

**University of Guelph
School of Engineering
Engg*3160 Biological Engineering Systems II
Fall, 2011**

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Office Hours: Tuesdays and Thursdays 11:30 to 12:00 pm or by appointment

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Textbook:

Transport Phenomena in Biological Systems (Second Edition) George A. Truskey, Fan Yuan, David Katz. Pearson Prentice Hall, ISBN 0-13-156988-0.

Schedule:

Lectures: MACK 309

Tuesdays: 10:00 AM to 11:30 AM

Thursdays: 10:00 AM to 11:30 AM

Labs/Tutorials: ROZH 107/SCIE 2101

Mondays: 3:30 PM to 5:30 PM

Wednesdays: 3:30 PM to 5:30 PM

Course Description:

Fundamentals and applications of mass transport in biological systems: Concepts on gas-liquid mass transfer; Membrane transport processes and heterogeneous reactions. Topics include cell adhesion, fermenter reaction, tissue perfusion, and mass transfer limitations in biofilms, microbial flocs, drug delivery, and biomimetics.

Learning Objectives:

- Develop conceptual models of biological systems
- With engineering principles use these concepts to develop mathematical descriptions and
- Design equipments with the quantitative descriptions

Laboratory:

The laboratory component will consist of three mass transfer experiments. These are to be done by eight groups. Each student will be submitting individual lab reports.

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Industrial Tours, Videos and Guest Lectures:

- Movie I - Sep 19, 2011 Monday 3:30 PM to 5:30 PM
- Guest Lecture I - Sep 27, 2011 Tuesday 10:00 AM to 11:30 AM
- Industrial Tour I - October 3, Monday 4:00 PM to 5:30 PM (*Wellington Brewery*)
- Guest Lecture II - October 27, Thursday 10:00 AM to 11:30 AM
- Industrial Tour II - November 7, Monday 4:00 PM to 5:30 PM (*Guelph Food Technology Centre*)
- Movie 2 - November 14, 2011 3:30 PM to 5:30 PM

Information on the tour, and transport arrangements will be discussed on Sep 12th during our first lab. The assignments and the exams will incorporate concepts from the videos, the industrial tours and the guest lectures.

Grade Evaluation:

Assignments	10%
Lab Reports	30%
In Class Quizzes	10%
Presentation	15%
Final Exam	35%

Engg*3160 Material to be covered:

Biological Mass Transfer Introduction

- Growth Requirements
- Membrane Transport

Mass Transfer Fundamentals

- Diffusion, mass balances and Fick's law
- Convection, boundary layer flow and Navier-Stoke's equations
- Lumped approximation models and mass transfer correlations

Bubble Mechanics

- Surface tension, Laplace's law and bubble formation
- Drag forces, terminal velocities and holdup correlations
- Bubble surface mass transfer coefficients

Agitation

- Impellers, mixing and flow patterns
- Power correlations for mass transfer

Membrane Processes

- Diffusion through membranes
- Dialysis, Pervaporation and Ultrafiltration
- Applications in oxygenation, biological product recovery, and drug delivery

Heterogeneous Reactions

- Diffusion through porous media, Convection to membrane surfaces
- Applications in pellet fermentations, tumor necrosis and bio-films

Exam Dates:

Final Exam is Scheduled for December 15, 2011, Thursday. Time: 19:00 PM to 21:00 PM, Location: TBA

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Student Responsibilities:

- Attend lectures and labs in order to obtain all the course material that you are responsible for.
- Check announcements page (course link website) on a regular basis.
- Submit assignments on time.
- Regularly, check your marks on the course web page and make sure they are up to date.
- Submission of assignments for re-marking must be done within a week of being returned.

Important Notes:

Communications regarding this course will frequently involve the course web page and email. Students are responsible for checking the course website and the university email account for all instructions and announcements. This must be done at least once every week.

Late Assignment/Missed Test Policy:

Generally, when you find yourself unable to meet a course requirement such as an assignment or a test as a result of compassionate, illness or physiological reasons, a formal explanation must be made in writing to the instructor and (where possible) proper documentation must be provided. This should be done prior to an exam or assignment (if possible) or as soon as possible but definitely within a week after the exam or assignment due date. If no explanations are provided, exams receive a grade of zero and assignments/lab reports are subject to the following deductions:

- 25% will be deducted if the assignment is up to 24 hours late,
- 50% will be deducted if the assignment is 24 to 48 hours late,
- No assignments will be accepted after that.

University Policy on Academic Misconduct:

Academic misconduct, such as plagiarism, is a serious offence at the University of Guelph. Please consult the Undergraduate Calendar and the School of Engineering programs guide, for offences, penalties and procedures relating to academic misconduct.

<http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml>

Disclaimer:

The instructor reserves the right to change any or all of the above in the event of appropriate circumstances, subject to the University of Guelph Academic Regulations.