Course Type	Course Code	Name of Course	L	T	P	Credit
DP	NMEC516	Thermo-Fluids Lab I	0	0	3	1.5

Course Objective

This course enables the students to understand the performance of various thermos-fluid processes such as heat exchanger, boiling and microchannel.

Learning Outcomes

On successful completion of this course, students will learn:

- To understand the performance of heat exchangers by measuring heat transfer rate
- To measure heat transfer in boiling and condensation
- To perform experiments in microchannel and heat pipe
- To perform experimentson flow visualization and mixing in microchannel

Unit No.	Topics to be Covered	Contact hours	Learning Outcomes
1	General introduction to the lab	3	The students will get an overview about the lab and the experiments to be performed
2	Discussion about the list of experiments and a brief discussion about the list of experiments to be performed	3	The students will get overall idea about the list of experiments and a brief idea about each experiments to be performed
3	To find the Effectiveness of Plate Heat Exchanger	3	Students will learn about the plate heat exchanger, which is a type of compact heat exchanger.
4	To find the Effectiveness of Cross - Flow Heat Exchanger	3	Students will learn about the working principle and performance of cross-flow heat exchangers.
5	To find the critical heat flux in Pool Boiling heat transfer	3	Students will learn about pool boiling and critical heat flux.
6	To find the heat transfer coefficient for filmwise and dropwise condensation	3	Students will learn about the condensation process and heat transfer attached to it.
7	To find the Heat Transfer coefficient in mixed convection	3	Students will learn about mixed convection and how it is different from forced and natural convection.
8	To find the Effectiveness of shell and tube heat exchanger	3	Students will learn about the shell and tube heat exchanger
9	To find the friction factor and heat transfer coefficient in microchannel	3	Students will learn about microchannel flow and heat transfer and how it is different from conventional channel flow and heat transfer.
10	To find the effective thermal conductivity and thermal resistance in a heat pipe	3	Students will learn about the working principle of the heat pipe and its performance.
11	To quantify flow velocities and study particle trajectories within a microchannelusing microfluidic tracer particles.	3	Students will learn about the flow behaviour in a microchannel, which is an important phenomenon for mixing.
	To utilize high-speed / confocal microscopy for detailed visualization of flowpatterns, and fluid interfaces within microchannels.	3	Students will get familiarized with confocal microscopy and its use for the study of boundary layer and fluid interfaces in microchannel

12	Compensation class for the lab	3	The students will be given a compensation lab class to complete all the experiments for those who were absent in the lab
13	Practice and review	3	Evaluation
14	Practice and review	3	Evaluation

Total = 14 x 3 = 42 hrs

Text Books

1. Fundamentals of Heat and Mass Transfer-Theodore L. Bergman, Adrienne S. Lavine, Frank P. Incropera, David P. Dewitt, Wiley publication, 8th Edition, 2018.

Reference books

1. Nguyen, N. T., Werely, S. T., Fundamentals and applications of Microfluidics, Artech House; 3rd Edition (January 31, 2019).