreciate Wind power and its sources

Unit I

Limitation of conventional energy sources, need and growth of alternative energy sources, basic scheme and application of direct energy conservation, Solar energy: Introduction, The characteristics of the sun, Definitions related to solar radiations, solar radiation geometry, Estimation of daily solar radiation, Theory of solar cells, Solar cell materials, solar drying, solar furnaces, Solar cooking, solar greenhouse technology, solar thermal power generation, solar cell array

Unit II

Solar Thermal Energy: Solar radiations, flat plate collectors and their materials, applications and performance, focusing of collectors and their materials, applications and performance; solar thermal power plants, thermal energy storage for solar heating and cooling, limitations

Unit III

Geothermal Energy: Resources of geothermal energy, thermodynamics of geo-thermal energy conversion-electrical conversion, non-electrical conversion, environmental consideration, estimates of geothermal power, nature of geothermal fields, advantages & disadvantages of geothermal energy forms, applications of geothermal energy, Geothermal power plant, Fuel Cells: Principle, working of various types of fuel cells, performance and limitations

Unit IV

Wind Energy: Wind power and its sources: Principle of working of Wind Energy, performance and limitations of energy conversion systems. Site selection, criteria, momentum theory, wind characteristics

Text / References Books:

1. John Twideu and Tony Weir, "Renewal Energy Resources" BSP Publications, 2006
2. M.V.R. KoteswaraRao, "Energy Resources: Conventional & Non-Conventional" BSP Publications, 2006.
3. D.S. Chauhan, "Non-Conventional Energy Resources" New Age International.
4. C.S. Solanki, "Renewal Energy Technologies: A Practical Guide for Beginners" PHI Learning.
5. Peter Auer, "Advances in energy system and Technology" Vol I & II Edited by Academic Press.
6. G.D. Rai, "Non-conventional Energy sources" Khanna Publishers
7. Raja A.K., "Introduction to Non-Conventional Energy Resources" Scitech Publications.
8. Fahrenbruch and Bube, "Fundamentals of Solar cells. Photovoltaic Solar Energy"

M.Sc. Physics Semester III

Open Elective – II

Sources of Energy –II

Theory Marks: 80

Internal Assessment: 20

Time: 3 hours

COURSE OUTCOMES

- CO1 Students will be able to understand the importance of Bio-mass, bio gas and their applications
- CO2 Students will be able to understand the concept, working and application of Ocean Thermal Energy
- CO3 Students will be acquainted with carbon based sources of energy
- CO4 Students will be able to appreciate nuclear sources of energy

Unit I

Bio-mass: Introduction of biogas, Availability of bio-mass and its conversion theory, classification of biogas plants, principle & working of floating drum plant & fixed dome type plant- advantages & disadvantages. Biogas from plant waste, community biogas plants, utilization of biogas.

Unit II

Ocean Thermal Energy Availability, theory and working principle, performance and limitations. Wave and Tidal Wave: Principle, working, performance and limitations.

Unit III

Petroleum and Coal energy: Petroleum, origin, composition, production, extraction, octane number, kerosene, LPG, lubricants natural gas, physical properties and uses of coal, genesis of coal, molecular structure, determination of fixed carbon content, coal for generation of electricity, zero emission power plants, coal reserves and mining.

Unit IV

Nuclear Energy: Nucleus and its constituents, charge mass, isotopes, isobars, mass defect, binding energy and nuclear stability, radiation and nuclear reactions.

Nuclear fission, chain reaction, U^{235} , U^{238} , controlled nuclear fission and nuclear reactors, fast breeder reactor, nuclear fusion, condition for nuclear fusion reaction, Hydrogen bomb, Nuclear bomb

Text / References Books:

1. John Twideu and Tony Weir, "Renewal Energy Resources" BSP Publications, 2006
2. M.V.R. KoteswaraRao, "Energy Resources: Conventional & Non-Conventional" BSP Publications, 2006.
3. D.S. Chauhan, "Non-Conventional Energy Resources" New Age International.
4. C.S. Solanki, "Renewal Energy Technologies: A Practical Guide for Beginners" PHI Learning.
5. Peter Auer, "Advances in energy system and Technology" Vol I & II Edited by Academic Press.
6. Raja A.K., "Introduction to Non-Conventional Energy Resources" Scitech Publications.
7. G.D. Rai, "Non-conventional Energy sources" Khanna Publishers