Course Type	Course Code	Name of Course	L	T	P	Credits
DE	NMED540	Heat Exchanger Design	3	0	0	3

Course Objectives

- The objective of the course is to understand the thermal design procedures of different types of Heat Exchangers used is various industrial applications.
- To get familiarized to different types of standards, charts, templates, property tables, industrial practices etc. required for design of heat exchangers.

Learning Outcomes

- Have a broad understanding of different heat transfer correlations used in various applications.
- Learn the step by step procedure to design various types of heat exchangers.
- Learn to estimate heat transfer rates in heat exchangers under various operating conditions.
- Learn about the material selection and maintenance of heat exchangers.

Unit No.	Topics to be Covered Lecture	Lecture Hours	Learning Outcomes
1	Introduction to Heat Exchangers, Classification of Heat Exchangers, Direct transfer type, Storage type, Direct contact type, Tubular, Plate and Extended surface H.Es, TEMA Nomenclature of Shell and Tube Heat Exchanger	6	Understanding different types of heat exchangers and their merits, demerits and applications
2	Basic Thermal and Hydraulic Relations in Heat Exchangers Design, Basic Principles of Thermal Design, The effectiveness-NTU Method, Thermal Hydraulic correlations for H.E Design, Shell side flow correlation	7	Understanding the basic methodology for heat exchanger design calculations. To get familiar with various correlations required for design calculations and their applications.
3	The tube side correlations, Thermal Design of Shell and Tube heat exchangers: Kern's Method, Tinker Model, Divided Flow Method, Design considerations	8	Step-by-step design procedure for different approaches for designing shell and tube heat exchanger.
4	Effects of fouling, Design of Condensers and Evaporators, Types and choice of a condenser / evaporators, Heat Transfer coefficient and Pressure drop calculations	8	Learning the effects of fouling in heat exchanger design, Methodology and correlations required for designing condensers and evaporators,
5	Design procedure, Thermal Design of Compact Heat Exchangers, Flow arrangements and Surface Geometries, Heat Transfer and Friction factor data	6	Learning the methodology and correlations required for designing compact heat exchangers.
6	Calculation procedure of compact heat exchanger, Flow induced vibrations in H.E, Tube vibration, Vibration Damage patterns, Regions of tube failures, Heat Exchanger Materials and their manufacturing techniques	7	Learning different mechanisms for flow-induced vibrations and its effects, Learning materials and manufacturing techniques used for heat exchangers.
	Total	42	

Text Books:

1. Sadik Kakac and Hongtan Liu, Heat Exchangers – Selection, Rating and Thermal Design, CRC press, 3rd Edition, 2012.

2. A. P. Fraas and M. N. Ozisik, Heat exchanger Design, Wiley New York, 1989.

References:

1. W. M. Kays, Compact Heat Exchanger, McGraw-Hill, New York, 1964.

2. D. Q. Kern, Extended Surface Heat Exchangers, McGraw-Hill, New York, 1st Edition, 1965.

3. G. Walker, Industrial Heat Exchangers-A Basic Guide, McGraw-Hill, New York, 1st Revised Edition, 1983.

4. D. Q. Kern, Process Heat Transfer, McGraw-Hill, New York, 1st Revised Edition, 2007.

5. S. K. Das, Process Heat Transfer, Narosa Publishing House, 2005.

6. Ramesh. K. Shah and Dusan. P. Sekulic, Fundamentals of Heat Exchanger Design, John Wiley and Sons, 2003.