

Elective Course for III year students of all departments

GENERAL ELECTIVE - ENERGY PHYSICS

(Students admitted from June 2008)

Semester- V	Hours/Week:4	Credits:2
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UNIT 1: ENERGY FUNDAMENTALS: Energy sources (sun, gravitational, geothermal, nuclear, chemical energies) brief explanation - Energy units and interconversions - Efficiency of devices. Introduction - Renewable and conventional energy systems - Comparison.

UNIT 2: CONVENTIONAL ENERGY SOURCES: World's reserve of commercial energy sources and their availability - Coal, Oil, Natural gas - Statistical details - Applications - merits and demerits.-Hydro power - Small hydro installations - Measurement of head and flow rate - Various methods - Working of a Pelton wheel impulse turbine.

NON-CONVENTIONAL ENERGY SOURCES:

UNIT 3: SOLAR ENERGY: Nature of solar radiation - Components - Solar heaters - Crop driers - Space cooling -Solar ponds - Solar cookers - Water desalination - Photovoltaic generation - Solar panel -watt - Hour calculations for solar PV installation - Regulators - Inverters - Solar batteries -merits and demerits of solar energy.

UNIT 4: BIOMASS ENERGY AND GEOTHERMAL ENERGY: Biomass energy - Biomass conversion process - Gobar gas plants - Photosynthesis-Biofuel classification - Biofuel production process - Advantages and disadvantages of energy farming. Geothermal energy - Wet steam systems - Dry steam systems - Dry rock and hot aquifer analysis.

UNIT5: WIND AND SEA ENERGY SOURCES: Wind Energy - Turbine types- Solidity- Horizontal axis machines - Vertical axis machines - Concentrators - Energy extraction - Betz model of expanding air stream -interference factor Power coefficient - Thrust on the turbines. Wave energy - Properties of deep water waves - Relationship between frequency and wavelength of deep water surface waves - Period of wave motion and phase velocity - Tidal Wave energy - Lunar induced tide - Period of lunar tides - Solar induced tides. OTEC - Basic principle - Rankine cycle of OTEC system.

UNIT6: NUCLEAR ENERGY AND ENERGY STORAGE: Nuclear Energy - Fission and Fusion - Energy release calculations - Evolution of Indian reactors - Nuclear power reactors - Construction and principle of working - Nuclear energy in industry, Medicine, and Agriculture. - Types of storage - Chemical storage - Hydrogen - Heat storage - Electrical storage - Lead acid battery - Mechanical storage-Flywheel - Hydrogen as a fuel (basics).

Books for Study and Reference:

1. John.W.Twidell, Anthony.D.Weir, *Renewable Energy Resources* (1987) English language book society/E.&F.N.Spon.
2. S.P.Sukhatme , *Solar Energy*,1990.Tata Mc-Graw Hill Publishing Co.Ltd.
3. R.Murugesan , *Modern Physics*. 8th edition,S.Chand and Company (2004).
4. Suresh Garg,Feroz Ahmed,L.S.Kothari , *Physics of Nuclear Reactors* (1996).Tata Mc Graw Hill publishing company limited.New Delhi.
5. Fonash, *Solar cell devices*.
6. RVER'S guide to solar battery charging:12V DC-12V AC Inverter -NOEL KIRKBY and BARBARA KIRKBY.
7. G.D. Roy , *Non Conventional energy sources*.