INSTRUCTION DIVISION

FIRST SEMESTER 2016-2017

Course Handout Part II

Date: 02/08/2016

In addition to part-I (General Handout for all courses appended to the time table this portion gives further specific details regarding the course.

Course No. : ME F311

Course Title : Heat Transfer.

Instructor-in-charge : P.SRINIVASAN

Instructor: **Nikhil Gakkar, Rajesh Kumar and Vikram Dhakkar**

Course Description: Fundamental concepts of heat transfer; steady state and unsteady- state heat conduction; analytical and empirical relations for forced and free convection heat transfer; heat exchanger analysis and design, heat transfer by radiation; associated laboratory.

Scope and Objective of The course: This course is designed to make the students familiarize with the concepts of heat transfer and it's applications in engineering. As a part of this course, students have to do the experiments to correlate theoretical knowledge with the experimental results.

1. Text Books:

T1: J.P. Holman, Heat Transfer, McGraw Hill, 2009,10th Edition.

(Adopted by Prof.Souvik Bhatacharya)

T2: Mittal RK, Lab Manual, EDD Notes 2004.

2. Reference Books:

R1: F. P. Incropera & D. P. Dewitt, Fundamentals of Heat and Mass Transfer, John Wiley & Sons, 2001, 5th edition.

R2: F. Kreith & M. S. Bohn, Principles of Heat Transfer, Brooks Cole, 2000, 6th edition.

R3: J. R. Welty and others, Fundamental of Momentum, Heat and Mass Transfer, John Wiley & Sons, 2000, 4th edition.

http://library.books24x7.com/books.aspx?btid={84a9b09c-bb03-41fa-a711-2c5ae007c124}&aroot={974cc99b-5f2e-4b3a-a7c6-2dd73a3224d8} (24X7 E books)

3.Course Plan:

Lecture No.	Learning Objectives	Topics to be covered	Reference Chap/Sec in Textbook/ Ref. Book
1	To revise the basic concepts of transport phenomena	Introduction to heat transfer.	Class notes.
2-4	To learn the basics of conduction heat transfer	Heat conduction equation	1.1 – 1.2 (T1)
5-7	To understand the analysis of one-dimensional steady state heat conduction	1D steady state heat conduction	2.1 – 2.8 (T1)
8-9	To understand the heat transfer from extended surfaces	Finned Surfaces	2.9 – 2.10 (T1)
10-11	To learn heat transfer analysis of unsteady-state conduction	Lumped system analysis; analytical methods of analysis	3.1 – 3.2 (T1) 3.4 – 3.6 (T1)
12-14	To do the analysis of multidimensional steady state heat conduction	Analytical and numerical methods	4.1 – 4.5 (T1)
15-16	To learn the principles of convection heat transfer	Concepts and basic relations in convection heat transfer	5.1-5.2 (T1) Class Notes

17-18	To understand the forced convection heat transfer for flow inside ducts	Analytical solutions and empirical relations	5.10, 5.11, 6.2 (T1)
19-22	To understand the forced convection heat transfer for flow over bodies	Analytical solution and empirical relations for forced convection heat transfer for flow over flat plate, cylinders, spheres and tube banks	5.4 – 5.9, 5.12, 6.3 – 6.5 (T1)
23-24	To understand the heat transfer analysis of natural convection systems	Analytical solutions and empirical correlation	7.2 – 7.12 (T1)
25-29	To learn the principles condensation and boiling	Filmwise,dropwise condensation ,pool boiling	9.1-9.2,9.4-9.5 (T1)
30-33	To learn the design and analysis of heat exchangers	Types of heat exchangers; LMTD and NTU method of analysis	10.1-10.13 (T1)
33-34	To understand the basic laws of radiation	Basic laws and nature of thermal radiation	8.1-8.3 (T1)
35-40	To learn the principles of radiation heat transfer	Radiation heat exchange between surfaces; radiation shields	8.4 – 8.8, 8.16 – 8.17 (T1)

4.Evaluation Schedule:

Component	Duration	Weightage(%)	Date & Time	Remarks
Mid semester test.	90minutes.	50	4/10 2:00 - 3:30 PM	OB
Lab report and Viva	--	40		--
Lab compre	120 minutes	10		OB
Assignment (Best 3 out of 5)	20minutes	20		OB
Comprehensive examination.	180 minutes.	80	5/12 FN	CB

5.Chamber consultation hours: To be announced in the class.

6.Notices: Notices pertaining to this course will be displayed on Mechanical Engineering notice board only.

7.List of Experiments:

Following is the tentative list of experiments. The exact list of experiments will be given at the beginning of laboratory session. At that time, other details like batch number, turn of each batch etc. will be announced.

Sl. No.	Experiments
1.	Development of hydrodynamic boundary layer over a flat plate.
2.	Determination of thermal Conductivity of Insulating Material
3.	Determination of equivalent thermal conductivity of a composite slab.
4.	Determination of critical thickness of insulation.
5.	Determination of temperature distribution in fins under natural convection.
6.	Determination of Temperature –Time history under transient conduction.
7.	Determination of forced convection heat transfer coefficient for internal flow.
8.	Determination of natural convection heat transfer coefficient from a vertical cylinder.
9.	Determination of effectiveness and LMTD of a shell and tube heat exchanger
10.	Determination of temperature distribution in a pin fin under forced convection.

11.	Comparison of dropwise and filmwise condensation processes.
12.	Determination of Emissivity of a test surface.
13.	Determination of Stefan Boltzman constant from Radiation experiments.
14.	Determination of peak heat flux for pool boiling.

Prof. P.Srinivasan

Instructor-in-charge

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