Engineering Physics
ENGPHYS 4A06
Engineering Physics Design and Synthesis Project
Undergraduate Studies
Fall 2025/Winter 2026
Course Outline

INSTRUCTOR OFFICE HOURS AND CONTACT INFORMATION

Dr. Adrian Kitai
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Office Hours: By appointment

TEACHING ASSISTANT OFFICE HOURS AND CONTACT INFORMATION

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COURSE WEBSITE/ALTERNATE METHODS OF COMMUNICATION

The official means of communication with students is via Teams.
It is the students' responsibility to regularly check Teams for updates and announcements.

CLASS FORMAT

Course Dates: 09/03/2025 – 04/30/2026
Units: 6
Course Delivery Mode: All classes are in-person.
Course Description: 6 unit(s)
Engineering design capstone project synthesizing undergraduate Engineering Physics knowledge to select a meaningful real-world problem, and engineer a solution by mathematically modelling the impact of design decisions and implementing them physically as part of an engineering team.

Two labs (three hours each), one capstone project; both terms

Prerequisite(s): Registration in the final level of the Engineering Physics, Engineering Physics

and Management, or Engineering Physics and Society program and credit in ENGPHYS 3L04 and either ENGPHYS 3BB3 or ENGPHYS 3BB4

The course is scheduled as follows:

Fall Semester:

Wednesday 8:30am to 11:30am

Friday 8:30am to 11:30am

Winter Semester:

Wednesday 8:30am to 11:30am

Friday 8:30am to 11:30am

COURSE INTENDED LEARNING OUTCOMES

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

1) Link your undergrad theoretical knowledge to the real world:

You will be able to identify a meaningful a real-world problem, and conceive, understand, build and demonstrate a solution to it.

2) Work effectively on a complex project in a Team:

You will be able to work in a Team and closely cooperate with your Team members in the context of a capstone project.

3) Understand the design process using a staged approach

You will be able to work through three critical stages of your design, culminating in an Expo-worthy live demonstration.

4**) Communicate and document your design and design process effectively**

You will be able to properly document your design and the rationalizations for specific design decisions in written, video and live formats.

ENGINEERING ACCREDITATION: GRADUATE ATTRIBUTES AND LEARNING OUTCOMES

The Canadian Engineering Accreditation Board (CEAB) is a division of Engineers Canada and is responsible for accrediting undergraduate engineering programs across Canada. Accreditation by the CEAB ensures that the engineering programs meet a national standard of quality and cover essential educational requirements. Graduate Attributes are a set of qualities and skills that the CEAB expects engineering graduates to possess. These attributes are a benchmark for the learning outcomes of accredited engineering programs. This section lists the Graduate Attribute Indicators associated with some of the Learning Outcomes in this course.

The Graduate Attributes 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.

Attribute	Indicator	YEAR 4
01 - A KNOWLEDGE BASE FOR ENGINEERING	01.1 - Competence in Mathematics	EP4A06
	01.4 - Competence in Specialized Engineering Knowledge	EP4A06
02 - PROBLEM ANALYSIS	2.1 Identifies and states reasonable assumptions and suitable engineering fundamentals, before proposing a solution path to a problem.	EP4A06
	2.2 Proposes problem solutions supported by substantiated reasoning, recognizing the limitations of the solutions	EP4A06
	3.2 Synthesizes the results of an investigation to reach valid conclusions.	EP4A06
04 - DESIGN	4.1 Defines the problem by identifying relevant context, constraints, and prior approaches before exploring potential design solutions.	EP4A06

	4.2 Explores a breadth of potential solutions, considering their benefits and trade-offs as they relate to the project requirements.	EP4A06
	4.3 Develops models/prototypes; tests, evaluates, and iterates as appropriate.	EP4A06
	4.4 Justifies and reflects on design decisions, giving consideration to limitations, assumptions, constraints and other relevant factors.	EP4A06
05 - USE OF ENGINEERING TOOLS	5.1 Evaluates engineering tools, identifies their limitations, and selects, adapts, or extends them appropriately.	EP4A06
	6.2 Manages interpersonal relationships, taking leadership responsibilities as needed.	EP4A06
07 - COMMUNICATION SKILLS	7.1 Demonstrates comprehension of technical and non-technical instructions and questions.	EP4A06

	7.3 Composes and delivers an effective oral presentation for the intended audience.	EP4A06
11 - ECONOMICS AND PROJECT MANAGEMENT	11.1 Applies economic principles in decision making.	EP4A06
	11.2 Plans and effectively manages a project's time, resources, and scope, following business practices as appropriate.	EP4A06

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

COURSE INFORMATION

MATERIALS AND FEES

For standard projects, modest departmental funding, with a limit to be determined, is available for supplies. Funds are only available at the end of the course (i.e., in April), and only with presentation of receipts (please keep your receipts. In 2024-2025 the amount provided was $160 per student. This is subject to change and this will be confirmed as soon as possible.

COURSE FORMAT AND EXPECTATIONS

You will work as an **Engineering Team** comprising ***not more than 3 students and not less than 2 students*** on a project of your choosing that is deemed satisfactory. ***There are absolutely no exceptions to these upper and lower student number limits.***

Assistance will be ***intensively provided in Week 1 of the semester*** to choose and qualify your projects. ***You must have a qualified project by Week 2.***

You will be assigned a TA who will meet with your Team weekly for one hour. ***All Team members must define their separate contributions each week.*** Your report that you present in person with the TA must include a summary of the work each of you have done that week,

the work you are planning for the following week, and a summary of any problems and challenges you are having. The main goal is to keep each team member on track. These weekly reports will also form one component of **Report 1** and **Report 2**. A grade of 5% is assigned to these weekly reports.

Your Engineering Team will be established by Week 2 and will start working on a qualified project by the end of Week 2. However the Team will be evaluated in mid November 2025. This evaluation will establish if the Team is healthy and has the full confidence of all three of:

i) the Team members (must be unanimous)
ii) the TA and
iii) the professor

The definition of "healthy" will be detailed during the fall semester. If the evaluation is positive and full confidence is established, then the Team can continue to the Winter semester with no changes.

However, in other cases, changes in the Team membership and/or project description will be required and these must be in place by December 2025***. There is no shame in this***. A variety of reasons can exist for changes in a Team membership being required.

This review will be conducted very carefully since no further changes in each Team will be allowed as of January 2026. This is due to the insufficient remaining time available to regroup and get on track before the course ends.

There will be only ***one common grade*** for all grade components assigned to a given Team. This means that an individual Team member's level of contribution to a Team Project relative to contributions by other Team members will not be considered as far as grades are concerned. A healthy Team is therefore essential to ensure fairness in grading.

By late October, you must demonstrate a physical proof of concept of your design. This proof of concept MUST involve hardware and it must show that the design is feasible. It is OK if it is held together by sticky tape and chewing gum at this point, but it is NOT OK to just present drawings and simulations.

What you have built by week 6 of Term 1 will be your Proof of Concept and it will be worth marks, sort of like a first midterm test.

The first 6 weeks of the winter term will be devoted to engineering design and revamping your builds, culminating in a critical in-course demo event to be scheduled in late February. This demo event will be organized in a **Departmental Showcase Event**

Marks at the Departmental Showcase event will be given for this critical milestone, sort of like a second midterm test. The expectation is that you will clearly validate the functionality of your projects with a live demo.

4) The remaining weeks in March will be for final improvements to your builds but at this point, ***the scope of your work will be limited to getting any remaining bugs out of what you***

demonstrated in February. Then your fully debugged demo will be ready for the faculty-wide Expo event in April.

6) The course will emphasize ***designing and building***, however following a well-documented design and analysis process is also a critical element. Your reports must capture this clearly. Mathematical design can be useful and important, but the design tools you use will depend on your project. Your TA and the professor will guide you on the appropriate type and level of design methodology to undertake.

8) You will have time to complete your written submissions during the final 4-5 weeks of each semester. Report 1 due in late November 2024 must describe your project and project next steps. Report 2 due in late March 2025 must describe your project and project achievements and must include a video. Formatting requirement details will be provided during the course.

LAB SAFETY

Presented as needed.

COURSE ASSESSMENT DETAILS

Component	Weight
Demo in mid October	20%
Demo and Showcase in mid February	25%
Weekly reports	5%
Report 1 including signed-off log	10%
Report 2 including signed-off log	10%
Faculty wide expo at the end of the winter semester and video	30%
Total	100%

GRADING SCALE

The McMaster 12 Point Grading Scale

Grade	Equivalent Grade Point	Equivalent Percentages
A+	12	90-100
A	11	85-89
A-	10	80-84
B+	9	77-79
B	8	73-76
B-	7	70-72
C+	6	67-69
C	5	63-66
C-	4	60-62
D+	3	57-59
D	2	53-56

D-	1	50-52
F	0	0-49

COURSE POLICY ON MISSED WORK, EXTENSIONS, AND LATE PENALTIES

MSAF policy:

- An MSAF for a missed quiz will automatically allocate the missed grade to the total quiz grade component.
- An MSAF for a missed assignment will automatically lead to a 1-week extension for that assignment, but it still needs to be submitted.

GENERATIVE AI

UNRESTRICTED USE

Students may use generative AI throughout this course in whatever way enhances their learning; no special documentation or citation is required. Students should prepare their assignments themselves and be able to explain the work they submit.

Also see Guidelines on the Use of Generative AI in Teaching and Learning - Academic Excellence - Office of the Provost for more information. Please note how this intersects with the following guidance on academic dishonesty.

APPROVED ADVISORY STATEMENTS

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 and the Faculty of Engineering are 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.

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.

ONLINE PROCTORING

Some courses may use online proctoring software for tests and exams. This software may require students to turn on their video camera, present identification, monitor and record their computer activities, and/or lock/restrict their browser or other applications/software during tests or exams. This software may be required to be installed before the test/exam begins.

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.

Academic Advising

Academic Advisors are available to assist you with any problems or questions you may have. This includes course selections, changes to your enrolment, McMaster Student Absence Form (MSAF), Religious, Indigenous, or Spiritual Observances (RISO) forms, exams, taking courses at another university (for credit at McMaster), Petitions for Special Consideration, and much more. Below is the contact information for the Office of the Associate Dean (Academic) in the Faculty of Engineering:

JHE-Hatch 301
https://www.eng.mcmaster.ca/programs/academic-advising
(905) 525-9140 ext. 24646

Physical and Mental Health

For a list of McMaster University's resources, please refer to the Student Wellness Centre.

Requests 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". An abbreviated version is provided below.

The University recognizes that students periodically require relief from academic work due to extenuating circumstances. Students seeking relief for missed academic term work are expected to read the ***McMaster Student Absence Form Policy***. The Policy aims to manage these requests by taking into account the needs and obligations of students, instructors and administrators. It is the prerogative of the instructor of the course to determine the appropriate relief for missed term work in their course. Any concerns regarding the granting of relief should be directed to the Faculty Office.

1. **Relief for missed academic work worth less than 25% of the final grade resulting from medical or personal situations lasting up to three (3) 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 or 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 (3) 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.