MECHENG 4X04
Independent Research Project

Undergraduate Studies
Fall/Winter 2024/25
Course Outline

CALENDAR/COURSE DESCRIPTION

Individual research project over two terms to be arranged by mutual consent of a faculty supervisor and the student with approval of the Department Associate Chair (Undergraduate).

PRE-REQUISITES AND ANTI-REQUISITES

Prerequisite(s): A minimum GPA of 9.5, consent of a supervisor, and registration in Level IV or above in any Mechanical Engineering program, or permission of the department.
Antirequisite(s): IBEHS 3I06 A/B, IBEHS 4H03, ELECENG 4OJ4, ENGPHYS 4H04

INSTRUCTOR OFFICE HOURS AND CONTACT INFORMATION

Dr. Cheryl Quenneville
ABB-C308
quennev@mcmaster.ca

Office Hours:
By appointment

COURSE WEBSITE/ALTERNATE METHODS OF COMMUNICATION

It is the student's responsibility to secure a supervisor for this course; if interested, please contact a professor for available projects. The supervisor is responsible for the immediate direction and instruction of the student and should commit a minimum of 30 minutes contact time per week, on average.

COURSE INTENDED LEARNING OUTCOMES

By the end of this course, students should be able to:

- Critically review and briefly summarize the existing scientific literature on the topic
- Identify a research question including formulating a testable hypothesis, if applicable
- Design a research approach including identifying appropriate tools / techniques and/or apparatus
- Recognize assumptions and identify uncertainty in research methods
- Obtain a substantiated conclusion based on the results and recognizing limitations of the methods
- Effectively communicate results in a written scientific report and an oral presentation

COURSE FORMAT AND EXPECTATIONS

The course is organized as an independent research project. Each student is expected to meet weekly with their supervisor to provide progress updates and will complete a research project over the course of the year.

Generative AI is a tool that may be used in limited context within this course. Please read the article “Best practices for using AI when writing scientific manuscripts, Buriak et al, ACS Nano 2023, 17(5) 4091-4093”. Students may use generative AI in this course to assist with early drafts, but final text must be in the student’s own words, and the output must be checked for correctness and completeness (e.g. suggested references must be confirmed). A

statement of how AI was used (if at all) must be included in all written reports and should be discussed with the research supervisor. Use of generative AI outside these guidelines or without citation will constitute academic dishonesty.

ASSESSMENT

Component	Due Date	Weight
Job Hazard Analysis / proposal	Sept. 30	5%
Oral progress report	Late November – Early December	10%
Written progress report	December	15%
Final oral presentation	Late March – Early April	20%
Final written report	April	35%
Research skills grade	End of year	15%
Total		100%

Each student must complete (in consultation with their supervisor) a project proposal outline by end of September. This should also include indication that all required safety training has been completed and will be pass/fail.

Oral presentations will be delivered at the end of each semester, taking the format of 10-minute presentation followed by 10-minutes of questions. This is to be attended by all students in the course and will be evaluated by two other faculty members than the research supervisor.

Written reports will be submitted at the end of each semester to the research supervisor. While these are recommended to be 10-pages and 15-20 pages, the format and specific deadline is up to the research supervisor. Term 1 should focus on literature review and project planning, and term 2 report should document the project in full, with major findings and analysis of data and limitations being covered.

Students are expected to maintain a lab notebook, documenting regular meetings and all work conducted on the project. It should be held to engineering standards for notebook records and will be submitted to the research supervisor along with the final report. The supervisor will assign a grade out of 15 on the research skills and involvement of the student.

ACCREDITATION LEARNING OUTCOMES

The Learning Outcomes defined in this section are measured for Accreditation purposes only and will not be directly taken into consideration in determining a student's grade in the course.

Outcomes	Indicators
Critically review and briefly summarize the existing scientific literature on the topic	3.1, 7.1, 12.2
Identify a research question including formulating a testable hypothesis, if applicable	2.1, 3.2
Design a research approach including identifying appropriate tools / techniques and/or apparatus	2.1, 2.2, 3.2, 5.1, 5.2, 7.1
Recognize assumptions and identify uncertainty in research methods	2.1, 2.2, 3.2, 5.1, 5.2
Obtain a substantiated conclusion based on the results and recognizing limitations of the methods	3.2, 5.2, 7.1
Effectively communicate results in a written scientific report and in an oral defense	7.1, 7.2, 7.3, 12.2

For more information on Accreditation, please visit: https://www.engineerscanada.ca

EQUITY, DIVERSITY, AND INCLUSION

Every registered student belongs in this course. Diversity of backgrounds and experiences is expected and welcome. You can expect your Instructor to be respectful of this diversity in all aspects of the course, and the same is expected of you.

The Department of Engineering Physics is committed to creating an environment in which students of all genders, cultures, ethnicities, races, sexual orientations, abilities, and socioeconomic backgrounds have equal access to education and are welcomed and treated fairly. If you have any concerns regarding inclusion in our Department, in particular if you or one of your peers is experiencing harassment or discrimination, you are encouraged to contact the Chair, Associate Undergraduate Chair, Academic Advisor or to contact the Equity and Inclusion Office.

MENTAL HEALTH & WELLNESS

For a list of McMaster University's resources, please refer to the Student Wellness Centre.
Talkspot is a non-crisis mental health resource specifically for students in the Faculty of Engineering.

ACADEMIC INTEGRITY

You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity. **It is your responsibility to understand what constitutes academic dishonesty.**

Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour 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. For information on the various types of academic dishonesty please refer to the *Academic Integrity Policy*, located at https://secretariat.mcmaster.ca/university-policies-procedures-guidelines/

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

AUTHENTICITY / PLAGIARISM DETECTION

Some courses may use a web-based service (Turnitin.com) to reveal authenticity and ownership of student submitted work. For courses using such software, students will be expected to submit their work electronically either directly to Turnitin.com or via an online learning platform (e.g. A2L, etc.) using plagiarism detection (a service supported by Turnitin.com) so it can be checked for academic dishonesty.

Students who do not wish their work to be submitted through the plagiarism detection software must inform the Instructor before the assignment is due. No penalty will be assigned to a student who does not submit work to the plagiarism detection software. **All submitted work is subject to normal verification that standards of academic integrity have been upheld** (e.g., on-line search, other software, etc.). For more details about McMaster's use of Turnitin.com please go to www.mcmaster.ca/academicintegrity.

COURSES WITH AN ON-LINE ELEMENT

McMaster is committed to an inclusive and respectful community. These principles and expectations extend to online activities including electronic chat groups, video calls and other learning platforms.

Some courses may use on-line elements (e.g. e-mail, Avenue to Learn (A2L), LearnLink, web pages, capa, Moodle, ThinkingCap, etc.). Students should be aware that, when they access the electronic components of a course using these elements, private information such as first and last names, user names for the McMaster e-mail accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in a course that uses on-line elements will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure, please discuss this with the course instructor.

CONDUCT EXPECTATIONS

As a McMaster student, you have the right to experience, and the responsibility to demonstrate, respectful and dignified interactions within all of our living, learning and working communities. These expectations are described in the *Code of Student Rights & Responsibilities* (the "Code"). All students share the responsibility of maintaining a positive environment for the academic and personal growth of all McMaster community members, **whether in person or online**.

It is essential that students be mindful of their interactions online, as the Code remains in effect in virtual learning environments. The Code applies to any interactions that adversely affect, disrupt, or interfere with reasonable participation in University activities. Student disruptions or behaviours that interfere with university functions on online platforms (e.g. use of Avenue 2 Learn, WebEx or Zoom for delivery), will be taken very seriously and will be investigated. Outcomes may include restriction or removal of the involved students' access to these platforms.

ACADEMIC ACCOMMODATION OF STUDENTS WITH DISABILITIES

Students with disabilities who require academic accommodation must contact Student Accessibility Services (SAS) at 905-525-9140 ext. 28652 or sas@mcmaster.ca to make arrangements with a Program Coordinator. For further information, consult McMaster University's *Academic Accommodation of Students with Disabilities* policy.

COURSE POLICY ON MISSED WORK, EXTENSIONS, AND LATE PENALTIES

1. Requests for extensions on written reports should be submitted directly to the research supervisor.
2. If the student is unable to attend their oral presentation they may present virtually or communicate with the course coordinator to arrange a rescheduled time. This will be at the convenience of the evaluators.

SUBMISSION OF REQUEST FOR RELIEF FOR MISSED ACADEMIC WORK

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".

1. **Relief for missed academic work worth less than 25% of the final grade resulting from medical or personal situations lasting up to three calendar days:**

    - Use the McMaster Student Absence Form (MSAF) on-line self-reporting tool. No further documentation is required.

- Students may submit requests for relief using the MSAF once per term.
- An automated email will be sent to the course instructor, who will determine the appropriate relief. Students must immediately follow up with their instructors. Failure to do so may negate the opportunity for relief.
- The MSAF cannot be used to meet a religious obligation or to celebrate an important religious holiday.
- The MSAF cannot be used for academic work that has already been completed attempted.
- An MSAF applies only to work that is due within the period for which the MSAF applies, i.e. the 3-day period that is specified in the MSAF; however, all work due in that period can be covered by one MSAF.
- The MSAF cannot be used to apply for relief for any final examination or its equivalent. See *Petitions for Special Consideration* above.

2. **For medical or personal situations lasting more than three calendar days, and/or for missed academic work worth 25% or more of the final grade, and/or for any request for relief in a term where the MSAF has been used previously in that term:**

    - Students must report to their Faculty Office to discuss their situation and will be required to provide appropriate **supporting documentation**.
    - If warranted, the Faculty Office will approve the absence, and the instructor will determine appropriate relief.

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 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.

COPYRIGHT AND RECORDING

Students are advised that lectures, demonstrations, performances, and any other course material provided by an instructor include copyright protected works. The Copyright Act and copyright law protect every original literary, dramatic, musical and artistic work, **including lectures** by University instructors

The recording of lectures, tutorials, or other methods of instruction may occur during a course. Recording may be done by either the instructor for the purpose of authorized distribution, or by a student for the purpose of personal study. Students should be aware that their voice and/or image may be recorded by others during the class. Please speak with the instructor if this is a concern for you.

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.