



FACULTY OF ENGINEERING & TECHNOLOGY

First Year Master of Engineering

Semester I

Course Code: 102440106

Course Title: Advance Thermal Power Plant

Type of Course: Program Elective II

Course Objectives: The course intends to make the students to understand the energy scenario and the environmental issues related to the power plants and to create awareness to the students on the various utilities in the power plants and the avenues for optimizing them

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
Lecture	Tutorial	Practical		Internal		External		Total
				Theory	J/V/P*	Theory	J/V/P*	
3	0	2	4	40 / 16	20 / 08	60 / 24	30 / 12	150 / 60

* J: Jury; V: Viva; P: Practical

Detailed Syllabus:

Sr.	Contents	Hours
1	INTRODUCTION Overview of Indian power sector – load curves for various applications – types of power plants – merits and demerits – criteria for comparison and selection - Economics of power plants.	4
2	STEAM POWER PLANTS Basics of typical power plant utilities - Boilers, Nozzles, Turbines, Condensers, Cooling Towers, Water Treatment and Piping system - Rankine Cycle – thermodynamic analysis. Cycle improvements – Superheat, Reheat, Regeneration	8
3	DIESEL AND GAS TURBINE POWER PLANTS I.C Engine Cycles - Otto, Diesel & Dual –Theoretical vis-à-vis actual – Typical diesel power plant – Types – Components - Layout - Performance analysis and improvement - Combustion in CI engines - E.C cycles – Gas turbine & Stirling - Gas turbine cycles – thermodynamic analysis – cycle improvements - Intercoolers, Re heaters, regenerators	8
4	ADVANCED POWER CYCLES Cogeneration systems – topping & bottoming cycles - Performance indices of cogeneration systems – Heat to power ratio - Thermodynamic performance of steam turbine cogeneration systems – gas turbine cogeneration systems – reciprocating IC engines cogeneration systems- Binary Cycle - Combined cycle – IGCC – AFBC / PFBC cycles – Thermionic steam power plant. MHD – Open cycle and closed cycle- Hybrid MHD & steam power plants	10



5	HYDROELECTRIC & NUCLEAR POWER PLANTS Hydroelectric Power plants – classifications - essential elements – pumped storage systems – micro and mini hydel power plants. General aspects of Nuclear Engineering – Components of nuclear power plants - Nuclear reactors & types – PWR, BWR, CANDU, Gas Cooled, Liquid Metal Cooled and Breeder reactor - nuclear safety – Environmental issues	9
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Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks						R: Remembering; U: Understanding; A: Application, N: Analyze; E: Evaluate; C: Create
R	U	A	N	E	C	
15%	35%	25%	15%	10%	0%	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1	Power Plant Engineering, P K Nag, McGraw Hill Education
2	A course in Power Plant Engineering, Arora and Domkundwar, Dhanpat Rai Publication
3	Analysis of Engineering Cycles Power, Refrigeration and Gas Liquefaction, Haywood R.W, Pergamon Press
4	Introduction to Nuclear Engineering, John R. Lamarsh, Anthony J. Baratta, Pearson Education Limited
5	Power Generation, Operation, and Control, Allen J. Wood, Bruce F. Wallenberg, Wiley
6	Power Plant Performance, A B Gill, Standards media
7	Cogeneration-combined heat and power (CHP): thermodynamics and economics, J P Horlock, Oxford
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Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	The student will be able to suggest improvements possible in steam and gas turbines	10
CO-2	Learn advanced power cycles	20
CO-3	The student will be able to explain advances in nuclear and MHD power plant	20
CO-4	Students will be able to handle issues related to the power plants	10
CO-5	Students will be able to explain how to combine different power plants	25
CO-6	Students will able to economic analysis of power plants	15
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CO-8	Click or tap here to enter text.	Click
CO-9	Click or tap here to enter text.	Click
CO-10	Click or tap here to enter text.	Click



List of Practicals / Tutorials:

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1	To study of modern steam power plant
2	To Study about the Various Types of Fuel & Ash Handling Systems
3	To study about different types of dust collectors and pulverized fuel burners
4	To study of different types of steam turbines
5	To study about different types of condensers and cooling towers
6	To study of gas power plant
7	To study of combined steam & gas turbine power plant
8	Study about thermodynamics performance of steam turbine, gas turbine and reciprocating I. C. Engine co-generation system
9	To study about nuclear power plant
10	Testing of diesel fired water tube boiler based steam power plant
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Supplementary learning Material:

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Curriculum Revision:

Version:	1
Drafted on (Month-Year):	Apr-20
Last Reviewed on (Month-Year):	Jul-20
Next Review on (Month-Year):	Apr-22