UBC - Department of Mechanical Engineering
MECH 375 – Heat Transfer Section: 201
3 Credits / [3,0,1]

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LECTURES: MECH 375 201 Mon/Wed/Fri 8:00 to 9:00 McLeod 228

TUTORIALS: MECH 375 T2A Wednesdays 10:00 to 11:00 McLeod 228

COURSE WEBSITE: **http://www.connect.ubc.ca/**

PREREQUISITES: Either (a) MECH 222 or (b) one of CHBE 241, PHYS 257 and one of CHBE 251, CIVL 215, MECH 280.

COURSE DESCRIPTION

This course is designed to introduce students to the basic concepts of heat transfer. Topics:

Conduction heat transfer:
- Steady and unsteady heat conduction.
- Fin Theory.

Convection heat transfer:
- Governing equations;
- Dimensionless parameters;
- Analogy between momentum and heat transfer;
- Design correlations for convection heat transfer.

Radiation heat transfer:
- Black- and gray-body radiation;
- Shape factors;
- Enclosure theory

Heat exchangers

COURSE LEARNING OBJECTIVES (CLO)

a. Develop a comprehensive and integrated skill to describe the physical mechanisms responsible for heat transfer

b. Think critically about different aspects that influence heat transfer

c. State/explain the significance of the basic "laws" of heat transfer

d. Build mathematical models for heat transfer problems (simple but still practical problems)

e. Critically examine a heat transfer system

Specific Objectives

At the end of this course, it is expected that students will able to:

- Identify the principal components of a heat transfer system
- Build simple mathematical models for heat transfer problems
- Solve steady-state and transient heat conduction problems
- Calculate thermal resistances
- Identify the importance of insulation in minimizing heat losses
- Calculate the contact thermal resistances between two surfaces
- Apply the fin theory and identify the importance of extended surfaces (fins) in enhancing heat transfer
- Calculate drag coefficient in external flow
- Calculate the rate of convection heat transfer from a surface to a stagnant or moving fluid
- Calculate pressure drop in duct flow
- Calculate the rate of convection heat transfer in duct flow
- Calculate the rate of radiation heat transfer between surfaces
- Design simple heat exchangers

TEXTBOOK

Fundamentals of Heat and Mass Transfer
F.P., Incropera, and D.P., DeWitt, T.L. Bergman, A.S. Lavine, 7th Edition, Wiley, 2011.
(Available in UBC bookstore)

REFERENCE HEAT TRANSFER TEXTBOOKS

1. **Principles of Heat Transfer**
   F., Kreith, and M.S., Bohn, 6th Edition, Brooks/Cole, Pacific Grove, California, 2001.

2. **Heat Transfer**
   J.P. Holman, 10th Edition, McGraw-Hill, 2010

OTHER USEFUL REFERENCES

1. **Principles of Engineering Thermodynamics**
   M.J., Moran, and H.N., Shapiro, 5th Edition, Wiley, 2004.
2. **Fluid Mechanics**
   F.M., White, 5th Edition, McGraw-Hill, 2003.

GRADING POLICY

Suggested Homeworks (**0%**)
11 Problem sets; these are **recommended**; **NOT** to be turned in for grading.

Quizzes (10%)
Two quizzes are designed (5% each) to be held ***during the tutorial hours***:

1- Quiz 1 **Wednesday, January 27, 2016**.
2- Quiz 2 **Wednesday, March 16**, **2016.**

Midterm (30%)
A 50 min midterm exam is designed to be held on **Wednesday, February 24, 2016:** ***during the lecture hours***.

Final Exam (60%)
Date and location of the final exam will be determined later.

Note: You have to pass the Final Exam to pass the Course.

LIST OF TOPICS	Corresponding Chapters in Textbook	Estimated Length
1) Introduction	**1, 2**	1 week
2) One-Dimensional Steady-State Heat Conduction	**3**	2 weeks
3) Multi-Dimensional Steady-State Heat Conduction	**4**	1 week
4) Transient (Unsteady) Heat Conduction	**5**	2 weeks
5) Convection Heat Transfer	**6 , 7, 8, 9**	3 weeks
6) Radiation Heat Transfer	**12, 13**	2 weeks
7) Heat Exchangers	**11**	2 weeks