McGill BIEN 471

Department of Bioengineering Bioengineering Research Project

Course Description. Students will pursue individual guided research projects in bioengineering. Under the guidance of a research supervisor, students will propose and implement a research plan that addresses a current gap in knowledge or industry need. Projects will be designed to provide experience in critical evaluation of primary research literature, experimental approaches and methodologies, quantitative analysis, mathematical modeling, and effective written and oral presentation of scientific ideas.

Prerequisite(s): BIEN200, or approval by the Instructor. Credits: 2

Course materials: Any relevant course materials, if requested, will be distributed during the semester through myCourses.

Course Objectives: At the completion of this course, students will be able to:

1. describe foundational as well as current literature in their field of interest.
2. develop a compelling research plan that addresses a current gap in knowledge or industry need.
3. use experimental techniques including (but not limited to) microscopy, biochemistry, quantitative analysis, and mathematical modeling to answer a research question.
4. effectively present research plans and progress, both through oral presentations and written documents.

Research advisor. Students should identify and obtain the approval of a McGill faculty member preferably in Engineering, and again preferably in the Department of Bioengineering, but professors in the Faculties of Science or Medicine, will be acceptable to serve as their course supervisor, provided that they grade the performance, and that they follow the course syllabus requirements. Students should meet with their prospective supervisor to outline a plan for the proposed project and, if needed, instruction in laboratory safety. The supervisor will be responsible for student grading.

Project proposal. A written project proposal will be submitted in the first week of the semester. The proposal should contain (1) a survey of the relevant literature, (2) the objectives of the proposed work in the form of a few (e.g., 2-3) specific aims, (3) the rationale for the proposed project, (4) a detailed description of the planned approach you will take to address the aims in (2).

Midterm progress presentation. Around mid-semester, students will present their preliminary results to their research supervisor and research group. This will be a time to assess progress and solidify plans for the remainder of the semester.

Final presentation. The results of the research project will be submitted during the final week of the semester in the format of a 1) scientific poster, or 2) manuscript-style report. Examples will be distributed via myCourses.
Students will be required to deliver a final oral presentation of their poster or report.

Grade Distribution:

Project Proposal (written)	25%
Midterm Progress Presentation (oral)	25%
Poster or Report	30%
Poster or Report Oral Presentation	20%

All aspects of content quantity and quality are to be agreed upon between student and research supervisor.

Design aspect. Because BIEN 471 is a core course for accreditation purposes, each element of the grading system, i.e., proposal, progress, report, and final presentation, must have clearly defined design elements. The present proposal of the definition of design is as follows:
"Engineering design is a process of making informed decisions to creatively devise products, systems, components, or processes to meet specified goals based on engineering analysis and judgement. The process is often characterized as complex, open-ended, iterative, and multidisciplinary. Solutions incorporate natural sciences, mathematics, and engineering science, using systematic and current best practices to satisfy defined objectives within identified requirements, criteria and constraints. Constraints to be considered may include (but are not limited to): health and safety, sustainability, environmental, ethical, security, economic, aesthetics and human factors, feasibility and compliance with regulatory aspects, along with universal design issues such as societal, cultural and diversification facets."
[cf. https://engineerscanada.ca/sites/default/files/2021-06/CEAB%20engineering%20design%20consultation%20report_Final.pdf]
The design aspect will represent 50% of the weight of each grading module.

Academic Integrity. McGill University values academic integrity. Therefore, all students must understand the meaning and consequences of cheating, plagiarism and other academic offences under the Code of Student Conduct and Disciplinary Procedures (see www.mcgill.ca/students/srr/honest/ for more information).