

MIE550S

Advanced Momentum, Heat and Mass Transfer

2016

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Timetable

Day	Start	End	Room
Tue	14:00	15:00	GB 120
Wed	12:00	13:00	GB 120
Fri	14:00	15:00	GB 120

Text:

G. Hauke “An Introduction to Fluid Mechanics and Transport Phenomena” Springer (2008).

This book is available as a free download from the University of Toronto library website:

<http://search.library.utoronto.ca/details?7962077>

Website: We will be using the U of T Portal website for MIE 550. Announcements, handouts, solutions etc. will be posted at the course web site. Please check it frequently

Mark Composition:

Quiz 1 (Friday, 5 February)	20%
Quiz 2 (Friday, 18 March)	20%
Final Exam	60%

Practice problems will be posted regularly on the Portal. These will not be graded, but they are representative of the type of questions that will be asked on the examinations and should all be attempted. Solutions to these problems will be posted on the website.

The quizzes and exams will be closed book. You may use any type of non-programmable calculator.

Topics Covered

Review of Fluid Mechanics

Integral Conservation Principles

Diffusion Transport

- Momentum Transport by Diffusion
- Heat Transport by Diffusion
- Mass Transport by Binary Diffusion
- Molecular Interpretation of Diffusion Transport .

Differential Conservation Principles

- Continuity Equation
- Momentum Equation
- Energy Equation
- Conservation of Chemical Species

Dimensional Analysis

- Buckingham Pi Theorem
- Dimensionless numbers

Dimensionless Equations and Numbers

- Nondimensionalization Process
- Continuity Equation
- Momentum Equation
- Temperature Equation
- Conservation of Chemical Species Equation
- Other Important Dimensionless Numbers
- Physical Interpretation of the Dimensionless Numbers

Laminar Boundary Layers

- Concept of Boundary Layer
- The Prandtl Theory
- Boundary Layer Thicknesses
- Incompressible Boundary Layer Equations
- Continuity Equation
- Momentum
- Temperature and Concentration Equations

Momentum, Heat and Mass Transport

- The Concept of Transport Coefficient
- Momentum Transport
- Heat Transport
- Mass Transport

Simultaneous heat and mass transfer

- Evaporative Cooling
- Droplet Evaporation
- Droplet Combustion