MOHAMMED SATHAK A J COLLEGE OF ENGINEERING

Siruseri IT park, OMR, Chennai - 603103

LESSON PLAN

Department of Mechanical Engineering

Name of the Subject	HEAT AND MASS TRANSFER	Name of the handling Faculty	MUHAMMAD IRFAN A A
Subject Code	ME8693	Year / Sem	III / VI
Acad Year	2021-2022	Batch	2019-2023

Course Objective

To understand the mechanisms of heat transfer under steady and transient conditions.

To understand the concepts of heat transfer through extended surfaces.

To learn the thermal analysis and sizing of heat exchangers and to understand the basic concepts of mass transfer.

Course Outcome

CO1: Apply heat conduction equations to different surface configurations under steady state and transient conditions and solve problems

CO2: Apply free and forced convective heat transfer correlations to internal flows through/over various surface configurations and solve problems

CO3: Apply free and forced convective heat transfer correlations to external flows through/over various surface configurations and solve problemsExplain the phenomena of boiling and condensation, apply LMTD and NTU methods of thermal analysis to different types of heat exchanger configurations and solve problems

CO4: Explain basic laws for Radiation and apply these principles to radiative heat transfer between different types of surfaces to solve problems

CO5: Apply diffusive and convective mass transfer equations and correlations to solve problems for different applications

Lesson Plan

Sl. No.	Topic(s)	T / R* Book	Periods Required	Mode of Teaching (BB / PPT / NPTEL / MOOC / etc)	Blooms Level (L1-L6)	CO	PO
UNIT I - CONDUCTION							
1	General Differential equation of Heat Conduction	T2	2	BB	L2	1	PO1 & PO2
2	Cartesian and Polar Coordinates	T2	1	BB	L2	1	PO1 & PO2
3	One Dimensional Steady State Heat Conduction	T2	1	BB	L2	1	PO1 & PO2
4	plane and Composite Systems	T2	2	BB	L2	1	PO1 & PO2
5	Conduction with Internal Heat Generation	T2	1	BB	L2	1	PO1 & PO2
6	Extended Surfaces	T2	2	BB	L2	1	PO1 & PO2
7	Unsteady Heat Conduction	T1	2	BB	L2	1	PO1 & PO2
8	Lumped Analysis	T1	1	BB	L3	1	PO1 & PO2
9	Semi Infinite and Infinite Solids	T2	1	BB	L3	1	PO1 & PO2
10	Use of Heisler’s charts.	T2	2	BB	L3	1	PO1 & PO2

Suggested Activity: Tutorial							
Evaluation method: Internal Assesment Test							
UNIT II - CONVECTION							
11	Free and Forced Convection	T2	3	BB	L2	2	PO1 & PO2
12	Hydrodynamic and Thermal Boundary Layer.	T2	3	BB	L2	2	PO1 & PO2
13	Free and Forced Convection during external flow over Plates	T1	3	BB	L3	3	PO1, PO2 & PO3
14	Free and Forced Convection during external flow over Cylinders	T1	3	BB	L3	3	PO1, PO2 & PO3
15	Internal flow through tubes	T1	3	BB	L3	2	PO1, PO2 & PO3
Suggested Activity: Assignment							
Evaluation method: Internal Assesment Test (MCQ)							
UNIT III - PHASE CHANGE HEAT TRANSFER AND HEAT EXCHANGERS							
16	Nusselt's theory of condensation	T2	2	BB	L2	3	PO1 & PO2
17	Regimes of Pool boiling and Flow boiling	T2	2	BB	L2	3	PO1 & PO2
18	Correlations in boiling and condensation	T2	2	BB	L2	3	PO1 & PO2
19	Heat Exchanger Types	T2	2	BB	L2	3	PO1 & PO2
20	Overall Heat Transfer Coefficient	T1	2	BB	L2	3	PO1 & PO2
21	Fouling Factors	T2	2	BB	L2	3	PO1 & PO2
22	Analysis – LMTD method - NTU method.	T1	3	BB	L3	3	PO1, PO2 & PO3
Suggested Activity: Case Study							
Evaluation method: Internal Assesment Test (MCQ)							
UNIT IV - RADIATION							
23	Black Body Radiation	T2	2	BB	L2	4	PO1 & PO2
24	Grey body radiation	T2	2	BB	L2	4	PO1 & PO2
25	Shape Factor	T2	2	BB	L2	4	PO1 & PO2
26	Electrical Analogy	T2	3	BB	L3	4	PO1, PO2 & PO3
27	Radiation Shields	T2	3	BB	L3	4	PO1, PO2 & PO3
28	Radiation through gases.	T2	3	BB	L3	4	PO1, PO2 & PO3
Suggested Activity: Assignment							
Evaluation method: Internal Assesment Test (MCQ)							
UNIT V - MASS TRANSFER							
29	Basic Concepts	R5	2	BB	L2	5	PO1

30	Diffusion Mass Transfer	R5	2	BB	L2	5	PO1
31	Fick's Law of Diffusion	R5	2	BB	L2	5	PO1
32	Steady state Molecular Diffusion	R5	2	BB	L2	5	PO1 & PO2
33	Convective Mass Transfer	R5	2	BB	L2	5	PO1 & PO2
34	Momentum	R5	1	BB	L2	5	PO1 & PO2
35	Heat and Mass Transfer Analogy	R5	2	BB	L3	5	PO1 & PO2
36	Convective Mass Transfer Correlations	R5	2	BB	L3	5	PO1 & PO2

Suggested Activity: Tutorial

Evaluation method: Internal Assesment Test (MCQ)

Content Beyond the Syllabus Planned

1	Boilers & Mountings

Text Books

1	Holman, J.P., "Heat and Mass Transfer", Tata McGraw Hill, 2000
2	Yunus A. Cengel, "Heat Transfer A Practical Approach", Tata McGraw Hill, 5th Edition 2015

Reference Books

1	Frank P. Incropera and David P. Dewitt, "Fundamentals of Heat and Mass Transfer", John Wiley & Sons, 1998.
2	Kothandaraman, C.P., "Fundamentals of Heat and Mass Transfer", New Age International, New Delhi, 1998.
3	Nag, P.K., "Heat Transfer", Tata McGraw Hill, New Delhi, 2002
4	Ozisik, M.N., "Heat Transfer", McGraw Hill Book Co., 1994.
5	R.C. Sachdeva, "Fundamentals of Engineering Heat & Mass transfer", New Age International Publishers, 2009

Website / URL References

1	https://nptel.ac.in/courses/112/101/112101097/

Blooms Level

Level 1 (L1) : Remembering	Lower Order Thinking	Fixed Hour Exa	**Level 4 (L4) : Analysing**	Higher Order Thinking	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	**CONDUCTION**	0	7	3	0	0	0	10	0	10
Unit 2	**CONVECTION**	0	2	3	0	0	0	5	0	5
Unit 3	**PHASE CHANGE HEAT TRANSFER AND HEAT EXCHANGERS**	0	6	1	0	0	0	7	0	7
Unit 4	**RADIATION**	0	3	3	0	0	0	6	0	6
Unit 5	**MASS TRANSFER**	0	6	2	0	0	0	8	0	8
Total		**0**	**24**	**12**	**0**	**0**	**0**	**36**	**0**	**36**
Total Percentage		**0**	**66.7**	**33.3333**	**0**	**0**	**0**	**100**	**0**	**100**

CO PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3											2	1
CO2	2	3	2										2	1
CO3	2	3	2										2	1
CO4	1	3	2										2	1
CO5	2	3											2	1
Avg	1.8	3	2										2	1

Justification for CO-PO mapping	
CO1	PO1: Contains Engineering knowledge, PO2: Problem analysis,
CO2	PO1: Contains Engineering knowledge, PO2: Problem analysis, PO3: Contains solution for complex engineering ptoblems
CO3	PO1: Contains Engineering knowledge, PO2: Problem analysis, PO3: Contains solution for complex engineering ptoblems
CO4	PO1: Contains Engineering knowledge, PO2: Problem analysis, PO3: Contains solution for complex engineering ptoblems
CO5	PO1: Contains Engineering knowledge, PO2: Problem analysis,

3	**High level**	**2**	**Moderate level**	**1**	Low level

Name & Sign of Faculty Incharge : MUHAMMAD IRFAN A A

Name & Sign of Subject Expert : MUHAMMAD IRFAN A A

Head of the Department : Dr.S.PRASATH

Format No :231