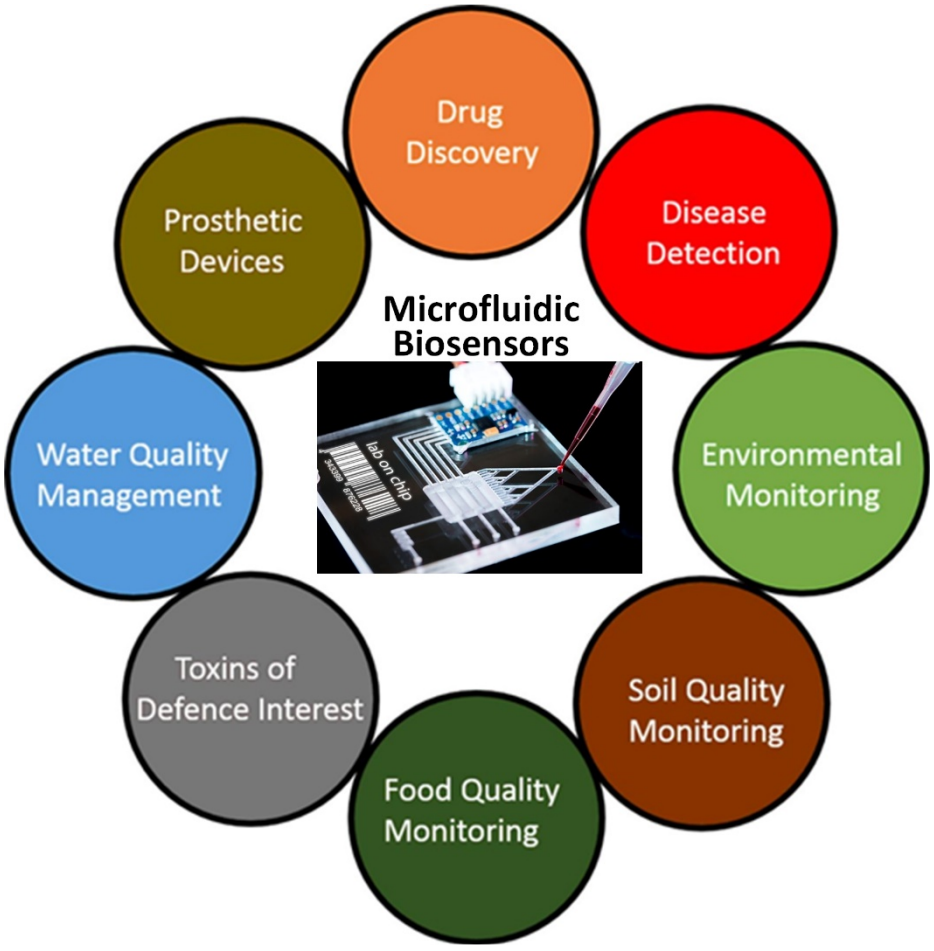
MIE 1299
SPECIAL TOPICS IN FLUID MECHANICS

MICROFLUIDIC BIOSENSORS

Course Syllabus

Xinyu Liu



GENERAL INFORMATION

Instructor:	Xinyu Liu
Office:	MC312, Mechanical Engineering Building
Phone:	416-946-0558
Email:	xyliu@mie.utoronto.ca
Lecture time:	TBD
Location:	MC306
Office hours:	Friday 11am-12pm (or appointment by email)
Prerequisite:	No specific prerequisites are required. Knowledge in chemistry, physics, and fluid mechanics will be the basis for understanding course materials.

REFERENCE BOOKS

No textbook is required for this course. Lecture notes will be provided on the course website as the major study materials, and journal articles and online materials will be suggested for supplemental readings. The students may also wish to consult the following textbooks.

- **Introduction to BioMEMS**, by Albert Folch, CRC Press, 2012.
- **Fundamentals of Microfabrication and Nanotechnology**, by Marc J. Madou, 3rd ed., CRC Press, 2012.
- **Chemical Sensors and Biosensors: Fundamentals and Applications**, by Florinel-Gabriel Bănică, Wiley, 2012.

COURSE DESCRIPTION AND CONTENT

This course will present the fundamentals and applications of biosensors realized on microfluidic platforms. Topics to be covered include:

- Microfabrication techniques for constructing silicon, glass, and polymer devices
- Microfluidic principles
- Biosensing mechanisms
- Design and analysis of microfluidic biosensors
- Microfluidic immunosensors
- Microfluidic nucleic acid sensors
- Microfluidic chemical sensors
- Other applications of microfluidic biosensors

EVALUATION METHODS

In-class Mid-Term Exam I (one-page info sheet allowed)	25%
In-class Mid-Term Exam II (one-page info sheet allowed)	25%
Term Project (literature review, design proposal, analysis and simulation, microfabrication process design, testing plan)	45%
Class participation, interaction, …	5%

TENTATIVE SCHEDULE

Week	Topic
#1	Introduction; Microfabrication techniques (I)
#2	Microfabrication techniques (II)
#3	Microfluidics principles (I)
#4	Microfluidics principles (II)
#5	Microfluidics principles (III) Biosensing mechanisms (I)
#6	Biosensing mechanisms (II) In-class midterm exam I (1 hour)*
#7	Study break; no lecture
#8	Biosensing mechanisms (III)
#9	Microfluidic immunosensors
#10	Microfluidic nucleic acid sensors
#11	Microfluidic chemical sensors In-class midterm exam II (1 hour)*
#12	Other applications of microfluidic biosensors
#13	Term project presentations

*Tentative dates. To be confirmed later.