

FALL 2020

ECE7440 T68 – Microfluidics

COURSE DESCRIPTION:

Microfluidics and lab-on-a-chip, as an emerging technology for developing low-cost, portable, and sensitive sensors, will be introduced. Fundamental operation principles, design procedure, and fabrication process of microfluidic systems will be presented. Emphasis will be on microfluidic systems for life sciences applications.

COURSE OBJECTIVE:

The objective of this course is to provide the students with the principals governing the operation of microfluidic systems and the process of design and fabrication of devices. Students will also learn about the medical and biological applications of microfluidic systems.

PRE-REQUISITES:

Undergraduate background in electromagnetics and electronics

CONTACT HOURS:

3-hours per week

COURSE CONTENT:

The following topics will be discussed:

- Introduction to microfluidics and lab-on-a-chip systems;
- Hydrodynamics of microfluidic systems;
- Diffusion and mixing in microfluidic systems;
- Electrohydrodynamics in microfluidic systems;
- Fabrication of microfluidic devices;
- Digital microfluidics;
- Applications of microfluidic systems in Life Sciences.

Additional advanced research topics as determined by the instructor.

HOMEWORK:

Homework will consist of assignments, a design project, and preparation of a seminar on the assigned project.

TEXTBOOK:

Brian J. Kirby, *Micro- and Nanoscale Fluid Mechanics: Transport in Microfluidic Devices* (Cambridge University Press, 2010)

Henrik Bruus, *Theoretical Microfluidics* (Oxford University Press, 2007)

Patrick Tabeling, *Introduction to Microfluidics* (Oxford University Press, 2005)

GRADE ANNOUNCEMENTS:

TBA – Due to COVID-19, this date to be announced by the Registrar’s Office

EVALUATION:

Your final course grade is determined by your performance in assignments, the course project, the project presentation, and a final examination. The weighting of each of these components is as follows: (Students must complete and pass all components in the course in order to be eligible to receive a passing grade.)

Assignments	4	5%	20	
Project	1	25%	25	
Project Presentation	1	5%	5	
Final Examination	1	50%	50	
TOTAL			100	

GRADE SCALE:

LETTER	MARK	LETTER	MARK	LETTER	MARK	LETTER	MARK
A+	90-100	B+	75-79	C+	65-69	D	45-54
A	80-89	B	70-74	C	55-64	F	<45

INSTRUCTOR INFO:

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Email: Elham.Salimi@umanitoba.ca

Office Hours: By appointment

VOLUNTARY WITHDRAW:

November 23, 2020

REQUIREMENTS/REGULATIONS

Student Responsibilities: It is the responsibility of each student to contact the instructor if he/she is uncertain about his/her standing in the course and his/her potential for receiving a failing grade. Students should also familiarize themselves with Sections 4 and 6 of the Regulations dealing with, among others, incomplete term work, deferred examinations, attendance and withdrawal, etc.

Lectures: Attendance at lectures is essential for successful completion of this course. Students must satisfy each evaluation component in the course.

ACADEMIC INTEGRITY

Students are expected to conduct themselves in accordance with the highest ethical standards of the Profession of Engineering and evince academic integrity in all their pursuits and activities at the university. As such, in accordance with the General Academic Regulations and Requirements of the University of Manitoba, Section 7.1, students are

reminded that plagiarism* or any other form of cheating is subject to serious academic penalty (e.g. suspension or expulsion from the faculty or university) regardless of media

- examinations
- assignments
- laboratory reports
- term exams

A student found guilty of contributing to cheating in examinations or term assignments is also subject to serious academic penalty

Please refer any questions regarding Academic Integrity to your course instructor.

***Plagiarism:** to steal and pass off (the ideas or words of another) as one's own; use (another's production) without crediting the source