UN503

Nuclear Energy in Society: Licensing and Regulation

Course Outline January-March, 2025

INSTRUCTOR:

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COURSE DATES:

Time:	~9:00am — 3:00pm including 30min lunch and ~30min tutorial
Location:	*Room SHA 038*
	Shawenjigewining Hall, Ontario Tech University
Lectures:	January 11 and 12
	February 1 and 2
	February 22 and 23
	March 8 and 9
Exams:	Final — March 22

COURSE DESCRIPTION:

This course will describe the fundamentals on licensing and regulatory affairs in the nuclear industry. The course will describe the Nuclear Safety and Control Act, the current regulatory framework, the role of licensees, the role of the regulator, and the licensing process for reactor facilities. This course will review the how the IAEA influences global nuclear safety as well as Canada's international obligations in the field of nuclear energy. The course will also cover how oversight of reactor facilities is shared between several provincial and federal authorities.

COURSE LEARNING OUTCOMES:

Upon successful completion of the course, students should be able to:

- Describe the licensing process for reactor facilities and the Canadian Nuclear Safety Commission (CNSC) organizational structure and authorities.
- Describe how the CNSC regulates reactor facilities including licensing, compliance, enforcement and certification.
- Describe the Canadian nuclear regulatory framework. This will include an examination of key regulations, CSA standards and regulatory documents used in regulating reactor facilities.
- Describe the obligations of licensees in the nuclear industry including requirements for making reports to the regulator
- Understand the international obligations Canada has agreed to and how they impact licensing and regulation of reactor facilities.

STUDY MATERIALS:

Course presentation slides, notes and recordings made available to all students.

Textbook:	The Essential CANDU - a textbook about the CANDU nuclear reactor (https://www.unene.ca/essentialcandu/) Cost: Free
Additional Resources:	Regulatory documents available online from: The Canadian Nuclear Safety Commission The International Atomic Energy Agency Cost: Free

TOPICS COVERED:

1. The Nuclear Safety and Control Act and the role of the CNSC.
2. The Regulatory Framework and risk informed regulatory process applied by the CNSC. This will include a review of several key regulations, Standards and Regulatory Documents.
3. The licensing process for new and existing reactor facilities.
4. The CNSC regulatory oversight program including compliance monitoring and enforcement.
5. The shared responsibility for regulation between CNSC and their federal and provincial partners.
6. Canada's role in global nuclear safety.

MARKING:

Quizzes (4):	20% (5% each)
Assignments (2):	20% (10% each)
Group Project:	20%
Final exam:	40%

Grading scale: 0-100%.

Assignments handed in late will receive a penalty of 2% per day, up to 5 days (or 10%); assignments handed in after this time will receive no grade unless the delay is accompanied by an approved request for accommodation.

COURSE SCHEDULE:

This course is taught in 8 modules over 4 weekends. The schedule for each day is provided in the table below. This schedule is tentative and should be viewed as an approximation.

Note that the final ~30 minutes of each class is intended to act as an office hour/tutorial for open question and discussion time. Additional online office hours with the instructor will be available by appointment.

Introduction and administration

0.1 Safety brief
0.2 Round table introductions
0.3 Course objectives, grading criteria, outcomes, and scope

Module 1 Overview of the federal nuclear regulator

1.1 Nuclear Regulation in Canada, why is nuclear power regulated federally
1.2 The NSCA and establishment of a federal nuclear regulator
1.3 How regulations are made, difference between regulations and standards
1.4 Organizational structure of the CNSC and division of responsibilities
1.5 Regulatory Framework overview, how it all fits together
1.6 CNSC rules of procedure and regulatory fundamentals

Pertinent regulatory requirements for this module

- Nuclear Safety and Control Act, S.C. 1997, c. 9; Parts 1, 2, 3, 8, 9, 10, 18, 20, 21,
- Regulatory Documents 3.5.3, 3.6

Module 2 Licensing

2.1 The CNSC licensing process for new facilities, existing facilities licence renewals, licence amendments and commission decisions
2.2 Impact and environmental assessment, including an overview of the Impact Assessment Act
2.3 Public and indigenous engagement
2.4 Identification and review of pertinent regulations and regulatory documents

Pertinent regulatory requirements for this module

- Review of the Nuclear Safety and Control Act, S.C. 1997, c. 9; Parts 24, 25
- Class I Nuclear Facilities Regulations, SOR/2000-204, Part 1, 3, 4, 5, 6, 8
- General Nuclear Safety and Control Regulations, SOR/2000-202; Parts 1, 2, 3, 6, 12, 15, 17
- REGDOCs 1.1.1, 1.1.2, 1.1.3, 3.5.1, 3.4.1, 3.2.1, 3.2.2, 3.3.1

Module 3 Regulatory Affairs

3.1 Nuclear Safety and Control Act, S.C. 1997, c. 9
3.2 Powers of the commission, designated officers and inspectors
3.3 Licensing basis (Licenses, Licence Condition Handbooks and Regulatory Commitments)
3.4 Classes of CNSC licenses
3.5 Reporting Requirements, how to decide what needs to be reported
3.6 CNSC inspection process

Pertinent regulatory requirements for this module

- Nuclear Safety and Control Act, S.C. 1997, c. 9 (0.5hr); Parts 26, 27, 30, 31, 32, 33, 35, 36, 38, 39, 40, 41, 43, 44, 48, 65
- REGDOC 3.5.2

Module 4 The role of Management System in Regulatory Affairs and Licensing

4.1 Description of management system including key elements
4.2 Performance assessment
4.3 Problem Identification and Resolution
4.4 Safety Culture
4.4 Supply and Contractor Management

4.5 Certified staff

Pertinent regulatory requirements for this module

- CSA N286, N299
- REGDOC 2.1.1, 2.1.1, 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.5

Module 5 Facilities and Equipment

5.1 The role of safety analysis in licensing and regulatory affairs
5.2 Design requirements
5.3 Fitness for service requirements including the role of the authorized nuclear inspector

Pertinent regulatory requirements for this module

- REGDOC 2.4.1, 2.4.4, 2.4.5, 2.5.1, 2.5.2, 2.6.1, 2.6.2, 2.6.3

Module 6 Health, safety and environment

6.1 Overview of the RP Regulations

- Will include Health Canada's Responsibilities

6.2 Regulatory aspects of ALARA, dose and hazard control
6.3 Conventional Health and Safety

- Will include an introduction to Ontario provincial health and safety requirements

6.4 Environmental Protection, effluent monitoring, environmental risk assessment

- Will include interactions with Dept of Fisheries and Oceans (DFO) and Environment, Climate Change Canada (ECCC)

6.5 Waste management

Pertinent regulatory requirements for this module

- Radiation Protection Regulations (SOR/2000-203) Part 3, 4, 5, 6, 7, 8, 12, 17, 18, 20, 21, 22, 23
- REGDOC 2.7.1, 2.8.1, 2.9.1, 2.9.2

Module 7 Emergency Preparedness and Security

7.1 Emergency management and fire protection,

- Including the federal and provincial response plans

7.2 Security
7.3 Safeguards and non-proliferation

Pertinent regulatory requirements for this module

- Nuclear Security Regulations (SOR/2000-209) Part 6, 7, 8, 9, 10, 11, 17, 18, 25, 26, 27
- REGDOC 2.10.1, 2.10.2

Module 8 Stakeholder relations and Commission proceedings

8.1 Indigenous engagement, consultation and engagement
8.2 Public engagement
8.3 Industry groups (COG, WANO, INPO)
8.4 Description of final project
8.5 IAEA – INES, IRS, IRRS, OSSART

Pertinent regulatory requirements for this module

- REGDOC 3.2.1, 3.2.2

DELIVERY FORMAT AND ATTENDANCE:

This course will be delivered **in hybrid mode** with simultaneous in-person lecturing in the classroom and online/distance lecturing via Zoom.

Regular attendance and active participation are strongly encouraged. The path to success in this course is through consistent engagement; missed classes are at the student's own risk.

Additionally, students are responsible for informing the instructor(s) of any absences in a timely manner, as far in advance as possible.

To attend online lectures, students must be physically located in Canada. Online attendance from outside of the country is not possible.

In-person attendance is required for the final exam.

For students whose full-time residence is outside of Ontario, it will be possible to arrange for invigilated in-person writing of the final exam at an examination center or college/university in their home province. Invigilated exams must be on the same date (or the day before if weekend examination is not available) and under the same writing conditions as in-province students.

Lecture recordings will be available to students a couple of days after every lecture. Students are encouraged to listen the recordings while they study for the exam or working on the assignments.

TECHNOLOGY AND HARDWARE:

In order to participate fully and make best use of the course materials, students should have a computer with a minimum 12" screen, a camera, and a microphone-equipped headset.

ACADEMIC INTEGRITY:

Academic misconduct includes, but is not limited to: Cheating on examinations, assignments, reports, or other work used to evaluate student performance. Cheating includes, but is not limited to, copying from another student's work or allowing one's own work to be copied, submitting another person's work as one's own, fabrication of data, consultation with an unauthorized person during an examination, or use of unauthorized aids, including generative AI. Penalties for academic misconduct include failing the course component, entire course and/or ejection from the UNENE G.Dip. or M.Eng. program.