## ENERGY ENGINEERING

## B.E, VII Semester, Mechanical Engineering

## [As per Choice Based Credit System (CBCS) scheme]

| Course Code | 17ME71 | CIE Marks | 40 |
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| Number of Lecture Hours/Week | 04 | SEE Marks | 60 |
| Total Number of Lecture Hours | 50(10 Hours per Module) | Exam Hours | 03 |

**Credits – 04**

**Course Objectives:**

- **Understand energy scenario,energy sources and their utilization**
- **Learn about energy conversion methods and their analysis**
- **Study the principles of renewable energy conversion systems**
- **Understand the concept of green energy and zero energy.**

**Module - 1**

**Thermal Energy conversion system:** Review of energy scenario in India,General Philosophy and need of Energy ,Different Types of Fuels used for steam generation,Equipment for burning coal in lump form, strokers, different types, Oilburners, Advantages and Disadvantages of using pulverized fuel, Equipmentfor preparation and burning of pulverized coal, unit system and bin system.Pulverized fuel furnaces, cyclone furnace, Coal and ash handling, Generationof steam using forced circulation, high and supercritical pressures.Chimneys: Natural, forced, induced and balanced draft, Calculations andnumerical involving height of chimney to produce a given draft. Coolingtowers and Ponds. Accessories for the Steam generators such asSuperheaters, De-superheater, control of superheaters, Economizers, Air preheatersand re-heaters.

**Module - 2**

**Diesel Engine Power System**: Applications of Diesel Engines in Power field.Method of starting Diesel engines. Auxiliaries like cooling and lubricationsystem, filters, centrifuges, Oil heaters, intake and exhaust system, Layout ofdiesel power plant.

**Hydro-Electric Energy**: Hydrographs, flow duration and mass curves, unithydrograph and numerical. Storage and pondage, pumped storage plants, low, medium and high head plants, Penstock, water hammer, surge tanks,gates and valves. General layout of hydel power plants.

**Module - 3**

**Solar Energy**: Fundamentals; Solar Radiation; Estimation of solar radiation on horizontal and inclined surfaces; Measurement of solar radiation data, Solar Thermal systems: Introduction; Basics of thermodynamics and heat transfer; Flat plate collector; Evacuated Tubular Collector; Solar air collector; Solar concentrator; Solar distillation; Solar cooker; Solar refrigeration and air conditioning; Thermal energy storage systems, Solar Photovoltaic systems: Introduction; Solar cell Fundamentals; Characteristics and classification; Solar cell: Module, panel and Array construction; Photovoltaic thermal systems

| Module - 4 |
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| **Wind Energy**: Properties of wind, availability of wind energy in India, windvelocity and power from wind; major problems associated with wind power,wind machines; Types of wind machines and their characteristics, horizontal land vertical axis wind mills, coefficient of performance of a wind mill rotor(Numerical Examples).<br>**Tidal Power**: Tides and waves as energy suppliers and their mechanics;fundamental characteristics of tidal power, harnessing tidal energy, Limitations. |
| **Module - 5** |
| **Biomass Energy**: Introduction; Photosynthesis Process; Biofuels; Biomass Resources; Biomass conversion technologies; Urban waste to energy conversion; Biomass gasification.<br>**Green Energy**: Introduction: Fuel cells: Overview; Classification of fuel cells; Operating principles; Fuel cell thermodynamics Nuclear, ocean, MHD, thermoelectric and geothermal energy applications; Origin and their types; Working principles, Zero energy Concepts . |
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| **Course outcomes:**<br>1. **Summarize the basic concepts of thermal energy systems,**<br>2. **Identify renewable energy sources and their utilization.**<br>3. **Understand the basic concepts of solar radiation and analyze the working of solar PV and thermal systems.**<br>4. **Understand principles of energy conversion from alternate sources including wind, geothermal, ocean, biomass, biogas.**<br>5. **Understand the concepts and applications of fuel cells, thermoelectric convertor and MHD generator.**<br>6. **Identify methods of energy storage for specific applications** |
| **TEXT BOOKS:**<br>1. B H Khan, Non conventional energy resources, 3rd Edition, McGraw Hill Education<br>2. Principles of Energy conversion, A. W. Culp Jr., McGraw Hill. 1996 |
| **REFERENCE BOOKS**<br>1. S.P. Sukhatme, Solar Energy: principles of Thermal Collection and Storage, Tata McGraw-Hill (1984).<br>2. C. S. Solanki, "Solar Photovoltaic's: Fundamental Applications and Technologies, Prentice Hall of India, 2009.<br>3. L.L. Freris, Wind Energy Conversion Systems, Prentice Hall, 1990. |

H.O.D.
Dept. Of Mechanical Engineering
Alva's Institute of Engg. & Technology
Mijar, MOODBIDRI - 574 225