SCHEME OF COURSE WORK

Course Details:

Course Title	**:Heat Transfer Lab**		
Course Code	**: 13ME1137**	**L T P C**	**: 0 0 3 2**
Program:	**: B.Tech**		
Specialization:	**: Mechanical Engineering**		
Semester	**:VI**		
Prerequisites	**:Thermodynamics, Heat Transfer**		
Courses to which it is a prerequisite	**:-------**		

Course Outcomes (COs):

1	Determine the effectiveness of the pin fin, and heat transfer coefficients in forced and natural convection.
2	Measure the overall thermal resistance of composite slab and composite sphere.
3	Test the critical heat flux in pool boiling of water.
4	Interpret Biot and Fourier numbers in unsteady state heat transfer, emissivity of a surface
5	Compare effectiveness and overall heat transfer coefficient of parallel and counter flow heat exchangers.

Program Outcomes (POs)

At the end of the programme, the students in THERMAL ENGINEERING will be able to

PO 1	Apply the knowledge of mathematics, science, engineering fundamentals to solve complex mechanical engineering problems
PO 2	Attain the capability to identify, formulate and analyse problems related to mechanical engineering
PO 3	Design solutions for mechanical system components and processes that meet the specified needs with appropriate consideration for public health and safety
PO 4	Perform analysis, conduct experiments and interpret data by using research methods such as design of experiments to synthesize the information and to provide valid conclusions
PO 5	Select and apply appropriate techniques from the available resources and current mechanical engineering and software tools
PO 6	Carry out their professional practice in mechanical engineering by appropriately considering and weighing the issues related to society
PO 7	Understand the impact of the professional engineering solutions on environmental safety and legal issues
PO 8	Transform into responsible citizens by resorting to professional ethics and norms of the engineering practice
PO 9	Function effectively in individual capacity as well as a member in diverse teams and in multidisciplinary streams
PO 10	Communicate fluently with the engineering community and society, and will be able to

	prepare reports and make presentations effectively
PO 11	Apply knowledge of the engineering and management principles to managing projects and finance in multidisciplinary environments
PO 12	Engage themselves in independent and life-long learning to continuing professional practice in their specialized areas of mechanical engineering

Course Outcome Versus **Program Outcomes:**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	M	S			M					
CO2	S	S		S			M					
CO3	S	S	M	S			M					
CO4	S	S	M	M			M					
CO5	S	S		S			M					

S - Strongly correlated, *M* - *Moderately* correlated, *Blank* - *No correlation*

AssessmentMethods:	Assignment / Quiz / Seminar / Case Study / Mid-Test / End Exam

Teaching-Learning and Evaluation

Week	TOPIC / CONTENTS	Course Outcomes	Sample questions	TEACHING-LEARNING STRATEGY	Assessment Method & Schedule
1	Heat transfer from a pin fin under forced convection conditions	CO1	Estimate the effectiveness and fin efficiency by forced convection.	Experiment	Internal Lab 1 Observation Record Submission (Week 1)
2	Estimation of critical heat flux in pool boiling of water	CO3	Calculate the critical heat flux and compare it with theoretical value.	Experiment	Internal Lab 1 Observation Record Submission (Week 2)
3	Natural convection heat transfer from a vertical cylinder	CO1	Determine the heat transfer coefficient of vertical cylinder by natural convection	Experiment	Internal Lab 1 Observation Record Submission (Week 3)
4	Forced convection heat transfer to air in tube flow	CO1	Determine the heat transfer coefficient of air in tube by forced convection.	Experiment	Internal Lab 1 Observation Record Submission (Week 4)
5	Estimation of thermal conductivity of the given metal rod	CO2	Calculate the thermal resistance and thermal conductivity of a metal rod and compare theoretically.	Experiment	Internal Lab 1 Observation Record Submission (Week 5)

6	Parallel flow heat exchanger- Estimation of effectiveness and overall heat transfer coefficient	CO5	Determine the effectiveness and overall heat transfer coefficient in parallel flow heat exchanger.	Experiment	Internal Lab 1 Observation Record Submission (Week 6)
7	Heat transfer from a pin fin under natural convection conditions	CO1	Estimate the effectiveness and fin efficiency by natural convection.	Experiment	Internal Lab 1 Observation Record Submission (Week 7)
8	**Mid-Test 1**				
9	Estimation of emissivity of a surface.	CO4	Determine the emmisivity of test plate by using black surface.	Experiment	Internal Lab 2 Observation Record Submission (Week 9)
10	Heat transfer through composite slab	CO2	Calculate the thermal resistance and heat transfer through composite slab.	Experiment	Internal Lab 2 Observation Record Submission (Week 10)
11	Heat transfer through composite sphere	CO2	Calculate the thermal conductivity of insulating powder by sphere in sphere method	Experiment	Internal Lab 2 Observation Record Submission (Week 11)
12	Counter flow heat exchanger- Estimation of effectiveness and overall heat transfer coefficient	CO5	Determine the effectiveness and overall heat transfer coefficient in Counter flow heat exchanger.	Experiment	Internal Lab 2 Observation Record Submission (Week 12)
13	Transient heat conduction– Estimation of Biot and Fourier numbers.	CO4	Estimation of heat transfer by unsteady state heat conduction.	Experiment	Internal Lab 2 Observation Record Submission (Week 13)
14	Determination of Stefan-Boltzman constant.	CO4	Calculate and compare The Stefan Boltzman constant.	Experiment	Internal Lab 2 Observation Record Submission (Week 14)
15	Determination of heat transfer rate in drop and film wise condensation.	CO3	Estimate heat transfer rate by drop and film wise condensation.	Experiment	Internal Lab 2 Observation Record Submission (Week 15)
16	**Mid-Test 2**				
17&18	**External Lab Exam**				