



**UBC - Department of Mechanical Engineering**  
**MECH 375 – Heat Transfer Section: 101**  
**3 Credits / [3,0,1]**

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**OFFICE HOURS:**

Mondays 10:00 to 11:00 RH 104  
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**Office:** Pulp and Paper Center

**LECTURES:** [MECH 375 101](#) Mon/Wed/Fri 9:00 to 10:00 Earth Sciences Building [1012](#)

**TUTORIALS:** [MECH 375 T1A](#) Mondays 13:00 to 14:00 MacLeod [228](#)

**COURSE WEBSITE:** [www.connect.ubc.ca](http://www.connect.ubc.ca)

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

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**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

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## TEXTBOOK

### Fundamentals of Heat and Mass Transfer

F.P., Incropera, and D.P., DeWitt, T.L. Bergman, A.S. Lavine, 7<sup>th</sup> Edition, Wiley, 2011.  
(Available in UBC bookstore)

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## REFERENCE HEAT TRANSFER TEXTBOOKS

1. **Principles of Heat Transfer**  
F., Kreith, and M.S., Bohn, 6<sup>th</sup> Edition, Brooks/Cole, Pacific Grove, California, 2001.
  2. **Heat Transfer**  
J.P. Holman, 10<sup>th</sup> Edition, McGraw-Hill, 2010
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## OTHER USEFUL REFERENCES

1. **Principles of Engineering Thermodynamics**  
M.J., Moran, and H.N., Shapiro, 5<sup>th</sup> Edition, Wiley, 2004.
  2. **Fluid Mechanics**  
F.M., White, 5<sup>th</sup> Edition, McGraw-Hill, 2003.
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## 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 **Monday, October 5, 2015.**
- 2- Quiz 2 **Monday, November 9, 2015.**

### Midterm (30%)

A 50 min midterm exam is designed to be held on **Monday, October 26, 2015** during lecture time (9:00 to 9:50 at Earth Sciences Building [1012](#)).

### Final Exam (60%)

Date and location of the final exam will be determined later.

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

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