Clinical Instrumentation Course

Description:
The course is based on guest lectures provided by industry leading experts in the field of biomedical engineering and beyond. A range of topics will be covered touching upon a variety of healthcare areas, technologies, research foci.

Focus of course:
- Scientific principles underlying different instrumentation
- Merits & limitations of current technology
- Scope of clinical applications within continuum of care

Structure of course:
- The course is comprised of a 2 hour lecture each week, provided by invited experts in the field.
- Schedule of lectures is posted on Quercus
- Lectures will be held in person or virtually via Zoom if needed. Refer to Quercus for further instructions.
- Presentation notes will be posted on Quercus the evening before class. Presentation notes may not include all lecture material covered so it is important to attend/view the presentation

Evaluations:
The course grade is comprised of:
10% - Lecture Attendance
10% - Term paper proposal outline
30% - 2 peer reviews (proposal - 10%, term paper - 20%)
10% - Speaker engagement
40% - Final Term paper – see details below

Instructor:
Jan Andrysek

Teaching Assistant:
Gabriel Ng (gabrielp.ng@mail.utoronto.ca)

Assignment Descriptions

Term Paper:
The term paper is an in-depth discussion of one particular topic of your choice relating to clinical engineering in modern health care.

In the first part of the semester (see Timetable and Deadlines document for due dates), you will submit an initial proposal (Term paper proposal) consisting of a title and short description of the chosen topic (~500 words). During the middle of the semester, there will be a week with no scheduled lecture. The course instructor and TA will be available to provide guidance or suggestions on the proposed project. During this time, you will also receive input from the peer-review.

The Final Term paper is due towards the end of the course (see 'Timetable and Deadlines document for due dates). There are two steps to this submission. The first submission will be for a peer-review only. Once this is completed and you receive your feedback, you will have time to revise and improve your paper prior to submitting to the instructors by the final due date.

Please consider grading scheme, provided samples and feedback from the peer review and instructor/TA in planning and developing your paper. The topic can be, but does not need to be, related to the course lectures. If the topic is related to one of the course lectures, we expect literature review and/or proposed solutions to go beyond what is covered within the presentation. The suggested length is no more than 4500 words (excluding references).

Please submit your proposal and term paper on Quercus as a PDF or Word documents with the file naming convention including your name on Quercus. You will be expected to cite relevant and current papers from the scientific literature and/or other relevant technical or clinical resources. **Include a title page with your name, title and date**. See Quercus for examples of term papers.

Peer Review:
Students will complete peer reviews. These will serve as additional checkpoints to receive feedback as you develop your idea of choice. There are 2 peer review stages: immediately following the proposal and partway between the proposal submission and final submission (see 'Timetable and Deadlines' document). For each stage, students will be randomly assigned their peer's submissions to review and provide comments for, resulting in 3 reviews total (2 proposal reviews and 1 full paper review). Student marks will be assigned based on the quality of their reviews.

To assist with providing constructive feedback, we have also provided some additional documents and guidelines (see 'Example Peer Review'). While you are free to leave annotations directly on the proposal/term paper documents, your peer review submission must include comments and ratings using the 'Peer Review Outline' document.

Peer reviews will be automatically assigned through Quercus immediately following the deadline, so please ensure your Proposal and Initial Term Papers are submitted on time. To complete the peer review, please click Attach File when you leave your comments and include the Peer Review Outline document with your feedback. Additional information can be found here. These peer reviews are intended to be anonymous, so please ensure for the Proposal and Initial Term Paper that any identifiers such as your name are not included in your submission files.

Speaker Engagement:
Students are expected to not only attend the lectures, but to participate in questions and discussion with the speakers. To earn this mark, students should attempt to ask at least 2 thoughtful questions across the span of talks given during the semester. This should be during the 2-hour slot, either during the presentation if suitable, or immediately following the presentation if there is time. It is the responsibility of the student to identify an appropriate time during the lecture window.

Examples of questions could involve asking for further explanation/exploration of specific concepts of interest covered in the slides, about future opportunities in the space, challenges, etc. There is no specific template for appropriate questions, but we expect it to require more than a simple yes/no to answer.

To assist us in tracking your participation and assigning marks, students should introduce themselves to the guest lecturer when posing their question (e.g., state your name to the presenter). There will also be an assignment on Quercus (Speaker Engagement) allowing for multiple submissions. You will use this to summarize your question and the response that you receive. A submission must be completed for each of your questions **on the day of the respective lecture**, otherwise it will not be counted toward your engagement marks.

Lecture Attendance:

We encourage you to come to all of the lectures. But we understand that due to illness or other factors, you may need to miss the odd lecture. You can miss up to two lecturers and still receive full marks for attendance. If you miss 3 lectures you will get 5% for attendance and more than three lectures a grade of 0. Attendance will be taken during each lecture.

Late assignments:

Late assignments (proposal, term paper and peer-reviews) without authorized extensions will be penalized at the rate of 10% for each day past the deadline. No assignment that is more than 3 days late will be accepted and a grade of 0 will be assigned. For extensions contact your course instructor. Extensions will be considered at the instructor's discretion and specific circumstances. Documentation may be necessary, for example U of T Verification of Illness or Injury form or the U of T Verification of Extenuating Circumstance(s) form. If you have an alternative form of documentation, we will assess on a case-by-case basis.

Detailed Grading Scheme for Final Paper

Section	Criteria
Abstract/ Summary (5%)	• 250-350 words • Provides overview of the clinical problem, the current technology or treatment standard, proposed solution, and solution impact • Briefly outlines student's motivation for choosing project, as well as process for finding the project area
Problem Identification (25%)	Problem Statement • Defines the general problem to be solved (e.g., disease treatment, execution of surgical process, etc.) • Provides relevant clinical background of disease or process
	Identification of Clinical/Technical requirements and considerations • Identifies general requirements (clinical, technical, etc.) governing solution/product design in the space • Describes the needs of key user stakeholders (i.e., not business/profit, but device or solution function), and the impact of these needs on design • Access and critically interpret resources and references
Review of State-of-Knowledge (20%)	• Identifies 2 or more current state-of-the-art solutions/practice • Describes in sufficient detail the individual pieces of the technology, protocol, practice, etc.
Proposal Solution (40%)	• Critical appraisal and evaluation of current state-of-the-art, identification of shortcomings • Clear description of functional, aesthetic, and other design requirements in proposed solution (where these differ or add on top of the general requirements covered in *Problem Identification*) • Requirements follow clear logic based on *Problem Identification* and *Review of State-of-Knowledge* as well as sound product or workflow design principles • Student provides detailed description of design solutions, <u>with an emphasis</u> on components addressing the identified shortcomings in existing state-of-the-art • Proposed solution(s) incorporates student's unique critique and/or ideas and/or recommendations, etc., does not simply summarize or offer research techniques or published papers as the solution.
Style, Grammar, Org. (10%)	• Includes a standalone title page with student name and title of paper • None to minimal grammar mistakes that impede understanding of report • Use of references to support background information or justify solution decisions (where appropriate and existing) • Consistent reference style. ACS, AMA, IEEE (any style with numerical in-text citations) • Cohesive organization of paper with clear headings and flow • Maximum of 4500 words (excluding references and figure captions)