

**University of Guelph
School of Engineering
Engg*4390 Bio-Instrumentation Design
Fall, 2011**

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Office Hours: Tuesdays and Thursdays 11:30 to 12:00 pm or by appointment

Lab Technician: Hong Ma

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Teaching Assistant: Matthew DiCicco

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Textbook:

Practical Interfacing in the Laboratory: Using a PC for Instrumentation, Data Analysis and Control, Author: Stephen E. Derenzo.

The Measurement, Instrumentation and Sensors Handbook edited by J.G. Webster (CRC Press/IEEE Press). It is a huge comprehensive handbook in two volumes and do not be intimidated by it. Obviously, we will not cover everything in this book.

Schedule:

Lectures: ROZH 109

Mondays: 11:30 Am to 12:20 PM

Wednesdays: 11:30 AM to 12:20 PM

Fridays: 11:30 AM to 12:20 PM

Labs/Tutorials: THRN 2196

Wednesdays: 12:30 PM to 2:30 PM

Course Description:

Theory and selection criteria of devices used in measurements in biological systems; design of complete measurement systems including transducers, signal conditioning and recording components; error analysis. Differences between measurements in biological and physical systems. Topics also include overview of bio-imaging, microfluidics, nano-biosystems and sensors.

Learning Objectives:

- To integrate the concepts and principles to realize bio-instrumentation systems
- To understand the principles of instrumentation used to measure factors that characterize biological systems and
- physical or chemical factors that have a profound effect of biological systems
- Quantify the performance of bio-instrumentation systems through calibration, testing and error analysis

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Laboratory:

The laboratory component of the course comprises two parts. The first part is an assigned laboratory exercise that is completed by each student independently. The second part consists of the evaluation of two different transducers that is carried out by teams of 2 students working together over the semester. There is a variety of sensors available, but others can be sourced if the one you have a particular interest in is not in the initial selection. Ask the technician or TA or the instructor. A laboratory proposal will be required for each team detailing the approach to be taken, the equipment requirements and safety and operational procedure. Only when your proposal is complete and approved by the instructor can you carry out the experiments during the assigned laboratory periods (and at other times by arrangement with Ms. Hong Ma, the technician in charge of the electrical laboratory). This will, of course, be subject to prior lab bookings and any safety concerns. Safety aspects MUST be addressed in the laboratory proposals. More details will be found in the lab handout.

Design Project:

This is an individual project on a topic chosen by each student in consultation with the instructor. A design proposal is required. The project comprises a preliminary design for an instrumentation system solution in the context of a specific problem that poses biological constraints. The final design report will include the complete development of the design, with appropriate justification for the component choices. The system designed will not be constructed in most cases, although given sufficient resources students may assemble prototypes.

Grade Evaluation:

		Due Date
Design Proposal	10%	Friday, October 7, 2011
Lab Report I	10%	Monday, October 17, 2011
Lab Report II	15%	Wednesday, November 16, 2011
Design Project	30%	Wednesday, November 30, 2011
Presentation	10%	November 14 – 25, 2011
Final Exam	25%	Wednesday, December 7, 2011

Lab Report I is based on your Thermocouple Laboratory I work, and Lab Report II is based on your team lab work.

Safety in the laboratory is a prime concern. Lab proposals must include a safety section. Depending upon the experiment conducted, appropriate safety protection such as gloves and goggles must be worn. University policy forbids working alone in a lab; this will be strictly enforced. Laboratory and design reports will be graded for grammar and writing style as well as technical content.

Engg*4390 Material to be covered:

Introduction to Instrumentation and Measurement
Signal Processing, Signals and Noise
Force, strain and weight measurements
Fluid System Measurements
Thermal Variables and Measurements
Displacement and Position
Optical Measurements
Chemical composition, pH, humidity
Bio-potentials, blood pressure and flow, ventilation - Power correlations for mass transfer
Membrane Processes

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Exam Dates:

Final Exam is Scheduled for December 7, 2011, Wednesday. Time: 19:00 PM to 21:00 PM, Location: TBA

Student Responsibilities:

- Attend lectures and labs in order to obtain all the course material that you are responsible for.
- Check announcements page (courselink website) on a regular basis.
- Submit assignments on time.
- Regularly, check your marks on the course web page and make sure they are up to date.
- Submission of reports and proposals for re-marking must be done within a week of being returned.

Important Notes:

Communications regarding this course will frequently involve the course web page and email. Students are responsible for checking the course website and the university email account for all instructions and announcements. This must be done at least once every week.

Late Reports/Missed Test Policy:

Generally, when you find yourself unable to meet a course requirement such as an assignment or a test as a result of compassionate, illness or physiological reasons, a formal explanation must be made in writing to the instructor and (where possible) proper documentation must be provided. This should be done prior to an exam or assignment (if possible) or as soon as possible but definitely within a week after the exam or assignment due date. If no explanations are provided, exams receive a grade of zero and assignments/lab reports are subject to the following deductions:

- 25% will be deducted if the assignment/report is up to 24 hours late,
- 50% will be deducted if the assignment/report is 24 to 48 hours late,
- No assignments will be accepted after that.

University Policy on Academic Misconduct:

Academic misconduct, such as plagiarism, is a serious offence at the University of Guelph. Please consult the Undergraduate Calendar and the School of Engineering programs guide, for offences, penalties and procedures relating to academic misconduct.

<http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml>

Disclaimer:

The instructor reserves the right to change any or all of the above in the event of appropriate circumstances, subject to the University of Guelph Academic Regulations.