Mechanical Engineering Dept. Department

Syllabus
ME 437: Design/Rating Heat Exchangers (3-0-3)

Course Catalog Description:

Heat transfer mechanisms leading to basic heat exchanger equations, classification and analysis of heat exchangers including geometry; heat transfer and flow friction characteristics; compact and shell-and-tube heat exchanger application and design procedures; fouling and its effect on life cycle analysis; maintenance methodology; flow-induced vibration and noise in heat exchangers.

Course Pre-requisites:

- ME 315: Heat Transfer

Course Objectives:

1. Introduce basic principles of heat transfer, fluid mechanics and engineering thermodynamics knowledge into overall design of various types of heat exchangers.
2. Teach students to handle design and performance evaluation problems of various class of heat exchangers.
3. Familiarize students with engineering equation solver and its use in various heat exchanger design and rating problems.

Course Learning Outcomes:

CLO1. Demonstrate basic understanding of several types of heat exchangers that will include double pipe, shell-and-tube, plate-and-frame, plate fin and finned tube heat exchangers.

CLO2. Identify capabilities and limitations of different configuration of heat exchangers in terms of their performance, maintenance and economic considerations, etc.

CLO3. Demonstrate importance of appropriate fouling allowance in design of heat exchangers.

CLO4. Demonstrate ability to use EES and EXCEL in solving open-ended design problems

Learning Resources:

- Course material
- Course material plus case studies
- Course material plus case studies
- Field trip

Lecture Assessment Plan:

Assessment Task	Week Due	Weight
Exam 3	12	20.0%
Home Works	15	10.0%
Project	15	10.0%
Final Exam	16	30.0%
Exam 1	4	10.0%
Exam 2	8	20.0%

Lecture Weekly Schedule:

Week#	Topics
1	1. Basic mechanisms of heat transfer, such as conduction, convection, boiling, condensation, and radiation
2	1. Basic mechanisms of heat transfer, such as conduction, convection, boiling, condensation, and radiation (Continue)
	2. Classification of heat exchangers according to flow
3	2. Classification of heat exchangers according to flow (Continue)
	3. Heat exchanger analysis using LMTD, NTU-R-P-F and 𝜀-NTU methods
4	3. Heat exchanger analysis using LMTD, NTU-R-P-F and 𝜀-NTU methods (Continue)
5	3. Heat exchanger analysis using LMTD, NTU-R-P-F and 𝜀-NTU methods (Continue)
	4. Selection criteria of heat exchangers
6	4. Selection criteria of heat exchangers (Continue)
	5. Thermal-hydraulic and mechanical design of shell-and-tube heat exchangers
7	5. Thermal-hydraulic and mechanical design of shell-and-tube heat exchangers (Continue)
8	6. Design and analysis of double-pipe heat exchangers
9	6. Design and analysis of double-pipe heat exchangers (Continue)
	7. Design and performance evaluation of finned-tube heat exchangers
10	7. Design and performance evaluation of finned-tube heat exchangers (Continue)
11	7. Design and performance evaluation of finned-tube heat exchangers (Continue)
	8. Performance evaluation of plate-fin heat exchangers
12	8. Performance evaluation of plate-fin heat exchangers (Continue)
13	9. Design considerations in boilers and condensers
14	10. Fouling growth models and its impact on heat exchanger performance and life-cycle analysis

Week#	Topics
15	10. Fouling growth models and its impact on heat exchanger performance and life-cycle analysis (Continue)
	11. Flow-induced vibration