MATERIALS 4Q03
Materials for Sensors in Big Data and AI Systems

Instructor: Prof. Gu Xu, JHE 357, xugu@mcmaster.ca, x 27341

Course Schedule: Monday, Wednesday, Thursday, 17:30-18:20 pm, KTH-B101

Teaching Assistant: Mr. Arash Fattahi, fattaha@mcmaster.ca

Course Description:
This course will introduce students to the various concepts of Sensors and sensing materials for big data and artificial intelligence systems. And will discuss the theory, design and fabrication of chemical, thermal, electrical, magnetic and optical sensors.

Course Outcomes:
At the end of the course, students are expected to show the ability to:

- Understand the fundamentals of various sensor types for physical and chemical data.
- Understand the fundamentals of several broad classes of sensing materials.
- Understand the applications of several broad classes of sensor devices.
- Analyse the literature resources to assess wide range of information related to big data sensors and sensing materials.
- Communicate effectively a literature review on big data sensing through a presentation to the class, complete with Q&A.

MATLS 4Q03 is an important part of your training as an engineer. In particular the course will allow you to:

Gain Specialized Engineering Knowledge including:

(a) How sensing systems work.
(b) The main structure of advanced sensing materials and devices.
(c) State-of-the-art applications of these materials and devices

Evaluation:
1) Mid-term (30%): This 1 hr exam will take place in mid-October, covering the first half of the lectures.
2) Final Examination (35%): 1hr exam: This exam will focus on contents described and taught during the 2nd half of the lecture part.

3) Student Presentations (35%): Students will be required to deliver a 15 minute presentation based on a topic to be chosen. A student will present a 15 minute lecture, to be followed by a class-wide 10 minute Q&A session.

Evaluation hinges on presentation completeness, with an introduction, main content, and application section. Presenters will also be evaluated on presentation style, with a focus on clarity, ease of understanding, and audience engagement.

Depending on the number of student enrolled, we will have teams of two people per presentation or individual presentations delivered. The presenters will share their slides for review one week in advance in order to ensure high quality.

All of the presentation slides will be shared on Avenue after the presentations.

Approximate timeline for the course:

1) Introduction to big data sensing, main types of physical and chemical sensors
2) Semiconductors and devices
3) Optical materials, devices, spectroscopy
4) Magnetic materials etc. and devices
5) Electrochemical cells and sensors
6) Bio-electronic materials and sensors
7) Student presentations
Policy Reminders:

The Faculty of Engineering is concerned with ensuring an environment that is free of all adverse discrimination. If there is a problem that cannot be resolved by discussion among the persons involved, individual are reminded that they should contact the Department Chair, the Sexual Harassment Office or the Human Rights Consultant, as soon as possible. The Senate Resolution on Course Outlines states that: “students should be reminded that they should read and comply with the "Statement on Academic Ethics and the Senate Resolution on Academic Dishonesty" as found in the Senate Policy Statements distributed at registration and available in the Senate Office”.

Academic dishonesty consists of misrepresentation by deception or by other fraudulent means and can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: "Grade of F assigned for academic dishonesty"), and/or suspension or expulsion from the university.

It is your responsibility to understand what constitutes academic dishonesty. For information on the various kinds of academic dishonesty please refer to the Academic Integrity Policy, specifically Appendix 3, located at: http://www.mcmaster.ca/senate/academic/ac_integrity.htm

The following illustrates only three forms of academic dishonesty:
- Plagiarism, e.g. the submission of work that is not one's own or for which other credit has been obtained.
- Improper collaboration in group work.
- Copying or using unauthorized aids in tests and examinations.

Accessibility:

McMaster University is committed to fostering, creating and maintaining a barrier-free environment for all individuals providing equal rights and opportunities, including:

• Promoting a respectful attitude for persons with disabilities;
• Promoting awareness of the needs and abilities of persons with disabilities;
• Informing the University community about the services available to persons with disabilities and seeking to ensure that such services are delivered in ways that promote equity; and
• Providing support services, subject to certain limitations.

Students requiring service or accommodation contact Student Accessibility Services (SAS): http://sas.mcmaster.ca/ as soon as possible.
REQUESTS FOR RELIEF FOR MISSED ACADEMIC TERM WORK
McMaster Student Absence Form (MSAF)

In the event of an absence for medical or other reasons, students should review and follow the Academic Regulation in the Undergraduate Calendar “Requests for Relief for Missed Academic Term Work”.

ACADEMIC ACCOMMODATION FOR RELIGIOUS, INDIGENOUS OR SPIRITUAL OBSERVANCES (RISO)

Students requiring academic accommodation based on religious, indigenous or spiritual observances should follow the procedures set out in the RISO policy. Students requiring a RISO accommodation should submit their request to their Faculty Office normally within 10 working days of the beginning of term in which they anticipate a need for accommodation or to the Registrar's Office prior to their examinations. Students should also contact their instructors as soon as possible to make alternative arrangements for classes, assignments, and tests.

EXTREME CIRCUMSTANCES

The University reserves the right to change the dates and deadlines for any or all courses in extreme circumstances (e.g., severe weather, labour disruptions, etc.). Changes will be communicated through regular McMaster communication channels, such as McMaster Daily News, A2L and/or McMaster email.

For more information, please visit [http://mcmaster.ca/policy/Students-AcademicStudies/](http://mcmaster.ca/policy/Students-AcademicStudies/)

At certain points in the course it may make good sense to modify the schedule. The instructor may modify elements of the course and will notify students accordingly (in class, on the course website).