

PROFESSOR'S NAME	Prof. Himanshu Tyagi
DEPARTMENT	Department of Mechanical Engineering
INSTITUTE	Indian Institute of Technology Ropar
COURSE OUTLINE	<p>Introduction to Heat and Mass Transfer; One-dimensional heat conduction equation; General heat conduction equation; Boundary and initial conditions; Heat generation in a solid; Variable thermal conductivity; Thermal contact resistance (& networks); Heat conduction in plane walls, cylinders and spheres; Critical radius of insulation; Heat transfer from finned surfaces; Lumped system analysis; Transient heat conduction in large plane walls, long cylinders; Velocity & Thermal Boundary Layer; Heat Transfer in Turbulent Flows; Convection equations for flat plate; Non-dimensionalized convection equations and similarity; Parallel flow over flat plate; Flow across cylinders and spheres; Laminar and turbulent flow in tubes (entrance region); Constant surface heat flux; Constant surface temperature; Laminar flow in tubes – pressure drop, temperature profile, Nusselt number; Equation of motion and Grashof number; Natural convection over surfaces – vertical/inclined plates, cylinders, spheres; Natural convection over finned surfaces; Pool boiling, Flow boiling; Film condensation, Dropwise condensation; Analysis of heat exchangers; Log-mean temperature difference; Effectiveness NTU method; Heat Exchanger Types; Blackbody radiation; Radiative intensity; Radiative properties (ϵ, α, ρ);</p>

	Kirchhoff's Law; View factor relations; Black surfaces; Diffuse, gray surfaces; Network analysis; Mass diffusion; Fick's law of diffusion;

COURSE DETAILS

S. No	Module ID/ Lecture ID	Lecture Title/Topic
1	L1	Introduction
2	L2	Heat Conduction
3	L3	Heat Conduction
4	L4	Heat Conduction
5	L5	Heat Conduction
6	L6	Steady Heat Conduction
7	L7	Steady Heat Conduction
8	L8	Steady Heat Conduction
9	L9	Steady Heat Conduction
10	L10	Transient Conduction
11	L11	Transient Conduction
12	L12	Fundamentals of Convection
13	L13	Fundamentals of Convection
14	L14	Fundamentals of Convection
15	L15	Fundamentals of Convection
16	L16	External Flow
17	L17	External Flow

18	L18	Internal Flow
19	L19	Internal Flow
20	L20	Internal Flow
21	L21	Internal Flow
22	L22	Natural Convection
23	L23	Natural Convection
24	L24	Natural Convection
25	L25	Boiling and Condensation
26	L26	Boiling and Condensation
27	L27	Heat Exchangers
28	L28	Heat Exchangers
29	L29	Heat Exchangers
30	L30	Heat Exchangers
31	L31	Thermal Radiation
32	L32	Thermal Radiation
33	L33	Thermal Radiation
34	L34	Thermal Radiation
35	L35	Radiation Heat Transfer Between Surfaces
36	L36	Radiation Heat Transfer Between Surfaces
37	L37	Radiation Heat Transfer Between Surfaces
38	L38	Radiation Heat Transfer Between Surfaces
39	L39	Mass Transfer
40	L40	Mass Transfer

References if Any:

List of reference material/ books:

Yunus A. Cengel and Afshin Ghajar, *Heat and Mass Transfer*, 5th edition, McGraw-Hill Education (India) Private Limited, 2016.

Frank P. Incropera and David P. Dewitt, *Principles of Heat and Mass Transfer*, 7th edition, Wiley India Private Limited, 2012.

Name and contact details of two referees for the course:

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