BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE-PILANI - HYDERABAD CAMPUS FIRST SEMESTER 2019 - 2020

(COURSE HANDOUT PART II)

# 01/08/2019

In addition to part-I (general handout for all courses in the time-table), this handout provides the specific details regarding the course.

**Course No.**: ME F311

**Course Title**: Heat Transfer

**Instructor-in-charge**: N. JALAIAH

**Instructor(s)**: N. Jalaiah, Jeevan Jaidi, M. Srinivas

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 exchanger analysis and design; Heat transfer by radiation; associated laboratory.
2. **Scope and Objective:** This course is designed to make the students familiar with the concepts of heat transfer and the relevant applications in engineering. As a part of this course, the students shall perform a few experiments, thus to correlate the theoretical knowledge of the subject.

## Text Book:

* 1. **J.P. Holman**, Heat Transfer, 9th Edition, McGraw Hill, 2002.
  2. **M. Srinivas & R.K. Mittal,** Transport Phenomena-II Notes-EDD, 2003 (Data Book).

## Reference Books:

1. **C.P. Kothandaraman & S. Subramanyan**, Heat and Mass Transfer Data Book, 8th Edition, New Age International, 2014.
2. **Y.A. Cengel & A.J. Ghajar**, Heat and Mass Transfer – Fundamentals and Principles, 5th Edition, McGraw Hill, 2015.
3. **F. Kreith, R. M. Manglik & M.S. Bohn**, Principles of Heat Transfer, 7th Edition, John Wiley – ISV, 2013.
4. **F.P. Incropera, D.P. Dewitt, T.L. Bergman & A.S. Lavine**, Principles of Heat and Mass Transfer, 7th Edition, John Wiley

– International Student Version, 2013.

## Course Plan:

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| **Lecture Nos.** | **Learning Objectives** | **Topics to be covered** | **Chapter in the Text Book** |
| 1 – 3 | To revise the basic concepts of transport phenomena and learn the basics of  conduction heat transfer | Introduction to heat transfer, Heat conduction equation | 1.1 – 1.4 (T1) |
| 4 – 8 | To understand the analysis of one- dimensional steady state heat conduction and the heat transfer from extended  surfaces | 1D steady state heat conduction, Finned surfaces | 2.1 – 2.10 (T1) |
| 9 – 12 | To do the analysis of multidimensional  steady state heat conduction | Analytical, graphical and numerical  methods | 3.1 – 3.6 (T1) |
| 14 – 16 | To learn heat transfer analysis of unsteady-  state conduction | Lumped system analysis, Analytical and  numerical methods of analysis | 4.1 – 4.6 (T1) |
| 17 – 20 | To learn the principles of convection heat  transfer | Concepts and basic relations in convection  heat transfer | 5.1 – 5.2,  5.4 – 5.9 (T1) |
| 21 – 25 | To understand the forced convection heat transfer for flow inside ducts and flow over bodies | Analytical solution and empirical relations for forced convection heat transfer for flows in tubes and for flow over flat plate,  cylinders, spheres and tube banks | 5.10 – 5.11,  6.1 – 6.4 (T1) |
| 26 – 28 | To understand the heat transfer analysis of  natural convection systems | Analytical solutions and empirical  correlation | 7.1 – 7.12 (T1) |

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| **Lecture**  **Nos.** | **Learning Objectives** | **Topics to be covered** | **Chapter in the Text Book** |
| 29 – 32 | To learn the design and analysis of heat  exchangers | Types of heat exchangers, LMTD and NTU  method of analysis | 10.1 – 10.6 (T1) |
| 33 – 40 | To understand the basic laws of radiation and learn the principles of radiation heat  transfer | Basic laws and nature of thermal radiation, Radiation heat exchange  between surfaces, Radiation shields | 8.1 – 8.8,  8.16 – 8.17 (T1) |
| 41 – 42 | To learn the principles of condensation and  boiling | Filmwise, dropwise condensation, Pool  boiling and flow boiling basics | 9.1 – 9.5 (T1) |

1. **Evaluation Scheme**:

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| --- | --- | --- | --- | --- |
| **Evaluation Component** | **Duration** | **Weightage (%)** | **Date & Time** | **Nature of Component** |
| Lab Reports | --- | 10 | Continuous | **OB** |
| Lab Viva | --- | 5 | Continuous | CB |
| Lab Compre & Viva | 120 min | 5 | To be announced | CB |
| Surprise Tests | 15 min each | 5 | Lecture Class | **OB** |
| Tutorial Tests | 15 min each | 15 | Tutorial Class | **OB** |
| Mid Semester Test | 90 min | 20 | 01.10.2019  3.30 PM – 5.00 PM | CB |
| Comprehensive Exam | 180 min | 40 | 07.12.2019 AN | CB |

1. **List of Experiments**: The list of experiments and complete modalities of operation of the laboratory such as the exact titles of experiments, reports submission and evaluation methodology shall be announced at the beginning of laboratory session.
2. **Chamber Consultation Hour**: To be announced in the classroom.
3. **Notices**: All notices concerning this course shall be displayed on the Mechanical Engineering Notice Board. Students are advised to visit regularly **CMS** (institute’s web based course management system) for updates and notices.
4. **Make-up Policy**: Make-up shall be given only to the genuine cases with prior intimation. No make-up will be given for the surprise and tutorial tests.
5. **Academic Honesty and Integrity Policy**: Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

## Instructor-in-charge

**ME F311**