POWER PLANT ENGINEERING

Course Code	19ME4702A	Year	IV	Semester	I
Course Category:	Program Core	Branch	ME	Course Type	Theory
Credits:	3	L – T – P	3 – 0 – 0	Prerequisites:	Nil
Continuous Evaluation:	30	Semester End Evaluation:	70	Total Marks:	100

Course Outcomes		
Upon successful completion of the course, the student will be able to		
CO1	Describe various energy sources and combustion processes in steam power plants.	L1
CO2	Classify diesel and gas turbine power plants layout with auxiliaries.	L2
CO3	Relate hydro projects classifications, fusion and fission reactions in nuclear power plants and types of reactors.	L2
CO4	Estimate the advantages of combined working of different power plants and importance of measurement and instrumentation in power plant.	L3
CO5	Explain the concepts of power plant economics and impact of its effluents on environment.	L2

Course Articulation Matrix:

	Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3				1							2	1
CO2	3	3				2							2	2
CO3	3	3				2							2	3
CO4	3	3				1							2	2
CO5	3	3				2							2	1

Course Content		Mapped CO s
UNIT-1	INTRODUCTION TO THE SOURCES OF ENERGY: Resources and Development of Power in India. STEAM POWER PLANT: Plant Layout, Working of different Circuits, Fuel and handling equipments, types of coals, coal handling, choice of handling equipment, coal storage, Ash handling systems. COMBUSTION PROCESS: Properties of coal – overfeed and underfeed fuel beds, traveling grate stokers, and spreader stokers, retort stokers, pulverized fuel burning system and its components, combustion needs and draught system, Dust collectors, cooling towers and heat rejection, dearation. Corrosion and feed water treatment.	**CO1**
UNIT-2	DIESEL POWER PLANT: Introduction – IC Engines, types, construction– Plant layout with auxiliaries – fuel supply system, air starting equipment, lubrication and cooling system – super charging, application and comparison with other plants.	**CO2**

	GAS TURBINE POWER PLANT: Introduction – classification - construction – Layout with auxiliaries – Principles of working of closed and open cycle gas turbines. Combined Cycle Power Plants and comparison, Permanence evaluation of the gas turbine plant.	
UNIT-3	HYDRO ELECTRIC POWER PLANT: Water power – Hydrological cycle / flow measurement – drainage area characteristics – Hydrographs – storage and Pondage – classification of dams and spill ways. HYDRO PROJECTS AND PLANT: Classification – Typical layouts – Site selection of hydro plant - plant auxiliaries – plant operation pumped storage plants. NUCLEAR POWER PLANT: Fusion and fission Reactions, Nuclear fuel – breeding and fertile materials – Nuclear reactor – reactor operation, Fuel moderator and coolant. TYPES OF REACTORS: Pressurized water reactor, Boiling water reactor, sodium graphite reactor, fast Breeder Reactor, Homogeneous Reactor, Gas cooled Reactor, Radiation hazards and shielding – radioactive waste disposal.	**CO3**
UNIT-4	HYBRID POWER PLANTS: Introduction, Advantages of combined working, Load division between power stations, Storage type hydro-electric plant in combination with steam plant, Run off 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 hydroelectric and Nuclear power stations, coordination of different types of Power plants. POWER PLANT INSTRUMENTATION AND CONTROL: Importance of measurement and instrumentation in power plant, measurement of water purity, Gas analysis, O2 and CO2 measurements, measurement of smoke and dust, measurement of moisture in CO2 circuit, Nuclear measurements.	**CO4**
UNIT-5	POWER PLANT ECONOMICS AND ENVIRONMENTAL CONSIDERATIONS: Capital cost, investment of fixed charges, operating costs, cost per KWh, general arrangement of power distribution, Load curves, load duration curve. Definitions of connected load, Maximum demand, demand factor, average load, load factor, diversity factor – related exercises. Effluents from power plants and Impact on environment – pollutants and pollution standards – Methods of Pollution control.	**CO5**

Learning Resources	
Text Books:	A Course In Power Plant Engineering by – Arora and Domkundwar, Dhanpatrai & co.2011. 2.Power Plant Engineering, by P.K.Nag, TataMcHill-2008.
Reference Books:	1.A Text Book of Power Plant Engineering, by R K Rajput, Lakshmi Publications, 2008. 2.Power Plant Engineering, by P.C.Sharma, S.K.Kataria Publications, 2009. 3.Power plant Engineering, by Ramalingam, Scietech Publishers-2010. 4.An Introduction to Power Plant Technology, by G.D. Rai, Khanna publications-1996.
E-Resources & other digital Material:	https://nptel.ac.in/courses/112/107/112107291/