EXPANDED COURSE DESCRIPTION
MECHANICAL ENGINEERING
Lassonde School of Engineering
Mechanical Engineering
LE / MECH 4201 3.0 SECTION M
TRANSPORT PHENOMENA
FALL 2017 / WINTER 2018

Last Modified Date: 08/17/2017

COURSE CALENDAR DESCRIPTION

Introduction to constitutive equations and basic principles for mass transport, momentum transport and/or energy transport at two different scales of macroscopic and microscopic; examples from novel and traditional mechanical systems and applications are discussed. Prerequisites: LE/MECH 3201 3.00; LE/MECH 3203 3.00

INSTRUCTOR(S)

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<th>Name</th>
<th>Section / Format / Term</th>
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<td>Amirfazli, Alidad</td>
<td>Sec. M / LECT / W</td>
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TOPICS AND CONCEPTS

This is a course that includes three key subjects closely related topics (fluid dynamics, heat transfer, and mass transfer) which frequently occur in real-life engineering problems (industrial, biological, etc.). This course develops the knowledge and skills mechanical engineers need in the field of transport phenomena, and the uses of them to solve problems. The gained knowledge and experiences in this course will be essential for any future project, engineering activities, and graduate research.

Topics

1. The Nature of Transport Phenomena
   Basic concepts of transport phenomena, Describe the scope, aims, and methods of transport phenomena, Three levels of transport phenomena

2. Transport Phenomena Laws: Momentum Transport
   Viscosity and the mechanisms of momentum transport, Shell momentum balances in Laminar flow, Turbulent momentum flux, Polymeric liquids behavior.

3. Energy Transport
   Mechanisms of energy transport, Shell energy balances, Special forms of energy equation, Use of the Equations of Change to solve steady state problems, The macroscopic energy balance.

4. Mass Transport
   Diffusivity and the mechanisms of mass transport, Shell mass balance, Multicomponent systems, Macroscopic mass balances, and other mechanisms for mass transport

5. Applications of Transport phenomena in new fields
   Biotechnology, Microelectronics, Nanotechnology, Polymer science, etc.

LIST OF LEARNING OUTCOMES AND EXAMPLES OF

Course Learning Objectives

Upon successful completion of this course the student will be able to:
1. Demonstrate theoretical and practical basis for mass, momentum, and energy transport.
2. Demonstrate the importance of transport phenomena in applications relevant to different field of engineering.
3. Model transport problems, simplifying assumptions, and analytical/numerical techniques for solving the problems.
4. Review technical literature and to apply transport phenomena in different application fields (e.g. biotechnology, nanotechnology, etc.)

GRADED ASSESSMENT

Proposed Percentage Breakdown

Mini Project: 15%
Regular Assignments: 20%
Midterm Exam: 25%
Final Exam: 40%

ADDITIONAL INFORMATION

Required Textbook:
Transport Phenomena, 2/E
ISBN-10: 0470115394

Recommended:
Introduction to Transport Phenomena
ISBN-10: 0134548280

A free resource for fluid dynamics and flow engineering
http://www.efluids.com/

Example Journals:
International Journal of Microscale and Nanoscale Thermal and Fluid Transport Phenomena
Applied Mechanics Reviews (The American Society of Mechanical Engineers)
http://appliedmechanicsreviews.asmedigitalcollection.asme.org/journal.aspx?JournalId=113

ACADEMIC INTEGRITY LINKS
• Senate Policy on Academic Honesty
• Academic Integrity

STUDENT LINKS
• Student Rights and Responsibilities
• Religious Observance
• Academic Accommodation for Students with Disabilities
• Counselling and Disability Services

Many courses utilize Moodle, York University’s course website system. If your course is using Moodle, click here to access it.