



UNSW Course Outline

ZEIT8510 Explosive Ordnance Design and Systems - 2024

Published on the 11 Feb 2024

General Course Information

Course Code : ZEIT8510

Year : 2024

Term : Semester 1

Teaching Period : Z1

Is a multi-term course? : No

Faculty : UNSW Canberra

Academic Unit : School of Engineering and Technology

Delivery Mode : Online

Delivery Format : Standard

Delivery Location : UNSW Canberra at ADFA

Campus : UNSW Canberra

Study Level : Postgraduate

Units of Credit : 6

Useful Links

[Handbook Class Timetable](#)

Course Details & Outcomes

Course Description

This course provides a critical understanding of the construction and function of various EO systems and subsystems required for delivery to the target. The course develops an understanding of how explosives are harnessed to achieve the required capability, and the use of

parametric / sensitivity analysis for iterative design. Aero-ballistic properties will also be discussed in light of subsonic, transonic, supersonic and hypersonic effects. Inensitive munition (IM) design principles will also be explored.

Enrolment in this course is only available to students nominated by the Department of Defence.

Course Aims

This course aims to provide a critical understanding of the construction and function of various EO systems and subsystems required for delivery to the target.

Course Learning Outcomes

Course Learning Outcomes
CLO1 : Critically evaluate the requirements definition as well as the function and performance specifications (FPS) for an EO system.
CLO2 : Evaluate the systems specification and design of an EO system in terms of efficiency, functionality and capability.
CLO3 : Describe the design philosophy behind IM-compliant systems.
CLO4 : Critically evaluate the challenges for delivery of supersonic, hypersonic and submerged weapon systems.
CLO5 : Describe the subsystems used in EO systems with regards to target detection, tracking, propulsion, control, and on-board power systems.

Course Learning Outcomes	Assessment Item
CLO1 : Critically evaluate the requirements definition as well as the function and performance specifications (FPS) for an EO system.	<ul style="list-style-type: none">• Online Class Quiz 1• Online Quiz 3• Capstone Assignment
CLO2 : Evaluate the systems specification and design of an EO system in terms of efficiency, functionality and capability.	<ul style="list-style-type: none">• Online Class Quiz 1• Online Quiz 3• Capstone Assignment
CLO3 : Describe the design philosophy behind IM-compliant systems.	<ul style="list-style-type: none">• Online Quiz 2• Online Quiz 3• Capstone Assignment
CLO4 : Critically evaluate the challenges for delivery of supersonic, hypersonic and submerged weapon systems.	<ul style="list-style-type: none">• Online Quiz 2• Online Quiz 3• Capstone Assignment
CLO5 : Describe the subsystems used in EO systems with regards to target detection, tracking, propulsion, control, and on-board power systems.	<ul style="list-style-type: none">• Online Quiz 2• Online Quiz 3• Capstone Assignment

Learning and Teaching Technologies

Moodle - Learning Management System

Learning and Teaching in this course

The course is structured around a series of lecture-style presentations and discussions on specialist topics. All content will be available online including pre-recorded content. The course notes, which form the basis of the presentations, are supplemented by commercial and technical resource materials which will be available on the MOODLE site for the course.

Reference to these resources is recommended in preparation for the quizze(s). Your ability to utilize and integrate a range of technical resources in the assessment tasks will be a major criterion for superior performance in the course. Reference to these supplementary resources will greatly enhance your understanding of the various topics and develop an appreciation of the many types and formats of reference material which you may expect to be exposed to, and make use of, in your professional life.

Your active participation in the presentations is highly valued and will contribute significantly to the overall benefit and outcomes of the course.

Moodle is the Learning Management System used at UNSW Canberra. All courses have a Moodle site which will become available to students at least one week before the start of semester. Please find all help and documentation (including Blackboard Collaborate) at the [Moodle Support](#) page.

UNSW Moodle supports the following web browsers:

- » Google Chrome 50+
 - » Safari 10+
 - ** Internet Explorer is not recommended
- ** Addons and Toolbars can affect any browser's performance.

Operating systems recommended are:

Windows 7, 10, Mac OSX Sierra, iPad iOS10

For further details about system requirements click [here](#).

Log in to Moodle [here](#).

If you need further assistance with Moodle:

For enrolment and login issues please contact:

IT Service Centre

Email: itservicecentre@unsw.edu.au

Phone: (02) 9385-1333

International: +61 2 9385 1333

For all other Moodle issues please contact:

External TELT Support

Email: externalteltsupport@unsw.edu.au

Phone: (02) 9385-3331

International: +61 2 938 53331

Opening hours:

Monday – Friday 7:30am – 9:30 pm

Saturday & Sunday 8:30 am – 4:30pm

Additional Course Information

Referencing

In this course, students are required to reference following the APA 7 / Chicago NB referencing style. Information about referencing styles is available at: <https://guides.lib.unsw.adfa.edu.au/c.php?g=472948&p=3246720>

Study at UNSW Canberra

<https://www.unsw.adfa.edu.au/study>

Study at UNSW Canberra has lots of useful information regarding:

- Where to get help
- Administrative matters
- Getting your passwords set up
- How to log on to Moodle
- Accessing the Library and other areas.

Additional Information as required

CRICOS Provider no. 00098G

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
Online Class Quiz 1 Assessment Format: Individual	20%	Start Date: 11/03/2024 08:00 AM Due Date: 17/03/2024 11:59 PM
Online Quiz 2 Assessment Format: Individual	20%	Start Date: 22/04/2024 12:00 AM Due Date: 28/04/2024 11:59 PM
Online Quiz 3 Assessment Format: Individual	20%	Start Date: 20/05/2024 12:00 AM Due Date: 26/05/2024 11:58 PM
Capstone Assignment Assessment Format: Individual	40%	Start Date: Not Applicable Due Date: 07/06/2024 11:58 PM

Assessment Details

Online Class Quiz 1

Assessment Overview

n/a

Course Learning Outcomes

- CLO1 : Critically evaluate the requirements definition as well as the function and performance specifications (FPS) for an EO system.
- CLO2 : Evaluate the systems specification and design of an EO system in terms of efficiency, functionality and capability.

Online Quiz 2

Assessment Overview

n/a

Course Learning Outcomes

- CLO3 : Describe the design philosophy behind IM-compliant systems.
- CLO4 : Critically evaluate the challenges for delivery of supersonic, hypersonic and submerged weapon systems.
- CLO5 : Describe the subsystems used in EO systems with regards to target detection, tracking, propulsion, control, and on-board power systems.

Online Quiz 3

Assessment Overview

n/a

Course Learning Outcomes

- CLO1 : Critically evaluate the requirements definition as well as the function and performance specifications (FPS) for an EO system.
- CLO2 : Evaluate the systems specification and design of an EO system in terms of efficiency, functionality and capability.
- CLO3 : Describe the design philosophy behind IM-compliant systems.
- CLO4 : Critically evaluate the challenges for delivery of supersonic, hypersonic and submerged weapon systems.
- CLO5 : Describe the subsystems used in EO systems with regards to target detection, tracking, propulsion, control, and on-board power systems.

Capstone Assignment

Assessment Overview

n/a

Course Learning Outcomes

- CLO1 : Critically evaluate the requirements definition as well as the function and performance specifications (FPS) for an EO system.
- CLO2 : Evaluate the systems specification and design of an EO system in terms of efficiency, functionality and capability.
- CLO3 : Describe the design philosophy behind IM-compliant systems.
- CLO4 : Critically evaluate the challenges for delivery of supersonic, hypersonic and submerged weapon systems.
- CLO5 : Describe the subsystems used in EO systems with regards to target detection, tracking, propulsion, control, and on-board power systems.

Detailed Assessment Description

ZEIT 8510 Capstone Assignment (40%) Due 14 Jun 2355 h Include an executive summary (one page limit) Word limit 7500 words, excluding technical appendices (unlimited)

The use of generative AI such as Chat GPT is expressly prohibited.

This is an academic paper, so take care to use appropriate references.

Guided by the assignment rubric, evaluate and compare the systems specification and design of the following two EO systems in terms of efficiency, functionality and capability:

- U.S. M93 Hornet Wide Area Munition (WAM) • Russian PTKM-1R Top-attack anti-tank mine

Context: You are deployed to a Joint Task Group in a foreign conflict as a member of the Weapons Technical Intelligence team. A new munition, the Russian origin PTKM-1R top-attack anti-tank mine, has been encountered by allied operators, being used by the opposing land force, although none have been recovered for analysis and exploitation. You have been tasked by the detachment Commander to provide a critical evaluation and report on this previously unknown weapon with a corresponding threat assessment based on the system design/specifications, mode of delivery, accuracy, damage mechanism and effects, targeting, communications, vulnerabilities, etc etc. The Commander requests a comparison of capability between the known, similar munition of American origin, the M93 Hornet Wide Area Munition. http://www.armyrecognition.com/weapons_defence_industry_military_technology_uk/russia_completes_design_of_ptkm-1r_topattack_anti_tank_mine.html

It goes without saying to be circumspect when searching Russian websites.

Extension activity: What is on the horizon in terms of top-attack anti-tank mines?

General Assessment Information

All marks obtained for assessment items during the session are provisional. The final mark as published by the university following the assessment review group meeting is the only official mark.

Online quiz 1 is due 17 Mar, feedback and grades will be given to students by the census date (24th of March).

Late Submission of Assessment

Unless prior arrangement is made with the lecturer or a formal application for special consideration is submitted, a penalty of 5% of the total available mark for the assessment will apply for each day that an assessment item is late up to a maximum of 5 days (120 hours) after which an assessment can no longer be submitted and a grade of 0 will be applied.

Use of Generative AI in Assessments

NO ASSISTANCE

It is prohibited to use any software or service to search for or generate information or answers. If

its use is detected, it will be regarded as serious academic misconduct and subject to the standard penalties, which may include 00FL, suspension and exclusion.

Grading Basis

Standard

Requirements to pass course

A 50% overall mark with submission of all pieces of assessment is required to pass the course

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 26 February - 1 March	Online Activity	Introductory Chemistry and Physics
Week 2 : 4 March - 8 March	Online Activity	Detonics and System Engineering
Week 3 : 11 March - 15 March	Online Activity	The Explosive Train and Metal-Pushing
	Assessment	Quiz 1
Week 4 : 18 March - 22 March	Online Activity	Introduction to Warheads and Insensitive Munitions
Week 5 : 25 March - 29 March	Online Activity	Introduction to Target Effects and EO Design
Week 6 : 1 April - 5 April	Online Activity	Underwater Effects and Principles and Operational Characteristics of Launch Systems
Week 7 : 22 April - 26 April	Online Activity	EO Subsystems and External Ballistics
	Assessment	Quiz 2
Week 8 : 29 April - 3 May	Online Activity	Performance Calculations
Week 9 : 6 May - 10 May	Online Activity	Advanced Calculations
Week 10 : 13 May - 17 May	Online Activity	Workshop and IM Formulations and Processing
Week 11 : 20 May - 24 May	Online Activity	Structural Insensitive Munitions Design Principles and Mitigation Features
	Assessment	Quiz 3
Week 12 : 27 May - 31 May	Online Activity	Capstone Assignment Focused Work
Week 13 : 3 June - 7 June	Online Activity	EO Systems of the Near- to Mid-Future
	Assessment	Capstone Assignment

Attendance Requirements

Students are strongly encouraged to attend all classes and review lecture recordings.

Course Resources

Prescribed Resources

Fleeman, E.L., Missile Design Guide, American Institute of Aeronautics and Astronautics, Inc. (2022), ISBN: 978-1-62410-618-7

Hazell, PJ: Armour: Materials, Theory, and Design, CRC Press (2023), 2nd ed ISBN: 9780367419714

Zukas, J.A. and Walters, W.P. (eds): Explosive Effects and Applications, Springer-Verlag (1998), ISBN 978-0-387-95558-2

Recommended Resources

Akhavan, J: The Chemistry of Explosives, 3rd Ed, RSC Publishing (2011), ISBN: 978-1-84973-330-4

Callister, W. D. & Rethwisch, D. G: Materials Science and Engineering: An Introduction, 10th Ed, Wiley (2018), ISBN-13: 9781119321590

Carlucci, D.E., Jacobson, S. S., Ballistics: Theory and Design of Guns and Ammunition, CRC Press (2007), ISBN: 9 781420066 197

Cooper, P.W., Explosives Engineering, Wiley-VCH (1996), ISBN: 0-471-18636-8

Hazell, PJ: The Story of the Gun: History, Science, and Impact on Society, Springer (2021), ISBN: 978-3-030-73652-1

Meyers, MA: Dynamic behaviour of materials, Wiley (1994), ISBN: 9 780471582 625

Rosenberg, Z and Dekel, E: Terminal ballistics, Springer (2012), ISBN: 3 642253 040

Course Evaluation and Development

One of the key priorities in the 2025 Strategy for UNSW is a drive for academic excellence in education. One of the ways of determining how well UNSW is progressing towards this goal is by listening to our own students. Students will be asked to complete the myExperience survey towards the end of this course.

Students can also provide feedback during the semester via: direct contact with the lecturer, the “On-going Student Feedback” link in Moodle, Student-Staff Liaison Committee meetings in schools, informal feedback conducted by staff, and focus groups. Student opinions really do make a difference. Refer to the Moodle site for this course to see how the feedback from previous students has contributed to the course development.

Important note: Students are reminded that any feedback provided should be constructive and professional and that they are bound by the [Student Code of Conduct Policy](#)

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
Convenor	Dr Nicholas Kani zaj			+61251145375	By appointment	No	Yes

Other Useful Information

Academic Information

Course Evaluation and Development

One of the key priorities in the 2025 Strategy for UNSW is a drive for academic excellence in education. One of the ways of determining how well UNSW is progressing towards this goal is by listening to our own students. Students will be asked to complete the myExperience survey towards the end of each course.

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Important note: Students are reminded that any feedback provided should be constructive and professional and that they are bound by the Student Code of Conduct.

<https://www.gs.unsw.edu.au/policy/documents/studentcodepolicy.pdf>

Equitable Learning Services (ELS)

Students living with neurodivergent, physical and/or mental health conditions or caring for someone with these conditions may be eligible for support through the Equitable Learning Services team. Equitable Learning Services is a free and confidential service that provides practical support to ensure your mental or physical health conditions do not adversely affect your studies.

Our team of dedicated **Equitable Learning Facilitators (ELFs)** are here to assist you through this

process. We offer a number of services to make your education at UNSW easier and more equitable.

Further information about ELS for currently enrolled students can be found at: <https://www.student.unsw.edu.au/equitable-learning>

Academic Honesty and Plagiarism

UNSW has an ongoing commitment to fostering a culture of learning informed by academic integrity. All UNSW staff and students have a responsibility to adhere to this principle of academic integrity. All students are expected to adhere to UNSW's Student Code of Conduct. Find relevant information at: [Student Code of Conduct \(unsw.edu.au\)](https://student.unsw.edu.au/student-code-of-conduct)

Plagiarism undermines academic integrity and is not tolerated at UNSW. It is defined as using the words or ideas of others and passing them off as your own, and can take many forms, from deliberate cheating to accidental copying from a source without acknowledgement.

For more information, please refer to the following:

<https://student.unsw.edu.au/plagiarism>

Submission of Assessment Tasks

Special Consideration

Special Consideration is the process for assessing and addressing the impact on students of short-term events, that are beyond the control of the student, and that affect performance in a specific assessment task or tasks.

Applications for Special Consideration will be accepted in the following circumstances only:

- Where academic work has been hampered to a substantial degree by illness or other cause;
- The circumstances are unexpected and beyond the student's control;
- The circumstances could not have reasonably been anticipated, avoided or guarded against by the student; and either:
 - (i) they occurred during a critical study period and was 3 consecutive days or more duration, or a total of 5 days within the critical study period; or
 - (ii) they prevented the ability to complete, attend or submit an assessment task for a

specific date (e.g. final exam, in class test/quiz, in class presentation)

Applications for Special Consideration must be made as soon as practicable after the problem occurs and at the latest within three working days of the assessment or the period covered by the supporting documentation.

By sitting or submitting the assessment task the student is declaring that they are fit to do so and cannot later apply for Special Consideration (UNSW 'fit to sit or submit' requirement).

Sitting, accessing or submitting an assessment task on the scheduled assessment date, after applying for special consideration, renders the special consideration application void.

Find more information about special consideration at: <https://www.student.unsw.edu.au/special/consideration/guide>

Or apply for special consideration through your [MyUNSW portal](#).

Late Submission of assessment tasks (other than examinations)

UNSW has a standard late submission penalty of:

- 5% per day,
- capped at five days (120 hours) from the assessment deadline, after which a student cannot submit an assessment, and
- no permitted variation.

Students are expected to manage their time to meet deadlines and to request extensions as early as possible before the deadline.

Electronic submission of assessment

Except where the nature of an assessment task precludes its electronic submission, all assessments must be submitted to an electronic repository, approved by UNSW or the Faculty, for archiving and subsequent marking and analysis.

Release of final mark

All marks obtained for assessment items during the session are provisional. The final mark as published by the university following the assessment review group meeting is the only official mark.