Faculty of mechanical engineering and Technology, SRM University, Kattankulathur-603203

School of mechanical engineering

Department of mechanical engineering

Course Plan

Course code: ME1154Date: 01/12/2014

Course title: THERMAL POWER SYSTEMS

Semester: 04

Academic year / semester: 2014-2015/even

Sections details

Section	Class Room no	Details of faculty				
		Name	Room no	Intercom	e-mail id	Student contact time
A-F		S.Malarmannan	MEB208		Malarmannan.s@ktr.srmuniv.ac.in	12.30P.M-1.15P.M

Direct assessment details.

Name of the assessment	Marks	Topics	Tentative date	Duration
Cycle test 1	10	Unit 1 and unit 2 (boiler accessories and mountings)	09/02/2015	100 min
Surprise test	05	unit 2 boiler testing – performance calculation	24/02/2015	15 min
Cycle test 2	10	Unit2 (boiler testing-cooling towers), Unit 3	09/03/2015	100 min
Model test	20	Entire syllabus	15/4/2015	3 hour
End semester Exam	50	Entire syllabus	May 2015	3 hour
Attendance	05			

1. Expected learning outcome of the course

		L	T	P	C
ME1154	THERMAL POWER SYSTEM	3	0	0	3
	Prerequisite				
	APPLIED THERMAL ENGINEERING				

Student outcomes	Program Educational Objectives			
	The main objective of the B.Tech in Mechanical Engineering Program is to provide a periodically-updated curriculum so that, following the completion of the program and with a few years of experience, our alumni will have the expertise to:			
	1. Practice mechanical engineering in different disciplines towards system design, realization,	2. Enhance professional practice to meet the global standards with ethical and social responsibility.	3. Solve industrial, social, and environmental problems with appropriate techniques and tools.	4. Work in large cross-functional teams and pursue life-long learning.
(a) an ability to apply knowledge of mathematics, science, and engineering	X		X	
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability	X	X	X	
(e) an ability to identify, formulate, and solve engineering problems	X		X	

Course designed by		Department of Mechanical Engineering										
1	Student outcome	a	B	c	d	e	f	G	h	i	j	k
		×		×		×						

2	Category	GENERAL (G)	BASIC SCIENCES (B)	ENGINEERING SCIENCES AND TECHNICAL ART (E)	PROFESSIONAL SUBJECTS (P)
					X

3	Broad area	Manufacturing	Design	Thermal	Genaral		

	(for professional courses only, i.e 'under P' category)			X			
4	Course Coordinator	Mr.S.Malarmannan					

Syllabus of the course

ME 1154	THERMAL POWER SYSTEMS	L	T	P	C
	Prerequisite	3	0	0	3
	Applied Thermal Engineering				

PURPOSE

To familiarize the students about the various auxiliary combustion equipment, steam generation and recovery systems, various conventional and non-conventional sources of energy with power plant economics.

INSTRUCTIONAL OBJECTIVES

1.	Know the functions of various auxiliary combustion equipment
2.	Understand the thermal power plant systems.
3.	Familiarize with operation of nuclear, Diesel and gas turbine power Plants.
4.	Familiarize with renewable energy sources and power plant economics.

UNIT I - FUEL COMBUSTION EQUIPMENTS (9 hours)

Types of combustion, stokers, fuel and ash handling equipments. Draft - forced, induced and balanced drafts. Selection of fans.Heat recovery equipmenteconomisers, air preheaters and reheaters, different types of superheaters and desuperheaters. Emission control, flue gas cleaning, particulate and gaseous emission control methods.

UNIT II - THERMAL POWER PLANT SYSTEMS (9 hours)

Steam generators - forced circulation, high-pressure boilers and super critical boilers, fluidized bed boiler, boiler accessories and mountings.Boiler testing. Condensers: Different types, design factors, air removal, performance calculation. Cooling towers - natural and mechanical draft types.

UNIT III - NUCLEAR, DIESEL AND GAS TURBINE POWER PLANTS (9 hours)

General nuclear fuels used in reactors, elements of nuclear reactor, moderator, control rods, coolants, description of different types of reactors. Radiation hazards, radioactive waste disposal. Diesel power plant - Classifications, components, selection of engine type. Gas turbine plant - closed and open cycles. Combined power cycles.

UNIT IV - RENEWABLE ENERGY SOURCES (9 hours)

Solar energy - measurement, methods of utilization, flat plate and concentrating collectors, water heater, air driers, photovoltaic cell. Wind energy - Horizontal and vertical axis wind turbines. Geothermal plants, tidal power plant, biomass and biogas plants, OTEC plants.

UNIT V - POWER PLANT ECONOMICS (9 hours)

Plant load factor and utilization factor, cost economics - Tariff rates, demand changes, load distributions. Energy conservation and audit.Maintenance aspects of power plants.

TOTAL : 45

TEXT BOOKS

1. Nag.P.K, "Power Plant Engineering", Tata McGraw Hill, New Delhi, 3rd edition, 2008.

2. Arora.S.C and Domkundwar.S, "Power Plant Engineering", DhanpatRai& Sons, New Delhi, 2001.

REFERENCES

R1. Ramalingam.K.K, "Power Plant Engineering", Scitech Publication Pvt. Ltd, 2002.

R2. Rai.G.D, "Non-Conventional Energy Sources", Khanna Publishers, 4th edition, New Delhi, 2009.

R3. El Wakil.M.M, "Power Plant Technology", McGraw Hill Inc., New York, 1985.

SESSION PLAN

Session no	Title and details of chapter	References
	FUEL COMBUSTION EQUIPMENTS	
1	Types of combustion, stokers	T2-Chapter8.1,8.2
2	Fuel and Ash handling equipment	T2-Chapter 7.4,7.6,9.2-9.5
3	Forced and induced drafts	T2-Chapter 12.4-12.7
4	Balanced drafts. Selection of fans	T2-Chapter 12.8-12.10
5	Heat recovery equipment-economisers ,	T1-Chapter 6.4,T2-Chapter 14.2
6	air preheaters and reheaters	T2-Chapter 14.3
7	different types of superheaters and desuperheaters	T2-Chapter 14.4
8	Emission control, flue gas cleaning,	T2-Chapter 37.8,37.9
9	particulate and gaseousemission control methods	R3 17.8
	THERMAL POWER PLANT SYSTEMS	
10	Steam generators - forced circulation,	T1-Chapter 6.22
11	high-pressure boilers and super critical boilers,	T2-Chapter 13.1-13.8
12	fluidized bed boiler	T1-Chapter 6.9
13	boiler accessories and mountings	T2 Chapter 14.1-14.5
14	Boiler testing	T2 Chapter 34.5
15	Different types of condensor	T2-Chapter 17.1-17.4
16	Design factors, air removal	T2-Chapter 17.9
17	performance calculation.	T2-Chapter 17.5
18	Cooling towers - natural and mechanical draft types.	T1 Chapter 8.6.1,8.6.2
	NUCLEAR, DIESEL AND GAS TURBINE POWER PLANTS	
19	General nuclear fuels used in reactors	T2-Chapter 29.1,29.2
20	elements of nuclear reactor, moderator,	T2-Chapter 28.4
21	control rods, coolants,.	T2-Chapter 29.6
22	description of different types of reactors	T2-Chapter 28.4
23	Radiation hazards, radioactive waste disposal.	T2-Chapter 30.4 -30.6
24	Diesel power plant - Classifications,components,	T2-Chapter 23, T1-Chapter 11.3
25	selection of engine type.	T2-Chapter 23.4
26	Gas turbine plant - closed and open cycles.	T2-Chapter 24, T1-Chapter 11.11
27	Combined power cycles.	T2-Chapter 25
	RENEWABLE ENERGY SOURCES	
28	Solar energy - measurement, methods of utilization	T2-Chapter 31.5
29	flat plate and concentrating collectors, water heater, air driers	R2-chapter 3.3,3.8,5.2,5.7,5.8
30	photovoltaic cell. Wind energy - Horizontal axis wind turbines	R3 Chapter 13.15,13.19.
31	vertical axis wind turbines	T2-Chapter 31.4
32	Geothermal plants	T1- Chapter 13.5, R3-Chapter 12
33	tidal power plant,	R3-Chapter 12

34	Biomass plants	R2-chapter 7.1
35	biogas plants,	R2-chapter 7.4-7.6, 7.9
36	OTEC plants	T1- Chapter14.7, R3-Chapter 15.1-15.6
	POWER PLANT ECONOMICS	
37	Plant load factor and utilization factor	T2-Chapter 32.1-32.4
38	cost economics – tariff rates	T2-Chapter 34.1-34.7
39	Demand changes	T2-Chapter 32
40	Load distrubition	T2-Chapter 34.6
41	Energy conservation, energy requirements in future	T2-Chapter 40.1-40.2
42	Energy conservation - distribution	T2-Chapter 40.3-40.5
43	Energy Audit	R2-chapter 17.2
44	Maintance aspect of power plantsof the plants	R2-chapter 17.4
45	Maintenance aspects of power plants.	R2-chapter 17.4

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T1. Nag.P.K, "Power Plant Engineering", Tata McGraw Hill, New Delhi, 3rd edition, 2008.

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Name of the faculty S. MALARMANNAN

Signature 4/12/14.