University of Victoria Engineering

# Faculty of Engineering

## COURSE OUTLINE

## MECH 395 – Introduction to Heat and Mass Transfer

**Term – Fall 2015** (201509)


**Instructor**

Dr. Andrew Rowe
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**Office Hours**

Days: Tuesday
Time: 11:30-1:30
Location: EOW 527

**Course Objectives**

To be able to recognize the physical modes of heat transfer, apply rate expressions to model thermal phenomena, and develop analytic skills for thermal design and analysis.

**Learning Outcomes**

1. List modes of heat transfer and their constitutive relations
    a. Identify heat transfer interactions
2. Calculate heat transfer rates and temperatures
    a. Create thermal resistance networks
    b. Solve systems of network equations
    c. Develop approximate numerical solutions to heat transfer equations
    d. Calculate convective heat transfer coefficients
    e. Estimate overall thermal resistance/transfer coefficients
3. Derive energy balance expressions
    a. Derive control volume balances
    b. Create surface balance expressions
    c. Derive boundary conditions to solve governing equations
4. Understand parameters governing transient thermal problems
    a. Identify when lumped approximations are valid
5. Analyse structures for heat transfer
    a. Evaluate effectiveness of finned arrays
    b. Perform sizing calculations for heat exchangers
    c. Propose design changes to improve heat transfer/thermal isolation

**Syllabus**

Fundamentals of heat transfer are introduced and explored. An introduction to heat transfer modes (conduction, convection and radiation) is followed by analytic methods to determine temperature distributions and heat transfer rates. Transient and multi-dimensional conduction; internal and external forced convection; heat exchanger analysis; heat transfer correlations and problem solving methods.

Section(s): A01 / CRN 12323

Days: Mon and Thur
Time: 10:00-11:20
Location: Ellliot 167

**Required Text**

Title: Fundamentals of Heat and Mass Transfer
Author: Bergman, T., and Lavine, A., Incropera, F.P., Dewitt, D.P.
Publisher: John Wiley & Sons
Year: 2011

**Assessment:**

| | | |
|---|---|---|
| Assignments: | 10% | Due Dates: See course schedule |
| Labs | 15% | |
| Mid-term | 25% | Date: See course schedule |
| Final Exam | 50% | |

**Note:**
Failure to pass the final exam will result in a failing grade for the course.

The final grade obtained from the above marking scheme for the purpose of GPA calculation will be based on the percentage-to-grade point conversion table as listed in the current Undergraduate Calendar.

**Assignment of E grade and supplemental examination for this course will be at the discretion of the Course Instructor. The rules for supplemental examinations can be found in the current Undergraduate Calendar.**

**Note to Students:**

Students who have issues with the conduct of the course should discuss them with the instructor first. If these discussions do not resolve the issue, then students should feel free to contact the Chair of the Department by email or the Chair's Secretary to set up an appointment.

**Accommodation of Religious Observance**
See entry in current Undergraduate Calendar

**Policy on Inclusivity and Diversity**
See entry in current Undergraduate Calendar

**Standards of Professional Behaviour**

You are advised to read the Faculty of Engineering document Standards for Professional Behaviour in current Undergraduate Calendar, which contains important information regarding conduct in courses, labs, and in the general use of facilities.

Cheating, plagiarism and other forms of academic fraud are taken very seriously by both the University and the Department. You should consult entry in current Undergraduate Calendar for the UVic policy on academic integrity.

**Course Lecture Notes**

Unless otherwise noted, all course materials supplied to students in this course have been prepared by the instructor and are intended for use in this course only. These materials are NOT to be re-circulated digitally, whether by email or by uploading or copying to websites, or to others not enrolled in this course. Violation of this policy may in some cases constitute a breach of academic integrity as defined in the UVic Calendar.

**Course Experience Survey**

I value your feedback on this course. Towards the end of term you will have the opportunity to complete a confidential course experience survey (CES) regarding your learning experience. The survey is vital to providing feedback to me regarding the course and my teaching, as well as to help the department improve the overall program for students in the future. When it is time for you to complete the survey, you will receive an email inviting you to do so. If you do not receive an email invitation, you can go directly to http://ces.uvic.ca. You will need to use your UVic NetLink ID to access the survey, which can be done on your laptop, tablet or mobile device. I will remind you nearer the time, but please be thinking about this important activity, especially the following three questions, during the course.

1. What strengths did your instructor demonstrate that helped you learn in this course?
2. Please provide specific suggestions as to how the instructor could have helped you learn more effectively.
3. Please provide specific suggestions as to how this course could be improved."