BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, Pilani
Pilani Campus
AUGS/ AGSR Division

Second Semester 2020-2021.
COURSE HANDOUT

Date: 18.01.2021

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 F220
Course Title: Heat Transfer
Instructor-in-charge: P.SRINIVASAN;
Tutorial Instructors: Aneesh.A.M, A.R.Harikrishnan, Ranganayukulu. C
Practical Instructors: Leo Daniel, Diplesh Gautam, Ashish Khare Devendra Kumar Vishwakarma.

1.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 exchangers; boiling and condensation; heat transfer by radiation; associated laboratory.

2. Scope and Objective of the Course:

This course is designed to make the students familiarize with the concepts of heat transfer and its applications. As a part of this course, students have to do the experiments to correlate theoretical knowledge with the experimental results

3. Text Books:

T1: JP Holman and Souvik Bhattacharyya, Heat Transfer (SI Edition), McGraw Hill Education, India, 2011,10th Edition

4. Reference Books:

R1:Incropera, Dewitt, Bergmann and Lavine, Fundamentals of Heat and Mass Transfer, 6th Ed., Wiley India, 2010, 6th edition.

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

5. Course Plan:

Module	Learning Outcome	Lecture session	Ref. Chap/Sec in Text/ Ref Book
1	Recapitulate basic concepts of transport phenomena	Introduction to heat transfer	Class notes
2-4	Learn basics of conduction	Heat conduction equation	1.1 – 1.2 (T1)
5-7	Understand analysis of 1-D steady state heat conduction	1-D steady state heat conduction	2.1 – 2.8 (T1)
8-9	Understand heat transfer from extended surfaces	Extended surface heat transfer	2.9 – 2.11 (T1)
10-11	Learn heat transfer analysis of unsteady-state conduction	Lumped system analysis; analytical methods of analysis	4.1 – 4.2 (T1) 4.3 – 4.5 (T1)
12-14	Analysis of multi-dimensional steady state conduction	Analytical & numerical methods	3.1 – 3.5 (T1)
15-16	Learn principles of convection	Concepts and basic relations in	5.1-5.3 (T1)

		convective heat transfer	
17-18	Understand forced convection heat transfer (internal flow)	Analytical solutions and empirical relations	5.10,6.1-6.2 (T1)
19-22	Understand forced convection heat transfer (external flow)	Analytical solution and empirical relations for forced convection: flat plate, cylinders, spheres, tube banks	5.4 – 5.9, 5.12, 6.3 – 6.4 (T1)
23-25	Understand natural convection	Analytical solutions and empirical correlation	7.1 – 7.12 (T1)
26-29	Learn condensation and boiling	Film and dropwise condensation, pool boiling	9.1-9.8 (T1)
30-34	Learn analysis of heat exchangers	Types of heat exchangers; LMTD and NTU method of analysis	10.1-10.9 (T1)
35-36	Understand basic laws of radiation	Basic laws and nature of thermal radiation	8.1-8.3 (T1)
36-40	Learn principles of Radiation heat transfer	Radiation heat exchange between surfaces; radiation shields; radiation network	8.4 – 8.11, 8.17 (T1)

6. Evaluation Scheme:

Component	Duration	Marks (Out of 200)	Date & Time	Nature of component (Closed Book/ Open book)
Mid semester test	**90 min**	**50**		**Open Book**
Lab report & Viva	**--**	**50**		**--**
Tutorial tests (Best 6 out of 8)	**50 min**	**40**		**Open Book**
Comprehensive examination	**180 min**	**60**	**13/5 FN**	**Open Book**

List of Experiments

Following is the tentative list of experiments. The exact list will be announced at the beginning of laboratory session along with batch number, turn of each batch etc.

No.	Experiments
1.	Development of hydrodynamic boundary layer over a flat plate
2.	Determination of thermal Conductivity of Insulating Material
3.	Determination of temperature distribution in fins under natural convection
4.	Determination of Temperature –Time history under transient conduction
5.	Determination of forced convection heat transfer coefficient for internal flow
6.	Determination of natural convection heat transfer coefficient from a vertical cylinder
7.	Determination of effectiveness and LMTD of a shell and tube heat exchanger
8.	Determination of temperature distribution in a pin fin under forced convection. (Remote lab)
9.	Determination of Emissivity of a test surface
10.	Determination of Stefan Boltzman constant from Radiation experiments
11.	Determination of peak heat flux for pool boiling
12.	Performance evaluation of Double pipe heat Exchanger
13.	Free and Forced Convection with VDAS- Pin-Fins

7. Chamber Consultation Hour: Fridays 5PM to 6PM in PSD/WILP office chamber in the I Floor of Library building.

8. Notices: Notices pertaining to this course will be available in Nalanda Portal.

9. Make-up Policy: No make up for any component.

10. Note (if any): It is highly desirable to attend the classes regularly to participate in the discussion and understand the course from the practical perspective.

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