Course code	Course Name	L-T-P-Credits	Year of Introduction
ME322	HEAT TRANSFER	2-1-0-3	2016

Prerequisite : Nil

Course Objectives

- To introduce the concepts of heat transfer to enable the students to design components subjected to thermal loading.

Syllabus

One dimensional steady state heat conduction - Extended Surfaces- Unsteady state heat Conduction - Free convection- Forced convection – Radiation heat transfer – Heat exchangers – condensers - evaporators – boiling heat transfer – heat transfer in gas turbine combustion chamber – ablative heat transfer – aerodynamic heating – moving boundary problems.

Expected Outcome

The students will

- Get idea about basic modes of Heat transfer.
- Be able to solve practical heat transfer problems.
- Be able to analyse heat exchangers.

Text Books:

1. S.C. Sachdeva, "Fundamentals of Engineering Heat & Mass Transfer", Wiley Eastern Ltd., New Delhi,1981.
2. Yunus A. Cengel, Heat Transfer – A Practical Approach, Tata McGraw Hill Edition, 2003.

Data Book (Approved for use in the examination)

- C P Kothandaraman and S Subramanyan, Heat and Mass Transfer Databook, New Age International, 2014

References:

1. C.Y.Chow, "Introduction to Computational Fluid Dynamics", John Wiley, 1979.
2. J.P. Holman, "Heat Transfer", McGraw-Hill Book Co., Inc., New York, 6e, 1991.
3. John D. Anderson, JR" Computational Fluid Dynamics", McGraw-Hill Book Co., Inc., New York, 1995.
4. John H. Lienhard, "A Heat Transfer Text Book", Prentice Hall Inc., 1981.
5. P. S. Ghoshdasidar , "Computer simulation of low and Heat transfer" McGraw-Hill Book Co, Inc, NewDelhi, 1998.
6. T.J. Chung, Computational Fluid Dynamics, Cambridge University Press, 2002

Course Plan

Module	Contents	Hours	End Sem. Exam Marks
I	Basic Modes of Heat Transfer – One dimensional steady state heat conduction: Composite Medium – Critical thickness.	2	15%

	Effect of variation of thermal Conductivity – Extended Surfaces – Unsteady state.	2	
	Heat Conduction: Lumped System Analysis, Heat Transfer in Semi-infinite and infinite solids,	3	
	Use of Transient, Temperature charts	2	
II	Introduction, Free convection in atmosphere free convection on a vertical flat plate – Empirical relation in free convection.	2	15%
	Forced convection.	2	
	Laminar and turbulent convective heat transfer analysis in flows between parallel plates, over a flat plate and in a circular pipe.	2	
	Empirical relations, application of numerical techniques in problem solving.	3	
FIRST INTERNAL EXAM			
III	Introduction to Physical mechanism of radiation heat transfer	1	15%
	Radiation properties – Radiation shape factors.	2	
	Heat exchange between non – black bodies.	2	
	Radiation shields.	1	
IV	Heat exchangers-Classification.	1	15%
	Temperature Distribution – Overall heat transfer coefficient.	2	
	Heat Exchange Analysis – LMTD Method. Heat Exchange Analysis –E-NTU Method.	3	
SECOND INTERNAL EXAM			
V	Special heat exchangers-condensers.	1	20%
	Special heat exchangers- evaporators.	1	
	Condensation heat transfer.	1	
	Boiling heat transfer phenomenon,boiling co- relations.	2	
VI	Heat transfer in gas turbine combustion chamber (descriptive only)	2	20%
	Ablative heat transfer.	1	
	Aerodynamic heating-Moving boundary problems.	1	
	Numerical treatment.	2	
END SEMESTER EXAM			

Question Paper Pattern

Maximum marks: 100 Exam duration: 3 hours

The question paper shall consist of three parts

Part A

4 questions uniformly covering modules I and II. Each question carries 10 marks

Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

Part B

4 questions uniformly covering modules III and IV. Each question carries 10 marks

Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

Part C

6 questions uniformly covering modules V and VI. Each question carries 10 marks

Students will have to answer any four questions out of 6 (4X10 marks =40 marks)

Note: In all parts, each question can have a maximum of four sub questions, if needed.