

CHALLENGE 2CC3
Critical Challenges for Humanity
Undergraduate Studies
Fall 2024/25
Course Outline

CALENDAR DESCRIPTION

We explore selected critical challenges for humanity, including energy needs and climate change, deployment of artificial intelligence and genetic engineering, and confronting the possibilities of nuclear and biological warfare. We present relevant key concepts in science, engineering, social science, and humanities and apply them to help to understand the scale of these challenges and their potential impacts on future humanity, including social, environmental, and economic implications.

PRE-REQUISITES AND ANTI-REQUISITES

Prerequisite(s): Registration in level II or above of any program
Antirequisite(s): None

INSTRUCTOR OFFICE HOURS AND CONTACT INFORMATION

Dr. Harold Haugen

haughenh@mcmaster.ca

Office Hours:

By appointment

TEACHING ASSISTANT OFFICE HOURS AND CONTACT INFORMATION

TBD

Office Hours:

By appointment

COURSE WEBSITE/ALTERNATE METHODS OF COMMUNICATION

<http://avenue.mcmaster.ca/>

Course Philosophy

This course is intended for students with a broad range of backgrounds. We will introduce certain elements of mathematics and science, but the goal is to ensure that the final evaluation does not hinge substantially on a student's command of the basic science. Rather, the key focus is on the implications for the critical challenges. Thus, students can delve into some fundamentals more if they wish, but we want to ensure that everyone can successfully complete the course with good standing with a reasonable effort.

COURSE INTENDED LEARNING OUTCOMES

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

- Grasp basic concepts of engineering, science, and social science connected with our critical challenges
- Be familiar with a range of relevant resources from journal articles, the media, and other online sources
- Appreciate key aspects of the current challenges
- Discuss potential solutions

MATERIALS AND FEES

Required Texts:

None

Recommended Additional Texts:

No text books are required for the course. In our lecture slides for various topics, short lists of core book recommendations will be provided.

Calculator:

Only a basic scientific calculator will be required for the course, but no calculators will be needed during testing.

Course Format and Expectations

The course is organized as follows:

- 3 classroom-based lectures per week (some of which will be highly interactive between students)
- 8 brief reports
- 4 assignments
- 4 in-class quizzes
- One in-class session per week will involve student groups
- Guest lectures will feature presentations by experts on various aspects of our core topics

COURSE SCHEDULE

Our tentative list of topics is given below. (Adjustments could be made along the way.)

- Welcome and Introduction
- Energy sources – current usage and future prospects
- Climate change – fundamentals; social, environmental, and economic implications
- Artificial intelligence – foundations and implications for the future
- Bio-revolution overview
- Discussion of the implications of biotechnology, in particular genetic engineering
- Pandemics and the threat of bio-warfare
- The nuclear domain – fundamentals, history, societal aspects, and applications
- The threat of nuclear weapons
- Synergy between our core topics, in particular between energy, climate change, AI, and biotechnology
- Social, political, and psychological aspects of our challenges
- The Canadian connection
- Opportunities and final thoughts

ASSESSMENT

Component	Weight #1	Weight #2
Brief reports	30%	30%
Assignments	30%	30%
Quizzes	20%	0%
Participation	20%	20%
Synthesis report (<i>see Note 6 below</i>)	0%	20%
Total	100%	100%

Note 1: Substantial choices will be given on student work in order to accommodate a wide range of backgrounds.

Note 2: We will take the best six of eight brief reports.

Note 3: We will take the best three of four assignments.

Note 4: Participation will be based on our group discussion sessions and guest lectures and is simply attendance.

Note 5: We will take the best three of four quizzes.

Note 6: You will have the option of doing a final synthesis report. If you perform better on the final report than on the best three of four quizzes, then the report score will replace the quiz score. However, you must attempt at least three of the four quizzes in order to be eligible for submitting a final report.

Comments on the use of generative AI

Unless otherwise indicated, students should assume that generative AI tools (such as ChatGPT) should not be used in this course for student work which is submitted for evaluation. The instructor will inform the class of any cases where generative AI will be incorporated. Any such use would be based on free AI tools.

ACCREDITATION LEARNING OUTCOMES (THIS IS ONLY POTENTIALLY RELEVANT FOR ENGINEERING STUDENTS.)

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
A knowledge base for engineering	1.1, 1.2, 1.3
Problem analysis	2.1, 2.2
Investigation	3.1
Individual and team work	6.3
Communication skills	7.1, 7.2, 7.3
Ethics and equity	10.2, 10.3
Life-long learning	12.1, 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](#).

PHYSICAL AND MENTAL HEALTH

For a list of McMaster University's resources, please refer to the [Student Wellness Centre](#).

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](https://secretariat.mcmaster.ca/university-policies-procedures-guidelines/), 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.

COURSE POLICY ON MISSED WORK, EXTENSIONS, AND LATE PENALTIES

For some of our course components, we take a specific number of best scores for the final evaluation. In such cases, consideration on missed work is only relevant if the minimum number of submissions in that category is not reached. For such eventualities, the method for accommodation should be discussed with the instructor.

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, ATL and/or McMaster email.