



## FACULTY OF ENGINEERING & TECHNOLOGY

### First Year Master of Engineering

### Semester II

**Course Code: 102440209**

**Course Title: Design of Heat Exchangers**

**Type of Course: Core Course IV**

**Course Objectives:** The course is design to provide fundamental knowledge of different type of heat exchangers used for thermal application.

#### Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
Lecture	Tutorial	Practical		Internal		External		Total
				Theory	J/V/P*	Theory	J/V/P*	
3	0	2	4	30/15	20/10	70/35	30/15	150/75

\* J: Jury; V: Viva; P: Practical

#### Detailed Syllabus:

Sr.	Contents	Hours
1	BASIC DESIGN METHODOLOGIES Classification of heat exchanger, selection of heat exchanger, Thermal-Hydraulic fundamentals, Overall heat transfer coefficient, LMTD method for heat exchanger analysis for parallel, counter, multipass and cross flow heat exchanger, e-NTU method for heat exchanger analysis, Fouling, Rating and sizing problems, heat exchanger design methodology	8
2	FOULING OF HEAT EXCHANGERS Basic consideration, effect of fouling on heat transfer and pressure drop, cost of fouling, design of heat exchangers subject to fouling, fouling resistance, cleanliness factor, techniques to control fouling	6
3	DESIGN OF DOUBLE PIPE HEAT EXCHANGERS Thermal and Hydraulic design of inner tube and annulus, hairpin heat exchanger with bare and finned inner tube, total pressure drop	9
4	DESIGN OF SHELL & TUBE HEAT EXCHANGERS Basic components, basic design procedure of heat exchanger, TEMA code, J-factors, conventional design methods, Bell-Delaware method.	9
5	DESIGN OF COMPACT HEAT EXCHANGERS Heat transfer enhancement, plate fin heat exchanger, tube fin heat exchanger, heat transfer and pressure drop	7



### Suggested Specification table with Marks (Theory) (Revised Bloom’s Taxonomy):

Distribution of Theory Marks						R: Remembering; U: Understanding; A: Application, N: Analyze; E: Evaluate; C: Create
R	U	A	N	E	C	
10%	15%	25%	20%	20%	10%	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

### Reference Books:

1	Heat Exchanger Selection, Rating and Thermal Design by Sadik, Kakac, CRC Press
2	Fundamentals of Heat Exchanger Design by Ramesh K Shah, Wiley Publication
3	Compact Heat Exchangers by Kays, V.A. and London, A.L., McGraw Hill
4	Heat Exchanger Design Handbook by Kuppan, T, Macel Dekker, CRC Press
5	Heat Exchanger Design Hand Book by Schunder E.U., Hemisphere Pub.
6	Process Heat transfer by Donald Q Kern, McGraw Hill

### Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	Students able to know the design methodology for heat exchanger.	30
CO-2	Students able to design the double pipe heat exchanger and shell & tube heat exchanger.	20
CO-3	Students able to develop the double pipe heat exchanger and shell & tube heat exchanger.	27
CO-4	Students able to understand the design of compact heat exchanger	23

### List of Practicals / Tutorials:

1	Study of basic design methodologies
2	Study of fouling in heat exchangers
3	Study of various types of heat exchangers
4	Design of evaporator for thermal system.
5	Design of condenser for thermal system.
6	Design of heat exchange equipment by using LMTD method.
7	Design of heat exchange equipment by using effectiveness- NTU method.
8	Design and analysis of double pipe heat exchanger with parallel and counter flow arrangement
9	Design and analysis of shell and tube type heat exchanger.
10	Design and analysis of plate type heat exchanger.

### Supplementary learning Material:

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<b>Curriculum Revision:</b>	
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