

Engineering Physics
ENGPHYS 4NE3
Advanced Nuclear Engineering
Winter 2026



ENGINEERING

Instructor Information

Markus Piro

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Office: NRB 105

Office Hours:

To be announced on A2L

TA Information

Name: Islam Md Arif

Email: islamm65@mcmaster.ca

Office Hour: To be announced on A2L

Class Times

Mondays @ 10:30 -- 12:20 h

Wednesdays @ 10:30 -- 11:20 h

As per SimplySyllabus instructions, locations of classrooms are not provided in the Syllabus. Please see Mosaic for locations.

Class Format

In-person attendance is required for this course.

Course Dates: 01/05/2026 - 04/07/2026

Units: 3.00

Course Delivery Mode: In Person

Course Description: Details of nuclear safety principles, such as defense in depth. Energy generation and conversion, heat transfer and transport in a nuclear reactor. Thermal margins and safety limits. Aging of reactor components. Safety concepts as they relate to reactor sub-systems: software, reactor physics, pressure boundaries, containment, shutdown systems, emergency core cooling, and beyond design basis protection systems. Three lectures; second term Prerequisite(s): ENGPYHS 3D03 or 3D04

Instructor-Specific Course Information

Course assessments are as follows:

1. **Assignments** will be posted to A2L and are intended to help students stay on top of course material. Assignments will be marked by the TA and returned to A2L.
2. All students will contribute to a **group project**. Details of the expectations of the group project will be provided in the Group Project Outline on A2L. Students are encouraged to engage with the instructor early on their projects.
3. Graduate students enrolled in ENGPYHS 6NE3 will also be required to complete an **independent project**. Details of the expectations of the group project will be provided in the Independent Project Outline on A2L.
4. There will be a **midterm exam** part way through the semester. The scope and expectations of the midterm exam will be communicated in-class in advance of the exam. The exam will be open book (e.g. lecture slides, books, assignments, notes) but electronics will not be permitted (except a calculator).
5. The **final exam** will follow the same format of the midterm exam but with different scope, which will be defined on A2L.

To maximize your success in this course, you should:

1. Attend lectures, review lecture slides, and literature reading assigned in-class.
2. Frequently review A2L for course information.

3. Work with your peers to ensure you understand course content.
4. Aim to understand concepts, only memorize knowledge.
5. Graduate students enrolled in 6NE3 should read the Lamarsh textbook if they haven't done so already.
6. Ask questions during lectures and office hours if anything is unclear. We're happy to help!

Important Links

- [Mosaic](#)
- [Avenue to Learn](#)
- [Student Accessibility Services - Accommodations](#)
- [McMaster University Library](#)
- [eReserves](#)

Course Learning Outcomes

- Understand fundamental principles related to nuclear safety and licensing, such as defence in depth; control, cool, and contain; the importance of codes and standards; REGDOCs; the CNSC licensing process.
- Describe the design and operation of CANDU nuclear generating stations.
- Describe the design and operation of BWR nuclear generating stations.
- Describe at a high level the unique design features of several other reactors, such as PWRs, Gen IV reactors, and research and test reactors.

Graduate Attributes

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 the Learning Outcomes in this course.

Course Schedule

A weekly breakdown of the course schedule

Week	Topic	Assessment
1	Review of nuclear fundamentals	
2	Introduction to safety and licensing	
3	CANDU: design, history, instrumentation	
4	CANDU: fuel channels and TH	
5	CANDU: fuel handling, secondary side	
Midterm Break		
6	BWR: design, history, instrumentation	
7	BWR: TH and reactor physics	
8	BWR: fuel & Fukushima	
9	Other: PWRs, HTGRs, SFRs	
10	Other: MSRs, RTRs, Fusion	
11	Project presentations	
12	Project presentations	
13	Exam preparation + contingency	

Required Materials and Texts

Please sign in with your MacID [here](#) to view your booklist

Introduction to Nuclear Engineering

Authors: J.R. Lamarsh, A.J. Baratta

Publisher: Pearson

Edition: 3rd or 4th editions are fine, as is the international edition

The Essential CANDU

Authors: Wj. Garland

Publisher: UNENE

<https://unene.ca/education/candu-textbook/>

Course Evaluation

Assessment Item	4NE3 Students	6NE3 Students
Assignments	10%	10%
Independent project	0%	15%
Group project	30%	25%
Midterm exam	30%	25%
Final exam	30%	25%

Course Evaluation Details

There are two assessment options based on whether the student is enrolled in 4NE3 (undergraduate) or 6NE3 (graduate). Students wanting to have any deliverable re-assessed will have two weeks from the time the deliverable is returned to the student. Please first see the TA for reconsideration of assignments or the midterm exam before seeing the instructor.

Undergraduate 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

Graduate Grading Scale

Graduate Student Grading Scale (Except for MBA and Master of Finance)

Grade	Points	Equivalent Percentage	Pass/Fail
A+	12	90-100	P+
A	11	85-89	P
A-	10	80-84	
B+	9	77-79	
B	8	73-76	
B-	7	70-72	
F	0	69 and under	F

MBA and Master of Finance Grading Scale

Grade	Points	Equivalent Percentage	Pass/Fail
A+	12	90-100	P+
A	11	85-89	P
A-	10	80-84	
B+	9	75-79	
B	8	70-74	

Grade	Points	Equivalent Percentage	Pass/Fail
B-	7	60-69	
F	0	59 and under	F

Late Assignments

A late penalty of 10% per day will apply to late deliverables.

Absences, Missed Work, Illness

MSAF'd assignments will be reweighed to the rest of the course deliverables. MSAF'd project deliverables will get a 3 calendar day extension. The exams are not subject to Self-Reported MSAFs as they are worth 25%+ each; faculty approved Administrative Reported MSAFs applied to exams will result in a deferred exam.

Generative AI: Some Use Permitted

Students may use generative AI for editing/translating/outlining/brainstorming/revising their work throughout the course so long as the use of generative AI is referenced and cited following citation instructions given in the syllabus. Use of generative AI outside the stated use of **editing/translating/outlining/brainstorming/revising** without citation will constitute academic dishonesty. It is the student's responsibility to be clear on the limitations for use and to be clear on the expectations for citation and reference and to do so appropriately.

Turnitin.com

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.

APPROVED ADVISORY STATEMENTS

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](#).

The following illustrates only three forms of academic dishonesty:

- plagiarism, e.g. the submission of work that is not one's own or for which other credit has been obtained.
- improper collaboration in group work.
- copying or using unauthorized aids in tests and examinations.

Authenticity / Plagiarism

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. Avenue to Learn, 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

Some courses may use on-line elements (e.g. e-mail, Avenue to Learn, 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.

Requests for Relief for Missed Academic Term Work

In the event of an absence for medical or other reasons, students should review and follow the [Policy on Requests for Relief for Missed Academic Term Work](#).

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, Avenue to Learn and/or McMaster email.