

University of Guelph
College of Engineering and Physical Sciences
Department of Chemistry

CHEM*4400: Advanced Topics in Analytical Chemistry Credit: 0.5)

CHEMICAL AND BIOCHEMICAL SENSORS

Winter Semester 2020

This course is an introduction to chemical and biochemical sensors. It includes an overview of their importance, principles, main components, functionality and challenges. Electrochemical and optical transductions will be discussed in particular.

Prerequisite: CHEM*3430.

Instructor: A. Houmam, Office MacN123 x56429. Email: ahoumam@uoguelph.ca

Office Hours: Mondays and Wednesdays from 1:00 to 2:30 PM.

I can be available outside of office hours. Please email me to arrange a meeting outside of these office hours.

There is no single textbook for this course. References to pertinent monographs and publications will be provided on a per-topic basis. Supplemental information in the form of class notes will be available on courselink.

Method of Presentation: Two lectures per week Tuesdays and Thursdays from 10:00 AM to 11:20 AM in MCKN, Room 238.

Method of Evaluation: The course grade will be based on one mid-term examination, a final examination and a report and presentation. The mid-term examination will be given on Tuesday February 25, from 10:00 AM to 11:20 AM. The winter break this semester begins

on Monday February 17 and ends on Friday February 21, so no classes are scheduled this week. The final examination will be given on Saturday April 18, 2020 from 7:00 PM to 9:00 PM (Room TBA).

The final grade will be calculated as follows:	Report and presentation	30%
	Mid-term examination	30%
	Final examination	40%

All midterm and final examination questions are an exercise in problem recognition and solving. They are to be attempted and solved individually.

Presentation subjects will be selected on or before Tuesday **January 28, 2020**. Each student will prepare an initial draft of the written report (in PDF format), and submit it to the instructor by Tuesday **February 25, 2020**. These materials will be distributed to two other members of the class, who will have the responsibility for providing written constructive comments back to the instructor by Tuesday **March 10, 2020**.

The presentations are tentatively planned for the classes of **March 12, 17 and 19**. Each student will make a 12 minute presentation (plus questions) on a topic of their choosing. The final version of the written report will be submitted by **Friday April 3 (at 12h00)** to the instructor. Students can also work in groups of 2 or 3 students on one main project. Information about the report requirements and format will be posted on courselink.

Subjects for these presentations will be chosen through consultation with the instructor, with the understanding that the subject cannot be closely related to the student's prior work experience or research activities. The final examination in CHEM4400 may include questions based on the presentations made by other members of the class.

Course Outline:

1. Introduction to sensors

- Sensors and transducers

- Chemical and biochemical sensors
- Examples of widely used sensors

2. Review of common sensor terminology

- General response curve
- Origins of selectivity

3. Recognition and selectivity

- Equilibrium-based selectivity
- Kinetic-based selectivity

4. Surface modification for sensing applications

- Substrate preparation
- Surface modification techniques

5. Electrochemical sensors

- Fundamental aspects
- Amperometric and potentiometric sensors

E-mail Communication: As per university regulations, all students are required to check their <uoguelph.ca> e-mail account regularly: e-mail is the official route of communication between the University and its students.

When You Cannot Meet a Course Requirement: When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons, please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. See the undergraduate calendar for information on regulations and procedures for Academic Consideration.

Drop Date: The deadline for dropping a course is the last day of classes (April 3rd for the W20 semester). The regulations and procedures for Dropping Courses are available in the Undergraduate Calendar.

Copies of out-of-class assignments: Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

Accessibility: The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student.

When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is required, however, interim accommodations may be possible while that process is underway.

Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability.

Use of the SAS Exam Centre requires students to book their exams at least 7 days in advance, and not later than the 40th Class Day.

More information: www.uoguelph.ca/sas

Academic Misconduct: The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community – faculty, staff, and students – to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring.

University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not

excuse students from responsibility for verifying the academic integrity of their work before submitting it.

Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

The Academic Misconduct Policy is detailed in the Undergraduate Calendar.

Recording of Materials: Presentations which are made in relation to course work—including lectures—cannot be recorded or copied without the permission of the presenter, whether the instructor, a classmate or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

Resources: The Academic Calendars are the source of information about the University of Guelph's procedures, policies and regulations which apply to undergraduate, graduate and diploma programs.