COURSE TITLE : POWER PLANT ENGINEERING
COURSE CODE : 5023
COURSE CATEGORY : E
PERIODS/ WEEK : 4
PERIODS/ SEMESTER : 60
CREDIT : 4

TIME SCHEDULE

MODULE	TOPIC	PERIODS
1	Fuels and combustion, Steam boilers, steam engine and steam turbine	15
2	Condensers, Cooling Towers and Thermal power plant	15
3	Hydro electric power plant, Diesel power plant and Gas Turbines & Jet propulsion	15
4	Renewable energy power plants and nuclear power plant	15
TOTAL		60

COURSE OUTCOME :

sl.no.	sub	student will be able to
1	1	Understand the fuels and combustion.
	2	Review the steam boiler, steam engine , steam turbine and condenser Boilers for process heating, Power generation & Co-generation; & Modern high pressure boilers including FBC (Fluidized Bed Combustion Boiler), understand the steam piping & accessories and insulation
	3	Comprehend the Steam boilers compounding of steam turbine and steam engine
2	4	Appreciate the condensors, vaccum efficiency of condensors and cooling towers
	5	Understand the working of thermal power plants
	6	Comprehend the working of hydro electric power plant and diesel power plant
3	7	Understand the working of gas turbine and jet propulsion
	8	Appreciate the working of nuclear power plant and non conventional power plant

SPECIFIC OUTCOME
MODULE I

1.1.0 Fuels & Combustion
1.1.1 List the various types of Fuels.
1.1.2 State the Merits & Demerits of various types of fuels
1.1.3 Describe the requirements of a good fuel.
1.1.4 Explain the properties of fuel– flashpoint, fire point & pour point,
1.1.5 Define Octane number & Cetane number
1.1.6 Deduce combustion equation & combustion volume
1.1.7 Explain calorific values- LCV & HCV

1.1.8 Explain the Bomb Calorimeter & Junker's Gas Calorimeter to determine the calorific value of fuel
1.1.9 Explain the factors affecting combustion- 3T (Turbulence, Temperature & time)
1.1.10 Analyse the products of combustion

Review the steam boiler, steam engine, steam turbine and condensor, Boilers for process heating, Power generation & Co-generation; & Modern high pressure boilers including FBC (Fluidized Bed Combustion Boiler)

1.2.0 Comprehend the Steam boilers compounding of steam turbine and steam engine
1.2.1 Review the steam boilers
1.2.2 Explain the steam piping and insulation
1.2.3 Explain the boiler draught (natural, forced. Induced, balanced)
1.2.4 Appreciate the working of Steam Turbine
1.2.5 List the advantages of steam turbines over steam engines
1.2.6 Classify steam turbines
1.2.7 Explain the impulse turbines and reaction turbines
1.2.8 Explain the working of a simple De-Laval turbine and Parson's reaction turbine with sketches
1.2.9 State the purpose of compounding of steam turbines
1.2.10 Explain the pressure compounding, velocity compounding and pressure-velocity compounding
1.2.11 Describe the working of compounding of steam engine.
1.2.12 Explain the modern steam turbines(reheating ,bleeding ,regenerating etc)

MODULE II

2.1.0 Appreciate the condensers, vacuum efficiency of condensers and cooling towers
2.1.1. List the different types of Steam Condensers
2.1.2 State the functions of steam condensers
2.1.3 Classify steam condensers
2.1.4 Illustrate the working of jet condensers and surface condensers
2.1.5 Define vacuum efficiency
2.1.6 Compute the vacuum efficiency
2.1.7 Define condenser efficiency
2.1.8 Compute the condenser efficiency
2.1.9 List the factors affecting vacuum efficiency
2.1.10. State the function of cooling towers
2.1.11. Explain the different types of cooling towers
2.2.0 Understand the working of the thermal power plant
2.2.1 Illustrate line diagram of condensing steam power plant.
2.2.2 Explain the working of air pumps
2.2.3 Explain the thermodynamic vapour power cycles, Carnot - Rankine cycles(Simple Problems)

MODULE III

3.1.0 Comprehend the working of hydro electric power plant and diesel power plant
3.1.1 Explain the working of a Hydro electric power plant

3.1.2 Explain the working of diesel power plant with a block diagram.

3.2.0 Understand the working of gas turbine and jet propulsion

3.2.1 State the working principle of Gas Turbines
3.2.2 State the application of gas turbine
3.2.3 List the types of gas turbines
3.2.4 Explain with flow diagram and T-S diagram, the working of constant pressure gas turbine (both open type and closed type)
3.2.5 Explain the work done by constant pressure closed gas turbine(no derivation)
3.2.6 Explain the work done by constant pressure open type gas turbine(no derivation)
3.2.7 Compute the work done by above turbines (simple problems only)
3.2.8 List the fuels used in gas turbines
3.2.9 List the advantages and limitations of gas turbines
3.2.10 Compare gas turbines with steam turbines.
3.2.11 Explain the principle of Jet propulsion
3.2.12 Illustrate the working of turbo jet engine, turbo- prop engine and prop-jet engine
3.2.13 Explain the principles of Rocket propulsion
3.2.14 Explain the ram jet engine.
3.2.15 Explain the pulse jet engine.

MODULE IV

4.1.0 Appreciate the working of nuclear power plant and non conventional power plant

4.1.1 Explain the theory of Nuclear Power Engineering
4.1.2 Explain Nuclear reaction, fission, fusion and chain reaction.
4.1.3 Explain the principal parts of a reactor
4.1.4 Describe the reaction controlled by control rods
4.1.5 List the various types of Nuclear reactors and the main products of a reactors
4.1.6 List the Nuclear fuel materials - uranium, thorium, plutonium.
4.1.7 Describe the moderator - graphite, beryllium, beryllium oxide, light and heavy oxide
4.1.8 Describe the of coolants - water, liquid metal, gas and organic liquids
4.1.9 Explain the working of a Nuclear power plant with the help of a schematic diagram.
4.1.10 Explain the renewable sources of energy
4.1.11 Illustrate the working of solar grain drier and solar cooker
4.1.12 Explain the principle of solar cells, flat plate collectors and parabolic concentrators
4.1.13 Identify the types of wind mills and their uses
4.1.14 Describe the working of wind mills
4.1.15 Describe the working of Bio gas Plant
4.1.16 Describe the working of Tidal power Plant
4.1.17 Describe the working of Geothermal Plant

GENERAL INFORMATION:

Use of Steam Tables and Mollier Charts may be permitted for Examination

CONTENT DETAILS

MODULE I

Fuels & Combustion

Fuels - types - Merits - Demerits - requirements of a good fuel- properties – flash- fire - pour point- Octane number- Cetane number- combustion equation –Combustion volume- calorific values- HCV - LCV - Bomb Calorimeter - Junker's Gas Calorimeter - calorific values- products of combustion -analysis.

Steam generators

Steam generator – Application - Modern high pressure boiler - La-Mont boiler, Benson boiler – Boiler piping and insulation. **Draught**-natural - forced - induced - balanced.

Steam turbines

Principle - operation – impulse – reaction - Types - De-Lavel turbine- Parson's turbine- modern steam turbine – reheating- bleeding - regeneration.-Compounding –pressure- Velocity- Pressure-velocity compounding- Compound steam engine.

MODULE II

Steam Condensers

Introduction - functions -Types - Jet condensers - counter flow and parallel flow type- Surface condensers –Condenser efficiency-Vacuum efficiency – definition- Factors affecting the vacuum efficiency-Mass of cooling water requirement -Cooling tower - function - types-Mass flow rate of water – Simple Problems.

Steam power plant

Working - Condensing steam power plant - Air pumps - Edward air pump - cooling towers - Forced draft - induced draft.

Thermodynamic vapour power cycles - Carnot - Rankine cycles – Simple Problems

MODULE – III

Hydro Electric Power plant- Diesel Power Plant- working.

Gas turbines-Working-Types - constant pressure - open - closed type - work done (simple problems only) - fuels - application - advantages - limitations

Jet Propulsion-Principle- working-Turbo - jet engine - Turbo - prop engine, Prop-jet engine- Rocket propulsion- Principles - Advantages -disadvantages- Applications.

MODULE – IV

Nuclear Power Engineering-Introduction-Nuclear reaction- Fission and fusion - chain reaction- Principal parts of a Reactor- Main parts of a reactor- Brief description of reaction control by Control rods- Brief description of the fuel material- Uranium- Thorium- Plutonium- moderators – Graphite, Beryllium - Beryllium oxide- light - heavy oxide- coolants – water- liquid metal- gas -organic liquids - Nuclear reactors-name different types – working of Boiling water reactor (BWR) - Pressurized water reactor (PWR) - Fast Breeder Reactor (FBR) power plants -Working of a nuclear power plant - schematic diagram.

Renewable sources of energy -

Solar Energy - solar grain drier - solar cooker - solar photovoltaic cells - flat plate collectors for power generators - parabolic concentrators for power generation - wind energy- working of wind mills – wind turbines - biogas energy- working of biogas plant – tidal energy -_working of tidal power plant - geothermal energy- working principle -

TEXT BOOKS

1. Text Book of Thermal Engg., -R.S. Khurmi & J.K. Gupta
2. Non-Conventional Energy sources - G.D. Rai

REFERENCE BOOKS

1. Heat Power Engineering - N. Rangassamy & E. Sundara moorthy
2. Elements & Heat Engines, Vol. I, II & III - R.C. Patel and C. J Karan chandani
3. Introduction to Non conventional Energy resources - Rajaetal.
4. Power plant Engineering - Ramalingam
5. Power plant Engineering -P.K.Nag.
6. Thermal Engg - SK Kulshrestha