

IV Year B.Tech. Mechanical Engg. II-Semester	L	T	P	To	C
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## ME424 NON-CONVENTIONAL SOURCES OF ENERGY

### **Course Description & Objective:**

*This course is aimed to introduce the fundamentals concerned with alternative ways of producing power. It also enables the importance of future energy demand.*

### **Course Outcomes:**

1. To know the energy demand of world, nation and available resources to full fill the demand.
2. To know about the conventional energy resources and their effective utilization.
3. To acquire the knowledge of modern energy conversion technologies.
4. To be able to identify available nonconventional (renewable) energy resources and techniques to utilize them effectively.

### **UNIT – I Principles of Solar Radiation:**

Role and potential of new and renewable energy sources. Environmental impact of solar energy, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on tilted surface, instruments for measuring solar radiation and sun shine, solar radiation data.

### **UNIT – II Solar Energy Collection, Storage and Applications:**

Flat plate and concentrating collectors; classification of concentrating collectors, their orientation and thermal analysis. Brief on advanced collectors. Different methods of storage - Sensible, latent heat, stratified and solar ponds. Solar Applications- solar heating and cooling techniques, solar distillation and drying, photovoltaic energy conversion.

### **UNIT - III Wind Energy:**

Sources and potential, horizontal and vertical axis windmills, performance characteristics, Betz criteria.

**Bio-mass Energy :** Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C.Engine operation and economic aspects.

### **UNIT - IV Geothermal Energy & Ocean Energy:**

Resources, types of wells, methods of harnessing the energy, potential in

India. OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics.

**UNIT - V Direct Energy Conversion:**

Need for DEC, Carnot cycle, limitations, principles of DEC. Thermo-electric generators, Seebeck, Peltier and Joule Thomson effects, Figure of merit, materials, applications, MHD generators, principles, dissociation and ionization, Hall effect, magnetic flux, MHD accelerator, MHD Engine, power generation systems, electron gas dynamic conversion, economic aspects. Fuel cells, principles, Faraday's laws, thermodynamic aspects, selection of fuels and operating conditions.

**TEXT BOOKS:**

1. Tiwari and Ghosal, "Renewable energy resources", 1<sup>st</sup> ed., Narosa Publications, 2007.
2. G.D. Rai, "Non-Conventional Energy Sources", 2<sup>nd</sup> ed., Standards Publishers, 2004.

**REFERENCE BOOKS :**

1. Sukhatme, "Solar Energy", 3<sup>rd</sup> ed., Tata Mc Graw Hill, 2008.
2. Ashok V Desai, "Non-Conventional Energy", 2<sup>nd</sup> ed., New Age International, 2008.
3. B.H. Khan, "Non Conventional Energy Sources", 1<sup>st</sup> ed., Tata Mc Graw Hill, 2009.