

ME 307: Course Outline

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ME 307: Heat Transfer Equipment Design

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ME 307: Syllabus

Concept of thermal system design; Heat transfer requirements; Mechanical design: Design parameters; Materials, cost and economics; Safety and reliability; Choice and availability; Optimization, cyclic service.

Heat transfer from finned surface: Basic fin design, types of fins, fin performance, efficiency of fins, equation of heat transfer from fins; Analysis of unsteady heat conduction.

Basic thermal design methods of heat exchangers; Types of heat exchangers: Parallel flow, counter flow, cross flow, shell-and-tube, mixed and unmixed, single and multiple pass, compact heat exchangers; Thermo-fluid characteristics: Sizing of heat exchangers; Fouling of heat exchangers; Performance of heat transfer equipment: The log mean temperature difference, Effective-NTU method, F correction factor.

Two-phase heat transfer equipment: Boiler, Evaporator, Condenser, Cooling tower.

Thermal systems with internal heat sources; Modelling of thermal equipment.



Tentative Lecture Plan [2024]

Topics	No. Lectures
1. Course overview	1
2. Thermal system design: Parameters, optimization & safety	5
3. Design: cost, economics & safety	3
4. Thermal system with internal heat generation	1
5. Heat transfer from extended surfaces	2
6. Transient heat conduction	3
7. Two phase heat transfer equipment: Boiler, evaporator, condenser, cooling tower	7
8. Modelling of thermal system	4
– Design of heat exchangers	13

⇒ Design of heat exchangers (1 cr. hr.) will be covered by Prof. Arif Hasan Mamun.



Course Outcome

CO	CO Statement	PO(s)	Levels
1.	Introduce different types of heat transfer equipment and their applications	PO (1)	C1, C2, A2
2.	Understand engineering design procedures and practices	PO (1)	C2
3.	Employ basic knowledge of heat transfer, thermodynamics, and fluid mechanics in different heat transfer equipment design problems.	PO (2) PO (3)	C3, A2
4.	Analyze heat transfer equipment and evaluate its performance.	PO (4)	C4, C6
5.	Analyze the economic aspects of their designed products	PO (3)	C4, C6
6.	Understand thermal equipment modeling procedure.	PO (5)	C6

- PO (1): Engineering knowledge; PO (2): Problem analysis; PO (3): Design/development of solutions; PO (4): Investigation; PO (5) Modern tool use; PO (6): The engineer and society; PO (7): Environment and sustainability; PO (8): Ethics; PO (9): Individual work and teamwork; PO (10): Communication; PO (11): Project management and finance; PO (12): life-long learning
- C-Cognitive: C1: Knowledge; C2: Comprehension; C3: Application; C4: Analysis; C5: Synthesis; C6: Evaluation
- A-Affective: A1: Receiving; A2: Responding; A3: Valuing; A4: Organizing; A5: Characterizing



Text/Reference Books

- Heat & Mass Transfer
by YA Cengel
- Design & Optimization of Thermal Systems
by Y Jaluria
- Design of Thermal Systems
by WF Stoecker
- Thermal Energy Systems: Design and Analysis
by SG Penoncello
- Boilers, Evaporators, and Condensers
by Sadik Kakac

