FACULTY OF ENGINEERING & TECHNOLOGY

First Year Master of Technology

Semester I

Course Code: 102450101

Course Title: ADVANCED THERMODYNAMICS AND HEAT TRANSFER

Type of Course: Core Course I

Course Objectives: The course is prepared to provide the detailed understanding of laws and principles of Thermodynamics and Heat Transfer

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
				Internal		External		Total
Lecture	Tutorial	Practical		Theory	J/V/P*	Theory	J/V/P*	
3	0	2	4	30/15	20/10	70/35	30/15	150/75

* **J**: Jury; **V**: Viva; **P**: Practical

Detailed Syllabus:

Sr.	Contents	Hours
1	ENTROPY: A Measure of Disorder: Increases of entropy principle and its application, Tds relation, entropy change of solid, liquid and ideal gas, entropy transfer with heat transfer, entropy generation in open and closed system , entropy balance EXERGY: A Measure of Work Potential: Exergy transfer by heat, work & mass, decrease of exergy principle and exergy destruction, applications of Gouy–Stodolatheorem, exergy balance for steady flow and closed processes, second law efficiency Law of Corresponding States	10
2	CONDUCTION: Conduction Rate Equation, Heat Diffusion Equation, Boundary and Initial Conditions, General conduction Equation, Conduction with Heat Generation, Extended Surfaces with Uniform and Non Uniform Cross Sections, Two Dimensional Steady State Conduction: Mathematical, Graphical and Numerical Analysis of Two Dimensional Heat Conduction Unsteady State Conduction: Lumped Parameter Analysis , Numerical Solutions, Heisler and Semi Analytical Analysis	10

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3	CONVECTION: Different Types of Flow and Boundary Layers, Flow Through Tubes, Flow Over Flat Plates, Cylinders, Spheres and Tube Blanks, Free Convection on Flat Surfaces, Cylinders, Spheres and Enclosed Spaces, Heat Transfer during Phase Trans formation: Boiling: Pool Boiling and its Correlations, Forced Convection Boiling, Condensation: Laminar and Turbulent Film Condensation, Film Condensation in Radial Surfaces and Horizontal Tubes, Heat Pipe	**11**
4	RADIATION: Radiation Intensity, Blackbody Radiation, Emission from Real Surfaces Radiation Combine with Conduction and Convection, Radiation Exchange withParticipating Media, Radiative exchange and overall heat transfer in furnaces	**08**

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks						**R**: Remembering; **U**: Understanding; **A**: Application, **N**: Analyze; **E**: Evaluate; **C**: Create
R	**U**	**A**	**N**	**E**	**C**	
10	20	20	20	15	15	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1	Thermodynamics – An Engineering Approach, YunusCengel& Boles, McGraw-Hill Publication, New Delhi
2	Fundamentals of Thermodynamics, Sonntag, B orgnakke& Van Wylen, John Wiley & Sons (As ia) Pvt.Ltd.
3	Engineering Thermodynamics, P.K. Nag, McGraw-Hill, New Delhi
4	Fundamentals of Heat and Mass Transfer, Incropera, Dewitt, John Wiley & Sons (Asia) Pvt. Ltd.
5	Heat Transfer, J P Holman, McGraw-Hill Publication, New Delhi
6	A Heat Transfer Textbook, J H Lienhard, P hlogistonPress
7	Fundamentals of Engineering Thermodynamics, Michael J. Morgan and Howard N. Shapiro, Wiley Publication.

Course Outcomes (CO):

Sr.	**Course Outcome Statements**	**%weightage**
CO-1	Apply entropy principle to various thermal engineering applications.	**10 %**
CO-2	Apply the concept of second law efficiency and exergy principle to various thermal engineering applications.	**10 %**
CO-3	Analyze steady state and transient heat conduction problems of real life Thermal systems.	**30 %**
CO-4	Analyze extended surface heat transfer problems and problems of phase change heat transfer like boiling and condensation.	**30 %**
CO-5	Students able to analyse radiation heat transfer problems of various thermal systems.	**20 %**

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List of Practicals / Tutorials:

1	Entropy, its Applications, Examples
2	Exergy Analysis
3	Basic experimentation on 1-D, steady state heat transfer without heat generation in different coordinate system.
4	Studies on conduction heat transfer with heat generation for different Applications.
5	Performance on extended surfaces with uniform cross section area with different conducting material.
6	Performance on extended surfaces with variable cross section area.
7	Performance on unsteady state heat transfer for heating and cooling of solid body.
8	Performance on emissivity measurement for the test plate
9	Basic experimentation on Free and Forced convection.
10	Studies and analysis of multidimensional conduction heat transfer.
11	Studies of gray and non-gray gas radiation heat transfer in an enclosure

Supplementary learning Material:

Curriculum Revision:	
Version:	**1**
Drafted on (Month-Year):	Apr-20
Last Reviewed on (Month-Year):	Jul-20
Next Review on (Month-Year):	Apr-22

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