

FLUID THERMAL MODELING AND SIMULATION LABORATORY

VI Semester: ME								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AME113	Core	L	T	P	C	CIA	SEE	Total
		-	-	3	2	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 42			Total Classes: 42			
OBJECTIVES: The course should enable the students to: I. Analyze the fluid flow through pipes. II. Understand the external fluid flow. III. Apply simulation techniques to heat flow problems. IV. Evaluate the thermal stresses of real time problems. V. Demonstrate the 3D Heat conduction for real time problems.								
COURSE LEARNING OUTCOMES (CLOs): The students should enable to: 1 Understand basic units of measurement, convert units, and appreciate their magnitudes. 2 Understand the basic principles of FEM 3 Utilize the governing equation for solving the fluid flow through the pipe 4 Model the 3D pipe flow domain using ansys 5 Mesh the 3D pipe flow domain using Ansys 6 Validate the results of analytical models introduced in lecture to the actual behavior of real fluid flows 7 Plot the variation velocity through the branch of pipes using Mat lab 8 Learn the creation of geometry using key point 9 Plot the analysis of external fluid flow problem 10 Determine the drag coefficient of a circular cylinder 11 Modelling and assemble of ball valve 12 Simulation of flow through ball valve 13 Plot the temperature distribution through the solid using Ansys APDL 14 Plot the vector distribution of thermal gradient and thermal flux of solid 15 Temperature distribution of fin element. 16 Treatment of boundary conditions. 17 Plot the 3Dheat conduction distribution. 18 Calculation of the efficiency of the counter flow heat exchanger using Ansys Flow Simulation. 19 Conjugate heat transfer problem using Ansys Flow Simulation. 20 3D Thermal Analysis, Finned Pipe using Ansys 21 Thermal stress analysis of piston 22 Plot the nodal as well elemental distribution of process parameters								
LIST OF EXPERIMENTS								
Week-1	INTERNAL PIPE FLUID FLOW – FEM							
Internal Pipe flow problem Using theoretical FEM.								
Week-2	INTERNAL PIPE FLUID FLOW - ANSYS							
Analyzing Flow in a System of Pipes using ANSYS.								

Week-3	INTERNAL PIPE FLUID FLOW – MATLAB
Internal Pipe flow problem using MAT LAB.	
Week-4	EXTERNAL FLUID FLOW
Determination of the drag coefficient of a circular cylinder immersed in a uniform fluid stream using ANSYS/SolidWorks Flow Simulation.	
Week-5	FLOW THROUGH BALL VALVE
Flow of water through a ball valve assembly using ANSYS/ SolidWorks Flow Simulation.	
Week-6	HEAT CONDUCTION
Heat Conduction within a Solid using ANSYS.	
Week-7	TEMPERATURE DISTRIBUTION
Temperature distribution in a fin cooled electronic component using ANSYS.	
Week-8	3D HEAT CONDUCTION
3D Heat Conduction within a Solid-Cell Phone using ANSYS.	
Week-9	COUNTER FLOW HEAT EXCHANGER
Calculation of the efficiency of the counter flow heat exchanger using ANSYS/SolidWorks Flow Simulation.	
Week-10	CONJUGATE HEAT TRANSFER
Conjugate heat transfer problem using ANSYS/ Solid Works Flow Simulation.	
Week-11	3D THERMAL ANALYSIS
3D Thermal Analysis, Finned Pipe using ANSYS.	
Week-12	THERMAL STRESS ANALYSIS
Text Books:	
1. Janna, W.S., —Design of Fluid Thermal Systems, Cengage Learning, 3 rd Edition, 2011.	
2. Jaluria, Y., —Design and Optimization of Thermal Systems, McGraw-Hill, 2 nd Edition, 2007.	
Reference Books:	
1. Suryanarayana, N. V. and Arici, Ö., —Design and Simulation of Thermal Systems, McGraw-Hill, 1 st Edition, 2003.	
2. McDonald, A. G., and Magande, H. L., —Thermo-Fluids Systems Design, John Wiley, 1 st Edition, 2012	
3. Robert Cook, —Concepts and Applications of Finite Element Analysis, Wiley, 1 st Edition, 2013.	