ENGG9744

Nuclear Safety, Security and Safeguards

Term Two // 2021

School of Mechanical and Manufacturing Engineering // UNSW Engineering

Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
Edward Obbard	e.obbard@unsw.edu.au	Please email me to arrange a meeting	Ainsworth Building J17	93857625

School Contact Information

Location

UNSW Mechanical and Manufacturing Engineering

Ainsworth building J17, Level 1

Above Coffee on Campus

Hours

9:00–5:00pm, Monday–Friday*

*Closed on public holidays, School scheduled events and University Shutdown

Web

School of Mechanical and Manufacturing Engineering

Engineering Student Support Services

Engineering Industrial Training

UNSW Study Abroad and Exchange (for inbound students)

UNSW Future Students

Phone

(+61 2) 9385 8500 – Nucleus Student Hub

(+61 2) 9385 7661 – Engineering Industrial Training

(+61 2) 9385 3179 – UNSW Study Abroad and UNSW Exchange (for inbound students)

(+61 2) 9385 4097 – School Office**

**Please note that the School Office will not know when/if your course convenor is on campus or available

Email

Engineering Student Support Services – current student enquiries

- e.g. enrolment, progression, clash requests, course issues or program-related queries

Engineering Industrial Training – Industrial training questions

UNSW Study Abroad – study abroad student enquiries (for inbound students)

UNSW Exchange – student exchange enquiries (for inbound students)

UNSW Future Students – potential student enquiries

- e.g. admissions, fees, programs, credit transfer

School Office – School general office administration enquiries

- NB: the relevant teams listed above must be contacted for all student enquiries. The School will only be able to refer students on to the relevant team if contacted

Course Details

Credit Points 6

Summary of the Course

Students will learn from professionals at the Australian Nuclear Science and Technology Organisation (ANSTO) and from the Australian Safeguards and Non-proliferation Office (ASNO) both how specific nuclear materials and safety- or security-critical systems are regulated in the organisational, national and international context. The course emphasises both knowledge and application. The assessments include presenting and critiquing safety cases and threat assessments, applying the tools for engineering safety assessments, and planning and communication for a localised nuclear accident case study. All these skills will be applicable in a wide range of contexts.

Course Aims

This course is aimed at achieving an advanced level of understanding of the regulatory challenges that face senior professionals in the nuclear industry, as well as those in other safety-critical or highly regulated industries which share similar challenges. These challenges are summarised as nuclear safety, nuclear security and nuclear safeguards. As such the course is wide in scope, but the common thread through all of this is that safety, security and safeguards are connected by their similarities in terms of the assessment and mitigation of threat and in the application of detailed conceptual and legal frameworks to ensure that these occur.

Course Learning Outcomes

After successfully completing this course, you should be able to:

Learning Outcome	EA Stage 1 Competencies
1. Present, critique and defend a safety case for a nuclear (or other safety-critical) activity	PE1.2, PE1.6, PE2.1, PE2.3, PE2.4, PE3.1, PE3.2, PE3.4, PE3.5
2. Formulate threat assessments and specify physical protection measures	PE2.4, PE3.6
3. Prepare operational plans and response for a nuclear emergency	PE3.2, PE3.3
4. Name the organisations, regulations and standards that influence the operation of nuclear facilities	PE1.1, PE1.3
5. Explain how the operators of nuclear facilities mitigate nuclear proliferation risks	PE1.3
6. Apply nuclear design principles and safety analysis methodologies	PE1.5, PE1.6, PE2.1, PE2.2
7. Assess consequences of radiological contamination	PE2.2

IAEA International Nuclear Management Academy

This course also provides several competency areas of the IAEA International Nuclear Management Academy (INMA) learning outcomes for masters' level course in Nuclear Technology Management

INMA Competency Area*	**INMA Competency Level**
1.2 International nuclear organizations	**1**
1.3 National nuclear technology policy, planning and politics	**1**
1.4 Nuclear standards	**1**
1.5 Nuclear law	**1**
1.8 Nuclear licensing, licensing basis and regulatory processes	**2**
1.9 Nuclear security	**2**
1.10 Nuclear safeguards	**2**
1.11 Transport of nuclear goods and materials	**1**
2.1 Nuclear power plant and other facility design principles	**1**
2.2 Nuclear power plant/facility operational systems	**1**
2.6 Nuclear safety principles and analysis	**3**
2.7 Radiological safety and protection	**3**
3.13 Nuclear incident management, emergency planning and response	**1**
4.3 Communication strategies for leaders in nuclear	**1**

*Grosbois, J. de, F. Adachi, and H. Hirose. 2017. "International Nuclear Management Academy Master's Programs in Nuclear Technology Management." IAEA.

Teaching Strategies

Fully online. This course is UNSW digital uplift content, which is taught online through the online learning platform.

Additional Course Information

This is a postgraduate course convened by the School of Mechanical and Manufacturing Engineering. It is part of the MEngSci Nuclear Engineering specialization and can be taken as an elective by 3rd or 4th year students from other schools and faculties on the approval of home school and the ENGG9744 course convener.

Assessment

Assessment Tasks

Assessment task	Weight	Due Date	Student Learning Outcomes Assessed
Safety Case	30%	02/08/2021 12:00 PM	1, 4, 6, 7
Threat Assessment	15%	07/07/2021 12:00 PM	2, 4
Emergency Scenario	15%	Instalments due on 18th, 23rd, 28th June	3, 6, 7
Final written examination	40%	Scheduled during exam time	4, 5, 6, 7

Assessment Details

Assessment 1: Safety Case

Start date: Not Applicable

Length: max 40 pages

Details:

In the Safety Case project, students write a safety case for a change in activity at a nuclear test reactor. There is an individual written report, and a safety case presentation. Grades are given based on a marking rubric. For late submissions, 20% of marks are deducted per day, reaching zero marks on 7th August, 2021. Marks are returned by 11th August.

The three most advanced learning outcomes (1-3) each correspond to an online, multimedia assignment. The safety case assignment is marked both by student peers and by the course convener. The reason for this peer review is to teach the essential function of a safety/security case for licensing - which is for it to be openly critiqued. Therefore advocating for one's own assessments, as well as giving and receiving objective criticism, are essential skills for all levels of professionalism in safety-critical industries, and are assessed in this course.

Submission notes: Submitted through Turnitin, in Moodle.

Turnitin setting: This assignment is submitted through Turnitin and students do not see Turnitin similarity reports.

Assessment 2: Threat Assessment

Start date: Not Applicable

Length: 800 words, plus threat assessment table of around 30 threats

Details:

Students work in groups to produce a design basis threat assessment for a nuclear facility. The assignment is graded by a rubric. For late submissions, 20% of marks are deducted per day, reaching zero marks on 12th July, 2021. Marks are returned by 14th July.

Submission notes: Submitted through Turnitin, in moodle.

Turnitin setting: This assignment is submitted through Turnitin and students do not see Turnitin similarity reports.

Assessment 3: Emergency Scenario

Start date: 14/06/2021 09:00 AM

Length: Variable, 200-300 words.

Details:

The emergency scenario assignment is a staged exercise that occurs over 14th-28th June. It is conducted individually, in response to notifications that students will receive during this time from the learning management system. As this is staged assignment, there are no marks for late submissions in a given stage, but missing a stage does not prevent you from trying the next one on time. Marks are returned by 2nd July.

Submission notes: Submitted in Moodle

Turnitin setting: This is not a Turnitin assignment

Assessment 4: Final written examination

Start date: Not Applicable

Length: 2 hr

Details: The final exam is an open book 2 hour test conducted through the learning management system. The exam is conducted synchronously, meaning no marks can be awarded after the exam has closed.

Submission notes: Submitted via Moodle.

Turnitin setting: This is not a Turnitin assignment

Attendance Requirements

The course is conducted fully online. The content is extensive and sometimes challenging meaning that attendance at weekly tutorials with the course convener while optional is strongly encouraged. Students will need to make arrangements to conduct group work together. Some assignments, such as the safety case presentation are scheduled in advance and attendance is mandatory to obtain the grades.

Course Schedule

View class timetable

Timetable

Date	Type	Content
O Week: 25 May - 28 May		
Week 1: 31 May - 4 June	Topic	Nuclear Safeguards
Week 2: 7 June - 11 June	Topic	Material Accounting
Week 3: 14 June - 18 June	Topic	Radiation Safety
Week 4: 21 June - 25 June	Topic	Incident Management
Week 5: 28 June - 2 July	Topic	Nuclear Security
Week 6: 5 July - 9 July	Topic	Nuclear safety fundamentals
Week 7: 12 July - 16 July	Topic	The safety case
Week 8: 19 July - 23 July	Topic	Safety Assessment
Week 9: 26 July - 30 July	Topic	Safety Analysis
Week 10: 2 August - 6 August	Presentation	Safety Case Presentations

Resources

Prescribed Resources

The most important resources are provided as pdf documents as part of the course.

Recommended Resources

1. Nuclear Safeguards, Security and Nonproliferation: Achieving Security with Technology and Policy
Author: James Doyle
ISBN 978-0750686730
Year Published 2008
Publisher Heinemann-Butterworth

2. Three Mile Island: A Nuclear Crisis in Historical Perspective
Author: J. Samuel Walker
ISBN 978-0520246836
Year Published 2006

3. Ablaze (The Story of the Heroes and Victims of Chernobyl)
Author: Piers Paul Read
ISBN 978-0679408192
Publisher Random House

4. Websites: Particularly IAEA documents (provided in the course materials). Also: WNA, ANS, NEI, WINS

Course Evaluation and Development

Feedback on the course is gathered periodically using various means, including th UNSW MyExperience process, informal discussion in the course, and the School's Student/Staff meetings. Your feedback is taken seriously, and continual improvements are made to the course based, in part, on such feedback.

Submission of Assessment Tasks

Assessment submission and marking criteria

Should the course have any non-electronic assessment submission, these should have a standard School cover sheet.

All submissions are expected to be neat and clearly set out. Your results are the pinnacle of all your hard work and should be treated with due respect. Presenting results clearly gives the marker the best chance of understanding your method; even if the numerical results are incorrect.

Marking guidelines for assignment submissions will be provided at the same time as assignment details to assist with meeting assessable requirements. Submissions will be marked according to the marking guidelines provided.

Late policy

Work submitted late without an approved extension by the course coordinator or delegated authority is subject to a late penalty of 20 percent (20%) of the maximum mark possible for that assessment item, per calendar day.

The late penalty is applied per calendar day (including weekends and public holidays) that the assessment is overdue. There is no pro-rata of the late penalty for submissions made part way through a day.

Work submitted after the ‘deadline for absolute fail’ is not accepted and a mark of zero will be awarded for that assessment item.

For some assessment items, a late penalty may not be appropriate. These are clearly indicated in the course outline, and such assessments receive a mark of zero if not completed by the specified date. Examples include:

1. Weekly online tests or laboratory work worth a small proportion of the subject mark, or
2. Online quizzes where answers are released to students on completion, or
3. Professional assessment tasks, where the intention is to create an authentic assessment that has an absolute submission date, or
4. Pass/Fail assessment tasks.

Examinations

You must be available for all quizzes, tests and examinations. For courses that have final examinations, these are held during the University examination periods: February for Summer Term, May for T1, August for T2, and November/December for T3.

Please visit myUNSW for Provisional Examination timetable publish dates. For further information on exams, please see the Exams webpage.

Special Consideration

If you have experienced an illness or misadventure beyond your control that will interfere with your

assessment performance, you are eligible to apply for Special Consideration prior to submitting an assessment or sitting an exam.

UNSW now has a Fit to Sit / Submit rule, which means that if you attempt an exam or submit a piece of assessment, you are declaring yourself fit enough to do so and cannot later apply for Special Consideration.

For details of applying for Special Consideration and conditions for the award of supplementary assessment, please see the information on UNSW's Special Consideration page.

Please note that students will **not** be required to provide **any** documentary evidence to support absences from any classes missed **because of COVID-19 public health measures such as isolation**. UNSW will **not** be insisting on medical certificates from anyone deemed to be a positive case, or when they have recovered. Such certificates are difficult to obtain and put an unnecessary strain on students and medical staff.

Applications for special consideration **will** be required for assessment and participation absences – but no documentary evidence **for COVID 19 illness or isolation** will be required.

Academic Honesty and Plagiarism

UNSW has an ongoing commitment to fostering a culture of learning informed by academic integrity. All UNSW students have a responsibility to adhere to this principle of academic integrity. Plagiarism undermines academic integrity and is not tolerated at UNSW. *Plagiarism at UNSW is defined as using the words or ideas of others and passing them off as your own.*

Plagiarism is a type of intellectual theft. It can take many forms, from deliberate cheating to accidentally copying from a source without acknowledgement. UNSW has produced a website with a wealth of resources to support students to understand and avoid plagiarism, visit: student.unsw.edu.au/plagiarism. The Learning Centre assists students with understanding academic integrity and how not to plagiarise. They also hold workshops and can help students one-on-one.

You are also reminded that careful time management is an important part of study and one of the identified causes of plagiarism is poor time management. Students should allow sufficient time for research, drafting and the proper referencing of sources in preparing all assessment tasks.

If plagiarism is found in your work when you are in first year, your lecturer will offer you assistance to improve your academic skills. They may ask you to look at some online resources, attend the Learning Centre, or sometimes resubmit your work with the problem fixed. However more serious instances in first year, such as stealing another student's work or paying someone to do your work, may be investigated under the Student Misconduct Procedures.

Repeated plagiarism (even in first year), plagiarism after first year, or serious instances, may also be investigated under the Student Misconduct Procedures. The penalties under the procedures can include a reduction in marks, failing a course or for the most serious matters (like plagiarism in an honours thesis) even suspension from the university. The Student Misconduct Procedures are available here:

www.gs.unsw.edu.au/policy/documents/studentmisconductprocedures.pdf

Academic Information

Credit points

Course credit is calculated in Units-Of-Credit (UOC). The normal workload expectation for one UOC is approximately 25 hours per term. This includes class contact hours, private study, other learning activities, preparation and time spent on all assessable work.

Most coursework courses at UNSW are 6 UOC and involve an estimated 150 hours to complete, for both regular and intensive terms. Each course includes a prescribed number of hours per week (h/w) of scheduled face-to-face and/or online contact. Any additional time beyond the prescribed contact hours should be spent in making sure that you understand the lecture material, completing the set assignments, further reading, and revising for any examinations.

On-campus class attendance

Public distancing conditions must be followed for all face-to-face classes. To ensure this, only students enrolled in those classes will be allowed in the room. No over-enrolment is allowed in face-to-face classes. Students enrolled in online classes can swap their enrolment from online to a **limited** number of on-campus classes by Sunday, Week 1. Please refer to your course's Microsoft Teams and Moodle sites for more information about class attendance for in-person and online class sections/activities.

Your health and the health of those in your class is critically important. You must stay at home if you are sick or have been advised to self-isolate by NSW health or government authorities. Current alerts and a list of hotspots can be found here. **You will not be penalised for missing a face-to-face activity due to illness or a requirement to self-isolate.** We will work with you to ensure continuity of learning during your isolation and have plans in place for you to catch up on any content or learning activities you may miss. Where this might not be possible, an application for fee remission may be discussed. Further information is available on any course Moodle or Teams site.

In certain classroom and laboratory situations where physical distancing cannot be maintained or there is a high risk that it cannot be maintained, face masks will be considered **mandatory PPE** for students and staff.

For more information, please refer to the
FAQs: https://www.covid-19.unsw.edu.au/safe-return-campus-faqs

Guidelines

All students are expected to read and be familiar with UNSW guidelines and polices. In particular, students should be familiar with the following:

- Attendance
- UNSW Email Address
- Special Consideration
- Exams
- Approved Calculators
- Academic Honesty and Plagiarism

Important Links

- Moodle
- Lab Access
- Computing Facilities
- Student Resources
- Course Outlines
- Faculty Transitional Arrangements for COVID-19
- Makerspace
- UNSW Timetable
- UNSW Handbook
- Equitable Learning Services

Image Credit

IAEA ImagebankFollow
Safeguards Organizing Team (03410999)
Organizing Team of the Symposium on International Safeguards: Building Future Safeguards Capabilities. IAEA headquarters, Vienna, Austria. 29 October 2018

Photo Credit: Dean Calma / IAEA

CRICOS

CRICOS Provider Code: 00098G

Acknowledgement of Country

We acknowledge the Bedegal people who are the traditional custodians of the lands on which UNSW Kensington campus is located.

Appendix: Engineers Australia (EA) Professional Engineer Competency Standard

Program Intended Learning Outcomes	
Knowledge and skill base	
PE1.1 Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline	✓
PE1.2 Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline	✓
PE1.3 In-depth understanding of specialist bodies of knowledge within the engineering discipline	✓
PE1.4 Discernment of knowledge development and research directions within the engineering discipline	
PE1.5 Knowledge of engineering design practice and contextual factors impacting the engineering discipline	✓
PE1.6 Understanding of the scope, principles, norms, accountabilities and bounds of sustainable engineering practice in the specific discipline	✓
Engineering application ability	
PE2.1 Application of established engineering methods to complex engineering problem solving	✓
PE2.2 Fluent application of engineering techniques, tools and resources	✓
PE2.3 Application of systematic engineering synthesis and design processes	✓
PE2.4 Application of systematic approaches to the conduct and management of engineering projects	✓
Professional and personal attributes	
PE3.1 Ethical conduct and professional accountability	✓
PE3.2 Effective oral and written communication in professional and lay domains	✓
PE3.3 Creative, innovative and pro-active demeanour	✓
PE3.4 Professional use and management of information	✓
PE3.5 Orderly management of self, and professional conduct	✓
PE3.6 Effective team membership and team leadership	✓