CHM414/1102H1: Chemical Sensors and Biosensors

Contact Information

Instructor & Coordinator: Dr. Sonia Sheikh
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Office Hours: Monday and Wednesday arranged by appointment only
E-mail policy: Please allow 2 business days for a response; e-mails are not guaranteed to be answered on holidays and weekends.

Overview

CHM414/1102H introduces students to the highly interdisciplinary subject of chemical and biological sensors (a.k.a biosensors) through a variety of lectures and research assignments. Students will gain an understanding of the basic concepts of chemical and biological sensor technology, their use as alternative analytical tools, and become familiar with current literature. Classes are held on Mondays and Wednesdays from 3:00-4:00 p.m. in LM155, unless otherwise announced. *Please note that there will be **NO** lectures on Monday, Oct. 9, 2017 (Thanksgiving holiday), Monday, Nov. 6, 2017 (study break), and Wednesday, Nov. 8, 2017 (study break).* Course topics/lectures include:

- Introduction to sensor technology: types of sensors, components and design, requirements
- Surface modification: types of probes (*e.g.* antibodies, nucleic acids, receptors), criteria for device surface attachment, adsorption, physisorption, covalent attachment
- Surface characterization techniques: methods to obtain information about surfaces (*e.g.* X-ray photoelectron spectroscopy, atomic force microscopy, contact angle, *etc.*)
- Clinical diagnostics: blood protein adsorption onto surfaces, the problem of non-specific adsorption and techniques to minimize signal interference from biological matrices, biocompatibility, introduction to theranostics, point-of-care devices, and *in vivo* sensors
- Electrochemical sensors: potentiometric, amperometric, voltammetric, field effect transistor technology
- Acoustic wave devices: phenomenon of piezoelectricity, bulk acoustic wave devices as chemical sensors, Sauerbrey response equation, propagation of acoustic waves in fluids, other devices (*e.g.* surface acoustic wave, surface transverse wave, *etc.*)
- Optical and electromagnetic radiation based devices: sources of radiation for sensors, evanescent wave technology, surface plasmon resonance (SPR) experiments for biosensing

General Expectations

Given the scope of the material, it is essential that students employ good study habits from the beginning. All students should read assigned material and take the initiative to further read on topics and/or contact the instructor with any questions they may have about the material.

Course Evaluation

Students will be evaluated based on an assignment, presentation, and a final research essay. The **assignment** will be **due** on **Mon., Oct. 23, 2017** at **3:00 p.m. in class**. **Journal presentations** will begin near the end of term (~ Nov. 27, 2017) and continue until Dec. 06, 2017. The final **essay** will be **due** on **Wed., Dec. 06, 2017** at **3:00 p.m.** in class. There will be no final exam. The final mark will be divided as follows:

- Assignment - 40%
- Journal presentation in pairs - 25% (a portion of mark goes towards participation during presentations)
- Final research essay - 35%

Submission of YOUR Course Work

All assignments should be submitted by the deadline specified. Any course work submitted past the stated deadline without an extension or valid explanation will be subject to a penalty of 5% of the maximum possible mark per business day past the deadline. In case of illness, students will need to see a doctor at the time of illness and have them complete the appropriate form. University policy requires you to submit a "Verification of student illness" form completed by the medical professional consulted at the time of illness.

Plagiarism will not be tolerated – please see the departmental policy on plagiarism for more information: http://www.chem.utoronto.ca/undergrad/plagiarism.php

Remarking of Returned Term Work

If a student finds an error in marks addition on any item of returned work, they should bring it to the attention of the course instructor within two weeks from the date it was made available for collection. Any work written in pencil will *not* be accepted for remarking.