# ME 307: Course Outline [2021-22]

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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 exchanges; 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 [2021-22]

| | Topics | No. Lectures |
|---|---|---|
| 1. | Course overview | 1 |
| 2. | Heat Exchangers: Applications & Classifications | 2 |
| 3. | Review of Heat Transfer & Fluid Flow | 2 |
| 4. | HX: Energy Balance and LMTD | 2 |
| 5. | HX: Effective NTU Method | 3 |
| 6. | Double Pipe Heat Exchanger (DPHX) | 3 |
| 7. | Cross Flow Heat Exchanger (CFHX) | 2 |
| 8. | Shell & Tube Heat Exchanger (STHX) | 3 |
| 9. | Plate & Frame Heat Exchanger (PFHX) | 1 |
| 10. | HRSG: Pinch Point Analysis | 1 |
| 11. | Two phase heat transfer equipment: Boiler, evaporator, condenser, cooling tower | 4 |
| 12. | Design: cost, economics & safety | |
| 13. | Thermal system with internal heat generation | |
| 14. | Heat transfer from extended surfaces | |
| 15. | Modelling of thermal equipment | |

$\Rightarrow$ Topics 12-15 (1 cr. hr.) will be covered by Prof. Mohammad Nasim Hasan.



## Text/Reference Books

- **Heat Transfer**
  by JP Holman
- **Heat Transfer: A Basic Approach**
  by MN Ozisik
- **Design of Fluid Thermal System**
  by WS Janna
- **Design of Thermal Systems**
  by WF Stoecker
- **Thermal Energy Systems: Design and Analysis**
  by SG Penoncello
- **Heat Exchangers: Selection, Rating and Thermal Design**
  by S Kakac et al.