

CHG 2314

Heat Transfer, Winter 2005

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- **Textbook: F.P. Incropera, D.P. DeWitt, Introduction to Heat Transfer, Fourth Edition, John Wiley & Sons**
- **Timetable:**
 - ⇒ Tuesdays, 11:30 - 13:00 Morisset Hall 212
 - ⇒ Fridays, 13:00 - 14:30 Morisset Hall 212
- **Course Evaluation**
 - ⇒ Assignments: 25% (There will be 9-10 assignments during the term.)
 - ⇒ Midterm: 25% or 0%
 - ⇒ Final Exam: 50% or 75%
- **Policies:**
 - ⇒ Class attendance is mandatory
 - ⇒ Assignments must be placed into the assignment box by 4:00 p.m. on due day. Students can work on assignments in groups up to three people.
 - ⇒ Late assignments, 1 day = -10%, 2 day = -50%, 3 days = not accepted.
 - ⇒ Midterm will take place during the first or second week after the study break. The exact date will be announced before the end of January.
 - ⇒ The midterm and final are open textbook exams.
 - ⇒ Class notes (the material appearing on transparencies), the solutions for the assignments and midterm will be available online and in the copy center in the basement of Marion Hall.
 - ⇒ Office hours: Mondays 13:30 – 15:00, Thursdays 10:00 – 11:30

Course Outline

- **Part 1 – Basic Concepts of Heat Transfer**
 - ⇒ Modes of heat transfer
 - ⇒ Application of thermodynamics in heat transfer
- **Part 2a – Introduction to Heat Conduction**
 - ⇒ Fourier's Law
 - ⇒ Thermal Conductivity
 - ⇒ Heat diffusion conduction equation and various boundary conditions
- **Part 2b – Steady State 1-D Conduction**
 - ⇒ Conduction across plane wall
 - ⇒ Concepts of thermal resistance and overall heat transfer coefficient
 - ⇒ Conduction across cylindrical and spherical shells
 - ⇒ Concept of critical thickness of insulation
 - ⇒ Conduction with heat generation
 - ⇒ Conduction in extended surfaces – fins
- **Part 2c – Steady State Multi-D Conduction**
 - ⇒ Graphical method
 - ⇒ Shape factors
 - ⇒ Exact method - analytical solutions
- **Part 2d – Unsteady Steady Conduction**
 - ⇒ Transient thermal response – Biot number
 - ⇒ Lumped thermal capacity model
 - ⇒ 1-D shapes – infinite plane slab, infinite cylinder, sphere
 - ⇒ Analytical solutions
 - ⇒ Graphical solutions
 - ⇒ Single-term approximation
 - ⇒ Semi-infinite solid
 - ⇒ Spatial effects
- **Part 3a – Fundamentals of Heat Convection**
 - ⇒ Basic definitions
 - ⇒ Heat transfer coefficient
 - ⇒ Dimensionless groups
- **Part 3b – Correlations for Heat Convection Without Phase Change**
 - ⇒ Forced external convection
 - ⇒ Forced internal convection
 - ⇒ Natural convection

- ⇒ Mixed forced and natural flows
- **Part 3c –Convection with Phase Change**
 - ⇒ Boiling
 - ⇒ Condensation
- **Part 4 - Heat Exchangers**
 - ⇒ Types of heat exchangers
 - ⇒ Single stream heat exchangers
 - ⇒ Log mean temperature difference approach
 - ⇒ Effectiveness and number of transfer unit approach
- **Part 5 - Thermal Radiation**
 - ⇒ The physics of radiation
 - ⇒ Shape factors and shape factor algebra
 - ⇒ Radiation exchange between black and gray surfaces
 - ⇒ Solar radiation