HEAT TRANSFER LABORATORY

VI Semester: ME

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AME112	Core	-	-	3	2	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 48				Total Classes: 48		

OBJECTIVES:

The course should enable the students to:

I. Understand the various forms of heat transfer and their applications in real life problems.
II. Analyze different methods to calculate the heat transfer coefficient in various heat transfer problems.
III. Analyze the theoretical knowledge and apply it in conducting experiments in the forms of heat transfer.

COURSE OUTCOMES (COs):

CO 1. Perform steady state conduction experiments to estimate thermal conductivity of different materials for plane, cylindrical and spherical geometries
CO 2. Perform the transient heat conduction experiment and obtain variation of temperature along the length of the pin fin.
CO 3. Estimate heat transfer coefficients in forced convection, free convection and determine effectiveness of heat exchangers
CO 4. Perform radiation experiments:determine surface emissivity of a test plane and stefan-Boltzmann's constant and compare with theritical values
CO 5. Estimate heat transfer coefficients in condensation, boiling and effectiveness of heat pipe

COURSE LEARNING OUTCOMES (CLOs):

The students should enable to:

1. Determine the overall heat transfer coefficient for a composite slab
2. Determine the thermal conductivity of a lagged pipe apparatus
3. Determine the thermal conductivity of a concentric sphere apparatus
4. Determine the thermal conductivity of a metal rod apparatus
5. Determine the effectiveness and the efficiency of fins in pin fin apparatus
6. Determine the thermal conductivity in transient mode
7. Determine the convective heat transfer coefficient in forced convection
8. Determine the convective heat transfer coefficient in natural convection
9. Determine the effectiveness of parallel and counter flow heat exchanger in both theoretical and experimental methods
10. Determine the emissivity of a grey and black body in the emissivity apparatus
11. Determine the Stefan Boltzmann constant and compare the value in the Stefan Boltzmann apparatus
12. Evaluate the critical heat flux value by studying different zones of boiling
13. Demonstrate the effectiveness of a heat pipe in the cooling of complex systems
14. Determine the condensation temperature in the film wise and drop wise condensation methods.

LIST OF EXPERIMENTS

WEEK 1	**COMPOSITE SLAB APPRATUS – OVERALL HEAT TRANSFER COEFFICIENT**
Determination of the overall heat transfer coefficient for a composite slab	
WEEK 2	**HEAT TRANSFER THROUGH LAGGED PIPE**
Determination of the thermal conductivity of a lagged pipe	

WEEK 3	**HEAT TRANSFER THROUGH CONENCTRIC SPHERE**
Determination of thermal conductivity of given concentric sphere	
WEEK 4	**THERMAL CONDUCTIVITY OF GIVEN METAL ROD**
Determination of thermal conductivity of the given metal rod	
WEEK 5	**HEAT TRANSFER IN PIN FIN APPARATUS**
Determination of the effectiveness and efficiency of pin fin	
WEEK 6	**EXPERIMENT ON TRANSIENT HEAT CONDUCTION**
Determination of thermal conductivity in transient mode.	
WEEK 7	**HEAT TRANSFER IN FORCED CONVECTION APPRATUS**
Determination of convective heat transfer coefficient in forced convection	
WEEK 8	**HEAT TRANSFER IN NATURAL CONVECTION APPRATUS**
Determination of convective heat transfer coefficient in natural convection	
WEEK 9	**PARALLEL AND COUNTER FLOW HEAT EXCHANGERS**
Determination of effectiveness of parallel and counter flow heat exchangers by experimental and theoretical methods	
WEEK 10	**EMISSIVITY APPARATUS**
Determination of emissivity of grey and black body	
WEEK 11	**STEFAN BOLTZMANN APPARATUS**
Determination of Stefan Boltzmann constant and compare its value.	
WEEK 12	**CRITICAL HEAT FLUX APPARATUS**
Evaluate the critical heat flux value by studying different zones of boiling	
WEEK 13	**STUDY OF HEAT PIPE**
Study the effectiveness of a heat pipe in cooling complex electromechanical systems	
WEEK 14	**FILM AND DROPWISE CONDENSATION APPARATUS**
Determination of different methods of condensation	

Text Books:

1. Yunus A. Cengel, "Heat Transfer a Practical Approach", Tata McGraw-Hill Education, 4th Edition, 2012.
2. R. C. Sachdeva, "Fundamentals of Engineering, Heat and Mass Transfer", New Age publication, 3rd Edition, 2012.

Web References:

1 https://en.wikipedia.org/wiki/Heat_Transfer
2 https://en.wikipedia.org/wiki/Heat and Mass Transfer

Prepared by:

Dr. K. Ch Apparao, Associate Professor

HOD, ME