

## HEAT TRANSFER LABORATORY

<b>VI Semester: ME</b>																										
Course Code	Category	Hours / Week			Credits	Maximum Marks																				
AMEB24	Core	L	T	P	C	CIA	SEE	Total																		
		-	-	2	1	30	70	100																		
<b>Contact Classes: Nil</b>		<b>Tutorial Classes: Nil</b>		<b>Practical Classes: 24</b>		<b>Total Classes: 24</b>																				
<p><b>I. COURSE OVERVIEW:</b> Heat transfer laboratory is intended to enhance the learning experience of the student about the flow of thermal energy due to temperature difference and the subsequent temperature distribution changes. This laboratory focuses on heat transfer modes, boundary conditions, one dimensional steady and unsteady state condition and heat exchangers applied to modern electric and electronic plants require efficient dissipation of thermal losses. Students are expected to gain experience in hands on training as well as knowledge to model heat exchangers, heat treatment of fins and complex mechanical systems.</p> <p><b>II. OBJECTIVES:</b> <b>The courses should enable the students to:</b></p> <ul style="list-style-type: none"> <li>I The information for validating heat transfer parameters during internal and external flows based on non-dimensional numbers and convective mode heat transfer.</li> <li>II Enhance the performance and analysis of heat exchangers for real-time applications using logarithmic mean temperature difference and number of transfer unit methods.</li> <li>III Compare experimental results with theoretical to improve the design for improving the efficiency of heat transfer rate.</li> </ul> <p><b>III. COURSE OUTCOMES:</b> <b>After successful completion of the course, students should be able to:</b></p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10%;">CO 1</td> <td style="width: 70%;">Identify the steps involved with different surfaces and geometries for which the temperature distribution and heat flow rates are calculated for automotive industry components like radiators, engine blocks.</td> <td style="width: 20%; text-align: right;">Apply</td> </tr> <tr> <td>CO 2</td> <td>Examine the principles associated with convective heat transfer to formulate and calculate the dynamics of temperature field in fluid flow for real time applications.</td> <td style="text-align: right;">Analyze</td> </tr> <tr> <td>CO 3</td> <td>Select the appropriate convection equations for solving heat transfer rate in cylinders and spheres.</td> <td style="text-align: right;">Apply</td> </tr> <tr> <td>CO 4</td> <td>Build the phenomena of boiling and condensation to give various correlations applied to heat exchangers, boilers, heat engines, etc.</td> <td style="text-align: right;">Evaluate</td> </tr> <tr> <td>CO 5</td> <td>Select the appropriate expression for overall heat transfer coefficient for modeling heat exchanger to achieve defect/error free components.</td> <td style="text-align: right;">Evaluate</td> </tr> <tr> <td>CO 6</td> <td>Identify the appropriate parameters for enhancing heat transfer rates in heat exchangers.</td> <td style="text-align: right;">Apply</td> </tr> </table>									CO 1	Identify the steps involved with different surfaces and geometries for which the temperature distribution and heat flow rates are calculated for automotive industry components like radiators, engine blocks.	Apply	CO 2	Examine the principles associated with convective heat transfer to formulate and calculate the dynamics of temperature field in fluid flow for real time applications.	Analyze	CO 3	Select the appropriate convection equations for solving heat transfer rate in cylinders and spheres.	Apply	CO 4	Build the phenomena of boiling and condensation to give various correlations applied to heat exchangers, boilers, heat engines, etc.	Evaluate	CO 5	Select the appropriate expression for overall heat transfer coefficient for modeling heat exchanger to achieve defect/error free components.	Evaluate	CO 6	Identify the appropriate parameters for enhancing heat transfer rates in heat exchangers.	Apply
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<b>List of Experiments</b>																										
<b>Week-1</b>	<b>Composite slab apparatus-Overall heat transfer coefficient</b>																									
Calculating the overall heat transfer coefficient for a composite slab																										
<b>Week-2</b>	<b>Heat transfer through lagged pipe</b>																									
Determination of thermal conductivity.																										
<b>Week-3</b>	<b>Heat transfer through concentric sphere</b>																									
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<b>Week-4</b>	<b>Thermal conductivity of given metal rod</b>																									

Determination of thermal conductivity.	
<b>Week-5</b>	<b>Heat transfer in Pin fin apparatus</b>
Calculate the effectiveness and efficiency of pin fin.	
<b>Week-6</b>	<b>Experiment on transient heat conduction</b>
Determination of thermal conductivity in transient mode.	
<b>Week-7</b>	<b>Heat transfer in forced convection apparatus</b>
Calculating convective heat transfer coefficient	
<b>Week-8</b>	<b>Heat transfer in natural convection apparatus</b>
Calculating convective heat transfer coefficient.	
<b>Week-9</b>	<b>Parallel an counter flow heat exchangers</b>
Calculate the effectiveness both experimental and theoretical method	
<b>Week-10</b>	<b>Emissivity apparatus</b>
Determination of emissivity of grey and blackbody.	
<b>Week-11</b>	<b>Stefan Boltzman apparatus</b>
Determination of Stefan Boltzman constant and compare its value.	
<b>Week-12</b>	<b>Critical heat flux apparatus</b>
Evaluate the critical heat flux value by studying different zones of boiling.	
<b>Week-13</b>	<b>Study of heat pipe</b>
Demonstration of heat pipe	
<b>Week-14</b>	<b>Film and drop wise condensation apparatus</b>
Understanding different methods of condensation	
<b>Text Books:</b>	
1. Yunus A. Cengel, "Heat Transfer a Practical Approach", Tata McGraw hill education (P) Ltd, New Delhi, 4 <sup>th</sup> Edition, 2012.	
2. R. C. Sachdeva, "Fundamentals of Engineering, Heat and Mass Transfer", New Age, New Delhi, India, 3 <sup>rd</sup> Edition, 2012.	
<b>Web References:</b>	
1. <a href="https://en.wikipedia.org/wiki/Heat_Transfer">https://en.wikipedia.org/wiki/Heat_Transfer</a>	
2. <a href="https://en.wikipedia.org/wiki/Heat_and_Mass_Transfer">https://en.wikipedia.org/wiki/Heat and Mass Transfer</a>	