SARDAR RAJA COLLEGE OF ENGINEERING, ALANGULAM

DEPARTMENT OF MECHANICAL ENGINEERING

MICRO LESSON PLAN

SUBJECT : HEAT AND MASS TRANSFER

CODE : ME2251

CLASS : II Year / IV SEM

STAFF

Mr. K.RAMSANKAR, Asst.Prof,

DEPT. OF MECHANICAL ENGG.

ME2251 HEAT & MASS TRANSFER **3 1 0 4**

L T P C

UNIT I CONDUCTION **11+3**

Basic Concepts – Mechanism of Heat Transfer – Conduction, Convection and Radiation – Fourier Law of Conduction - General Differential equation of Heat Conduction — Cartesian and Cylindrical Coordinates – One Dimensional Steady State Heat Conduction – Conduction through Plane Wall, Cylinders and Spherical systems – Composite Systems – Conduction with Internal Heat Generation – Extended Surfaces – Unsteady Heat Conduction – Lumped Analysis – Use of Heislers Chart.

UNIT II CONVECTION **10+3**

Basic Concepts –Heat Transfer Coefficients – Boundary Layer Concept – Types of Convection – Forced Convection – Dimensional Analysis – External Flow – Flow over Plates, Cylinders and Spheres – Internal Flow – Laminar and Turbulent Flow – Combined Laminar and Turbulent – Flow over Bank of tubes – Free Convection – Dimensional Analysis – Flow over Vertical Plate, Horizontal Plate, Inclined Plate, Cylinders and Spheres.

UNIT III PHASE CHANGE HEAT TRANSFER AND HEAT EXCHANGERS **9+3**

Nusselts theory of condensation-pool boiling, flow boiling, correlations in boiling and condensation. Types of Heat Exchangers – Heat Exchanger Analysis – LMTD Method and NTU - Effectiveness – Overall Heat Transfer Coefficient – Fouling Factors.

UNIT IV RADIATION **8+3**

Basic Concepts, Laws of Radiation – Stefan Boltzman Law, Kirchoffs Law –Black Body Radiation –Grey body radiation -Shape Factor Algebra – Electrical Analogy – Radiation Shields –Introduction to Gas Radiation

UNIT V MASS TRANSFER **7+3**

Basic Concepts – Diffusion Mass Transfer – Fick's Law of Diffusion – Steady state Molecular Diffusion – Convective Mass Transfer – Momentum, Heat and Mass Transfer Analogy – Convective Mass Transfer Correlations

L = 45 T = 15 TOTAL = 60 PERIODS

Text Books

1. Sachdeva R C, "Fundamentals of Engineering Heat and Mass Transfer" New Age International, 1995.
2. Frank P. Incropera and David P. DeWitt, "Fundamentals of Heat and Mass Transfer", John Wiley and Sons, 1998..

Reference Books

1. Yadav R "Heat and Mass Transfer" Central Publishing House, 1995.
2. Ozisik M.N, "Heat Transfer", McGraw-Hill Book Co., 1994.
3. Nag P.K, " Heat Transfer", Tata McGraw-Hill, New Delhi, 2002
4. Holman J.P "Heat and Mass Transfer" Tata McGraw-Hill, 2000.
5. Kothandaraman C.P "Fundamentals of Heat and Mass Transfer" New Age International, New Delhi, 1998

ME2251 – HEAT AND MASS TRANSFER

OBJECTIVE

- The course is intended to build up necessary background for understanding the physical behavior of various modes of heat transfer like conduction, covction and radiation.
- To understand the application of various experimental heat transfer correlations in Engineering calculations.
- To learn the thermal analysis and sizing of heat exchangers.
- To understand the basic concepts of mass transfer.

TEXT BOOKS

1. Sachdeva R.C, "Fundamentals of Engineering heat and mass transfer" New Age International.
2. Yadav R " Heat and mass transfer", Central Publishing House.

REFERENCES

1. Ozizik M.N, "Mass Transfer", Mcgraw Hill Book Co.
2. Nag P.K, "Heat ransfer", Tata Mcgraw Hill, New Delhi.
3. Holman J.P "Heat and mass transfer", Tata Mcgraw Hill.
4. Konthandaraman C.P "Fundamentals of heat and mass transfer", New Age International.
5. Frank P.Incropera and David P.Dewitt, "Fundamentals of heat and mass transfer", John wiley and Sons.
6. Velraj R, " Heat and mass transfer", Ane books, New Delhi.

MICRO LESSON PLAN

Hours	LECTURE TOPICS	READING
UNIT I CONDUCTION		
1	Mechanism of heat transfer	T1
2	Fourier law, Stefan Boltzman law	T1
3	General differential equation of heat conduction- Cartesian coordinates	T1
4	Cylindrical Coordinates	T1
5	Plane wall, cylinder & sphere	T1
6		
7	Composite wall	T1
8	Concurrent cylinder	T1
9	Conduction with internal heat generation	T1
10	Extended surfaces	T1
11		
12	Unsteady heat conduction	T1
13	Lumped Analysis	T1
14	Heislers chart	T1
UNIT II CONVECTION		
15	Convective heat transfer coefficient	T1
16	Boundary layer concept (AV CLASS)	T1
17	Types of convection	T1
18	Dimensional analysis	T1
19	Flow over plates, cylinders and spheres	T1
20		
21	Laminar and turbulent flow	T1
22	Flow over bank of tubes	T1
23	Free convection – Dimensional Analysis	T1
24	Flow over vertical plate, Horizontal plate	T1
25		
26	Flow over inclined plate, cylinders, spheres	T1
27		
UNIT III PHASE CHANGE HEAT TRANSFER AND HEAT EXCHANGERS		
28	Nusselt theory of condensation	T1
29	Pool boiling, flow boiling	T1
30		
31	Correlation in boiling and condensation	T1
32		
33	Types of heat exchangers	T1
34	LMTD method of heat exchanger analysis	T1
35		
36	Effectiveness – NTU methods	T1
37		

38	Overall heat transfer coefficient	T1
39	Fouling factors	T1
UNIT IV RADIATION		
40	Basic concepts, Law of radiation	T1
41	Stefan boltzman law, Kirchoff law	T1
42	Black body radiation	T1
43	Grey body radiation	T1
44	Shape factor algebra	T1
45		
46	Electrical analogy (AV CLASS)	T1
47		
48	Radiation shields	T1
49		
50	Introduction to gas radiation	T1
UNIT V MASS TRANSFER		
51	Basic concepts – Diffusion mass transfer	T1
52		
53	Fick's law of radiation	T1
54	Steady state molecular diffusion	T1
55		
56	Convective mass transfer	T1
57		
58	Momentum, heat and mass transfer Analogy (AV CLASS)	T1
59		
60	Convective mass transfer correlations	T1

PREPARED BY,

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