

MOHAMMED SATHAK A J COLLEGE OF ENGINEERING

Siruseri IT park, OMR, Chennai - 603103

LESSON PLAN							
Department of <u>Mechanical</u> Engineering							
Name of the Subject	THERMAL ENGINEERING - II			Name of the handling Faculty	MUHAMMAD IRFAN A A		
Subject Code	ME8595			Year / Sem	III / V		
Acad Year	2022-2023			Batch	2020-2024		
Course Objective							
To apply the thermodynamic concepts for Nozzles, Boilers, Turbines, and Refrigeration & Air Conditioning Systems.							
To understand the concept of utilising residual heat in thermal systems.							
Course Outcome							
CO1: Solve problems in Steam Nozzle							
CO2: Explain the functioning and features of different types of Boilers and auxiliaries and calculate performance parameters.							
CO3: Explain the flow in steam turbines, draw velocity diagrams for steam turbines and solve problems.							
CO4: Summarize the concept of Cogeneration, Working features of Heat pumps and Heat exchangers							
CO5: Solve problems using refrigerant table / charts and psychrometric charts							
Lesson Plan							
Sl. No.	Topic(s)	T / R*	Periods Required	Mode of Teaching (BB / PPT / NPTEL / MOOC / etc)	Blooms Level (L1-L6)	CO	PO
		Book					
UNIT I - STEAM NOZZLE							
1	Types and Shapes of nozzles,	T1	2	BB/PPT	L2	1	PO1
2	Flow of steam through nozzles	T1	1	BB/PPT	L2	1	PO1
3	Critical pressure ratio	T1	1	BB/PPT	L2	1	PO1
4	Variation of mass flow rate with pressure ratio	T1	1	BB/PPT	L2	1	PO2
5	Brayton – Cycle Analysis	T1	2	BB/PPT	L4	1	PO4
6	Effect of friction	T1	1	BB/PPT	L2	1	PO7
7	Metastable flow.	T1	1	BB/PPT	L2	1	PO1
Suggested Activity: Assignment / Case Studies / Tuorials/ Quiz / Mini Projects / Model Developed/others Planned if any : NIL							
Evaluation method: Internal Assesment Test							
UNIT II - BOILERS							
8	Types and comparison	T1	1	BB/PPT	L2	2	PO1
9	Mountings and Accessories	T1	2	BB/PPT	L2	2	PO1

10	Fuels - Solid, Liquid and Gas	T1	2	BB/PPT	L2	2	PO1
11	Performance calculations	T1	2	BB/PPT	L4	2	PO2
12	Boiler trial.	T1	2	BB/PPT	L3	2	PO7

Suggested Activity: Assignment / Case Studies / Tuorials/ Quiz / Mini Projects / Model Developed/others Planned if any : NIL

Evaluation method: Internal Assesment Test

UNIT III - STEAM TURBINES

13	Types, Impulse and reaction principles	T1	2	BB/PPT	L2	3	PO1
14	Velocity diagrams	T1	2	BB/PPT	L3	3	PO1
15	Work done and efficiency	T1	2	BB/PPT	L4	3	PO2
16	optimal operating conditions	T1	1	BB/PPT	L2	3	PO7
17	Multi-staging	T1	1	BB/PPT	L2	3	PO1
18	compounding and governing	T1	1	BB/PPT	L2	3	PO1

Suggested Activity: Assignment / Case Studies / Tuorials/ Quiz / Mini Projects / Model Developed/others Planned if any : NIL

Evaluation method: Internal Assesment Test

UNIT IV - COGENERATION AND RESIDUAL HEAT RECOVERY

19	Cogeneration Principles, Cycle Analysis, Applications	R3	2	BB/PPT	L4	4	PO2
20	Source and utilisation of residual heat	R3	2	BB/PPT	L2	4	PO1
21	Heat pipes	R3	1	BB/PPT	L2	4	PO1
22	Heat pumps	R3	1	BB/PPT	L2	4	PO1
23	Recuperative and Regenerative heat exchangers	R5	2	BB/PPT	L2	4	PO1
24	Economic Aspects	R3	1	BB/PPT	L3	4	PO7

Suggested Activity: Assignment / Case Studies / Tuorials/ Quiz / Mini Projects / Model Developed/others Planned if any : NIL

Evaluation method: Internal Assesment Test

UNIT V - REFRIGERATION AND AIR – CONDITIONING

26	Vapour compression refrigeration cycle.	R1	1	BB/PPT	L2	5	PO1
27	Effect of Superheat and Sub-cooling	R1	1	BB/PPT	L2	5	PO1
28	Performance calculations	R1	2	BB/PPT	L4	5	PO2
29	Working principle of air cycle, vapour absorption system, and Thermoelectric refrigeration	R1	1	BB/PPT	L2	5	PO1

30	Air conditioning systems	R1	1	BB/PPT	L2	5	PO7			
31	concept of RSHF, GSHF and ESHF	R1	1	BB/PPT	L2	5	PO1			
32	Cooling load calculations	R1	1	BB/PPT	L4	5	PO2			
33	Cooling towers – concept and types	R1	1	BB/PPT	L2	5	PO1			
Suggested Activity: Assignment / Case Studies / Tuorials/ Quiz / Mini Projects / Model Developed/others Planned if any : NIL										
Evaluation method: Internal Assesment Test										
Content Beyond the Syllabus Planned										
1	Types of Renewable Energy									
Text Books										
1	Kothandaraman, C.P., Domkundwar .S and Domkundwar A.V.,”A course in Thermal Engineering”, Dhanpat Rai & Sons, 2016.									
2	Mahesh. M. Rathore, “Thermal Engineering”, 1st Edition, Tata Mc Graw Hill Publications, 2010.									
Reference Books										
1	Arora .C.P., “Refrigeration and Air Conditioning”, Tata Mc Graw Hill, 2008									
2	Ballaney. P.L ." Thermal Engineering”, Khanna publishers, 24th Edition 2012									
3	Charles H Butler : Cogeneration” McGraw Hill, 1984.									
4	Donald Q. Kern, “ Process Heat Transfer”, Tata Mc Graw Hill, 2001.									
5	Sydney Reiter “Industrial and Commercial Heat Recovery Systems” Van Nostrand Reinhols, 1985.									
Website / URL References										
1	https://www.slideshare.net/vanitathakkar/steam-nozzles-vnt									
2	https://nptel.ac.in/courses/112/107/112107216/									
3	https://www.youtube.com/watch?v=6ThiShJ7LXg									
4	https://nptel.ac.in/courses/112/105/112105221/									
5	https://nptel.ac.in/courses/112/105/112105129/									
Blooms Level										
Level 1 (L1) : Remembering		Lower Order Thinking	Fixed Hour Exam s	Level 4 (L4) : Analysing					Higher Order Thinkin g	Projects / Mini Projects
Level 2 (L2) : Understanding				Level 5 (L5) : Evaluating						
Level 3 (L3) : Applying				Level 6 (L6) : Creating						
Mapping syllabus with Bloom’s Taxonomy LOT and HOT										
Unit No	Unit Name	L1	L2	L3	L4	L5	L6	LOT	HOT	Total
Unit 1	STEAM NOZZLE	0	6	0	1	0	0	6	1	7
Unit 2	BOILERS	0	3	1	1	0	0	4	1	5
Unit 3	STEAM TURBINES	0	4	1	1	0	0	5	1	6
Unit 4	COGENERATION AND RESIDUAL HEAT RECOVERY	0	4	1	1	0	0	5	1	6
Unit 5	REFRIGERATION AND AIR – CONDITIONING	0	6	0	2	0	0	6	2	8
Total		0	23	3	6	0	0	26	6	32

Total Percentage						0	71.88	9.375	18.75	0	0	81.3	18.75	100
CO PO Mapping														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO1 1	PO1 2	PSO1	PSO2
CO1	3	2			1		1						2	2
CO2	3	2			1		3						2	2
CO3	3	2			1		1						2	3
CO4	3	1			1		3						2	3
CO5	3	2			1		3						2	3
Avg	3	1.8			1		2.2						2	2.6
Justification for CO-PO mapping														
CO1	Contains More Engineering knowledge, Problem analysis, Modern tool usage,Environment and sustainability													
CO2	Contains More Engineering knowledge, Problem analysis, Modern tool usage, More Environment and sustainability													
CO3	Contains More Engineering knowledge, Problem analysis, Modern tool usage,Environment and sustainability													
CO4	Contains More Engineering knowledge, Problem analysis, Modern tool usage, More Environment and sustainability													
CO5	Contains More Engineering knowledge, Problem analysis, Modern tool usage, More Environment and sustainability													
3		High level			2		Moderate level			1		Low level		
Name & Sign of Faculty Incharge : MUHAMMAD IRFAN A A														
Name & Sign of Subject Expert :														
Head of the Department :														

Format No :231