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## ENERGY PRODUCTION, CONSERVATION AND MANAGEMENT

**Course Code: 13CH2113**

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<b>4</b>	<b>0</b>	<b>3</b>

**Course Educational Objectives:** This course introduces to the student

1. To understand the energy conservation and managing the energy more efficiently.
2. The concept of energy production from various energy resources.

**Course Outcomes:** After completion of the course the student would be able to

1. To implement the more energy efficient devices.
2. Understands the conservation techniques and will be applied commercially to save energy.
3. Understands how to manage energy and apply it more efficiently.

### UNIT- I

#### **Energy and Energy Types:**

Energy; Energy Types: Primary Energy, Secondary Energy; Non Renewable Energy Sources: Coal, Petroleum (Crude Oil), Petroleum Fractions, Natural Gas, Nuclear Energy; Heating Value of Fuels: Energy Density; Renewable Energy Resources: Hydro energy, Solar Energy, Biomass and Bioenergy, Wind Energy, Geothermal Energy, Ocean Energy, Projection on Renewable Energy Contributions; Hydrogen; Chemical Energy; Energy and Global Warming, Tackling the global warming; Natural Gas: Introduction Natural Gas as A fuel, New Frontiers for the Gas Industry.

### UNIT-II

#### **Energy Production:**

Energy Production, Electric Power Production, transmission of Energy, Distributed Energy Resources, Power Producing Engine Cycles: Carnot Cycle, Rankine Cycle, Brayton Cycle, Stirling Engine, Combined Cycles; Improving the Power Production in Steam Power Plants: Modification of Operating Conditions of the Condenser and Boiler, Reheating the Steam, Regeneration, Rankine Cycle, Reheat-

Regenerative Rankine Cycle, Hydropower Plant; Wind Power Plants, Hydrogen Production, Fuel Cells: Direct Methanol Fuel Cells, Microbial Fuel Cell; Biomass and Bioenergy Production: Bioethanol Production, Biodiesel and Green Diesel Production, Energy from Solid Waste, Other Energy Production Opportunities, Levelized Energy cost, Thermodynamics Cost, Ecological Cost: Ecological Planning, Coal-Fired Power Plants, Nuclear Power Plants; Use of Alternative Energy: Introduction, Solar Energy Wind Energy Refuse-Derived Fuel Cells.

### **UNIT-III**

#### **Energy Conservation:**

Energy Conservation and recovery, Conservation of Energy in Industrial Processes, Energy Conservation in Home Heating and Cooling: Home Heating by Fossil Fuel, Home Heating by Electric Resistance, Home Heating by Solar Systems; Energy Efficiency Standards: Efficiency of Air Conditioner, Maximum Possible Efficiency for Cooling, Fuel Efficiency; Fuel Efficiency of Vehicles, Energy Conservation While Driving, Regenerative Braking; Energy Conservation in Electricity Distribution and Smart Grid: Standby Power, Energy Conservation in Lighting, Energy Harvesting; conservation of Energy and Sustainability; Energy Conservation and Energy; Energy Recovery on Utilities Using Pinch Analysis: Composite Curves.

### **UNIT-IV**

#### **Energy Management**

**Introduction:** Background, The Value of Energy Management, The Energy Management Profession, Some Suggested Principles of Energy Management.

#### **Steam and Condensate Systems:**

Introduction, Thermal Properties of steam, Estimating Steam Usage and its Value, Steam Traps and Their Application, Condensate Recovery, Summary.

**Waste-Heat Recovery:** Introduction, Waste-Heat Survey, Waste-Heat Exchangers, Commercial Options in Waste-Heat-Recovery Equipment, Economics of Waste-Heat Recovery,

**UNIT-V****Effective Energy Management:**

Introduction, Energy Management Program, Organizational Structure, Energy Policy, Planning Audit Planning, Educational Planning, Strategic Planning Reporting, Ownership, Summary.

**Industrial Insulation:** Fundamentals of Thermal Insulation Design Theory, Insulation Materials, Insulation Selection Insulation Thickness Determination, Insulation Economics.

**Energy Auditing:** Introduction, Energy Auditing Services, Basic Components of an Energy Audit, Specialized Audit Tools, Industrial Audits, Commercial Audits, Residential Audits, Indoor Air Quality.

**TEXTBOOK:**

1. Yasar Demirel “*Energy-Production, Conversion, Storage, Conservation and Coupling*” Springer, 2012.

**REFERENCE:**

1. Barley L. Capehart “*Encyclopedia of Energy Engineering and Technology*”, CRC Press, 2007

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