

PHY- 702 : ENERGY TECHNOLOGY , SPACE PHYSICS AND MICROWAVES

UNIT- I:

ENERGY TECHNOLOGY:

Geothermal Energy: Introduction, Applications, Utilization of Geothermal Energy, Geothermal Energy Resources, Hydro Geothermal Resources, Hot Dry Rock Geothermal Resources.

Wind Energy: Introduction, Applications of Wind Energy and Historical Background, Merits and limitations of Wind energy Conversion, Nature and Origin of Wind, Wind Energy Quantum, Variables in Wind Energy Conversion systems, Wind power density, Power in wind Stream, Wind turbine Efficiency.

Biomass Energy: Introduction, Origin of Biomass(Renewable Energy by Photosynthesis in green plants), Biomass Energy Resources.

Ocean EnergyTechnologies: Introduction to energy from Ocean, Ocean Energy Resources, Off-shore and On-shore Ocean energy conversion Technologies, Advantages and limitations of Ocean energy conversion Technologies.

Ocean wave Energy Conversion: Introduction, Ocean waves, Parameters of a progressive wave, Equation of progressive wave, Energy and Power in ocean waves, Merits of Ocean wave Energy.

UNIT - II:

ENERGY STORAGE SYSTEMS:

Introduction, Energy storage systems for Electrical UTILITY Peak Shaving, Pumped Hydro Energy Storage Plants and Underground Pumped Hydro, Compressed Air Energy Storage, Battery Energy Storage Systems, Lead Acid Battery Cells Nickel-Cadmium Battery, Advanced Batteries, Supper Conducting Magnet Energy Storage, Advanced Flywheel Energy Storage, Thermal Energy Storage-thermal sensible heat storage and Latent heat energy storage, Chemical Energy Storage.

Basic reference: (For Unit-I & II)

Energy Technology by S.Rao and Dr. B.B. Parulekar, Khanna Pub.-1995 1st edition

UNIT- III

Ionosphere and Magnetosphere:

Interaction of solar radiation with atmosphere, Absorption cross-section and ionization efficiency, Rate of ion production by solar photons, Ionization by particle bombardment, Electron distribution with height, Plasma scale height, Ionization loss mechanisms and ion chemistry, Ionospheric regions and its extent. Magnetosphere;- Earth as a magnet, Solar Wind interaction with magnetic field, Trapped radiation.

Airglow and magnetic storms:

Airglow, Airglow spectrum and emission mechanisms, important chemical reactions for airglow, Airglow and ionosphere,Magnetic storms.

Basic references :

An Introductory Course on Space science and Earth's Environment by Shrinivas S. Degaonkar, Guj. Uni. Publication.

UNIT- IV:

Microwave Devices: Klystrons, Magnetrons and Traveling wave tubes, Velocity modulation, Basic principle of two cavity Klystrons and Reflex Klystrons, principles of operation of magnetrons, Gun effect, principle of operation, modes of operation of Gunn diode.

Microwave Passive Circuit Components and Measurements: Attenuators, E-plane tee, H-plane tee and hybrid tee, directional couplers, isolators and circulators.

Basic references :(For Unit- IV)

1. Microwave Devices and Circuits by S.Y.Liao PHI-1995
2. Microwave and Radar Engineering by M. Kulkarni, Umesh Pub. Delhi.
3. Microwave Propagation and Techniques by D.C.Sarkar, S Chand, New Delhi -1995
4. Fundamentals for Microwave Engineering by Robert E. Collin, McGraw Hill (2nd Edition)
5. Electronic Communication Systems by George Kennedy, Tata McGraw Hill.