ENERGY PRODUCTION, CONSERVATION AND MANAGEMENT

Course Code: 13CH2113

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Course outcomes:

On successful completion of the course, the student should be able to

CO1 : Classify the various energy sources.

CO2 : Differentiate the various energy production methods.

CO3 : Identify the importance of energy conservation.

CO4 : Identify and analyze the energy management principles.

CO5 : Recognize the importance of energy auditing.

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, Renkine Cycle, Reheat-Regenerative Rankine Cycle, Hydropower Plant; Wind Power Plants, Hydrogen Production, Feel 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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