ADVANCED POWER PLANT ENGINEERING
(Elective – I)

Course Code: 13ME2306

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Pre requisites: Thermodynamics and Thermal Engineering

Course Educational Objectives:

To make the student understand

1. various improvements possible in steam and gas turbines
2. advanced power cycles
3. advances in nuclear and MHD power plants.
4. combined operations of different power plants
5. environmental issues related to the power plants.
6. economic analysis of power plants

Course Outcomes:

The student will be able to

1. suggest improvements possible in steam and gas turbines
2. advanced power cycles
3. explain advances in nuclear and MHD power plants
4. explain how to combine different power plants
5. handle issues related to the power plants
6. explain economic analysis of power plants

UNIT – I

Rankine Cycle – performance – thermodynamic analysis of cycles, cycle improvements, super heaters, reheaters – condenser and feed water heaters – operation and performance – layouts, gas turbine cycles – optimization – thermodynamic analysis of cycles – cycle improvements – multi spool arrangement. intercoolers, reheaters, regenerators – operation and performance – layouts.

UNIT- II

Binary and combined cycle – coupled cycles – comparative analysis of combined heat and power cycles – IGCC – AFBC/PFBC cycles – thermionic steam power plant.

UNIT- III

Overview of Nuclear power plants – radioactivity – fission process – reaction rates –diffusion theory, elastic scattering and slowing down – criticality calculations – critical heat flux – power reactors – nuclear safety. MHD and MHD – steam power plants.

UNIT- IV

Advantages of combined working – load division between power stations – storage type hydro-electric plant in combination with steam plant – run of river plant in combination with steam plant – pump storage plant in combination with steam or nuclear power plant – coordination of hydro-electric and gas turbine stations – coordination of hydro-electric and nuclear power station – coordination of different types of power plants.

Air and water pollution –acid rains – thermal pollution – radioactive pollution –standardization – methods of control.

UNIT-V

Load curves–effects of variable load on power plant design and operation–peak load plant– requirements of peak load plants–cost of electrical energy–selection of type of generation– selection of generating equipments–performance and operating characteristics of power plants.

TEXT BOOKS:

1. Nag, P.K., "*Power Plant Engineering"*, Tata Mcgraw Hill Publishing Co Ltd, New Delhi, 1998.
2. Arora and Domkundwar, "*A course in power Plant Engineering"*, DhanpatRai and CO, 2004.

REFERENCES:

1. Haywood, R.W, " *Analysis of Engineering Cycles"*, 4th Edition, Pergamon Press, Oxford, 1991.
2. Wood, A.J., Wollenberg, B.F, "*Power Generation, operation and control"*, John Wiley, New York, 1984.
3. Gill, A.B., " *Power Plant Performance",* Butterworths, 1984.
4. Lamarsh, J.R., "*Introduction to Nuclear"*, Engg.2nd edition, Addison-Wesley, 1983.