UNSW Course Outline

ZEIT8205 Fundamentals of Surveillance Technologies - 2024

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General Course Information

Course Code : ZEIT8205
Year : 2024
Term : Semester 2
Teaching Period : Z2
Is a multi-term course? : No
Faculty : UNSW Canberra
Academic Unit : School of Engineering and Technology
Delivery Mode : In Person
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 includes an overview of the technologies and systems utilised in ground, airborne and spaceborne surveillance systems. Topics include an examination of the portions of the electromagnetic spectrum used for surveillance; optics fundamentals; image intensification

techniques; thermal imaging; non-imaging infrared systems; fundamentals of lasers and laser systems; fundamentals of radar, radar systems and their employment; ground, space-borne and airborne imaging systems; camouflage and concealment techniques; and countermeasures. It is worth 6 units of credit.

Course Aims

The course aims to:

- Provide and understanding of the fundamental technologies employed in surveillance systems.
- Provide and understanding of the principles of operation of a number of surveillance technologies.
- Provide an understanding of the major design and operational issues associated with these surveillance technologies.

Course Learning Outcomes

Course Learning Outcomes
CLO1 : Explain the fundamental technologies employed in surveillance systems.
CLO2 : Describe the principles of operation of a number of surveillance technologies.
CLO3 : Analyse and comment on the major design and operational issues associated with these surveillance technologies.

Course Learning Outcomes	Assessment Item
CLO1 : Explain the fundamental technologies employed in surveillance systems.	
CLO2 : Describe the principles of operation of a number of surveillance technologies.	
CLO3 : Analyse and comment on the major design and operational issues associated with these surveillance technologies.	

Learning and Teaching Technologies

Moodle - Learning Management System

Learning and Teaching in this course

The Learning Management System

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

Academic Integrity 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 https://www.gs.unsw.edu.au/policy/documents/studentcodepolicy.pdf

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

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
The University of New South Wales Canberra.

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
Presentation Assessment Format: Group Short Extension: Yes (7 days)	20%	Start Date: Not Applicable Due Date: The presentations begin in Week 7. Each week, 2 selected teams will present.
Exam Assessment Format: Individual	40%	Start Date: Not Applicable Due Date: Week 13: 21 October - 25 October
Discussion Forums Assessment Format: Individual Short Extension: Yes (7 days)	10%	Start Date: The 1st and 2nd discussion forums start on Week 6 and Week 11 correspondingly. Due Date: The 1st and 2nd discussion forums end on Week 7 and Week 12 correspondingly..
Homework Assignments Assessment Format: Individual Short Extension: Yes (7 days)	30%	Start Date: Weeks 1,2,3,4,5 and 7,8,9,10,11. Due Date: The week after the assignment is released

Assessment Details

Presentation

Assessment Overview

Presentation

Detailed Assessment Description

Students are split into groups of two and present a topic relevant to the course. The topics are either proposed by the students or assigned by the lecturer. This could be based on a chapter from a textbook or an IEEE/ACM research article. Students work closely with the lecturer during the preparation phase. The presentations are graded by both peer students and the lecturer based on the following criteria:

- Was the presentation relevant to the course in terms of defense applications and surveillance technologies, and did it include necessary details?
- Was the presentation complete in terms of providing specifications of the discussed technologies?
- Were the capabilities of the presented technologies discussed, such as use-cases and operational scenarios?
- Did all team members contribute equally?
- Was the presentation interactive, e.g., accompanied by a demonstration? Did the slides

contain charts, animations, etc.?
- Was the presentation well-structured? Were the presented topics logically connected?
- Did the presenters answer the questions clearly and thoroughly?

Exam

Assessment Overview

Final exam during exam week.

Detailed Assessment Description

A closed-book, 180-minute class test will assess the topics covered throughout the course. However, students are allowed to prepare one A4 cheat sheet with hand-written notes and use it during the exam. A mock exam or a list of topics covered in the exam will be provided to students prior to the test. Feedback will be provided to students on their returned scripts, as well as in a group feedback session during class. Individual feedback is also available upon request.

Discussion Forums

Assessment Overview

Discussion Forums

Detailed Assessment Description

The 2 discussion forums are equal weight (5% each) and aim to engage students in asking questions on topics covered during the lectures or on topics not covered in the lecture notes but relevant to the lecture materials, broadly defense, and/or adjacent surveillance technologies. Students are encouraged to ask open-ended questions, which means there may not be a single correct answer. Engagements are graded based on:

(a) Relevance and originality of the questions and answers.

(b) Clarity and depth of explanation in the answers.

(c) Use of appropriate references to support the answers.

While Large Language Models (LLMs) can be helpful resources, students should supplement their answers with references whenever possible to minimize the risk of misinformation (hallucination phenomenon).

Homework Assignments

Assessment Overview

Homework Assignments

Detailed Assessment Description

This assessment consists of 10 homework assignments (Weeks 1, 2, 3, 4, 5, and Weeks 7, 8, 9, 10, 11), each worth 3% of the course mark. The assignments include various computational problems and challenges that test the technological capabilities of the studied systems. Solutions are assessed based on their correctness, level of detail, and presentation style. Submitted sheets are graded and returned to students with additional comments.

While Large Language Models (LLMs) can be helpful resources, students should supplement their answers with references whenever possible to minimize the risk of misinformation (hallucination phenomenon).

General Assessment Information

Feedback on assessment tasks before the census date

The assignments are marked, and feedback is provided to students to self-assess their performance in the course. The feedback of assignments will be provided before the census date (11 August). The students could also request a one-on-one meeting to inquire on their performance in the course.

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

Generative AI is permitted to be used to the extent of review topics covered in class and self-learning. Especially when assignments involve some planning or creative processes, you are permitted to use software to generate initial ideas. However, you must develop or edit those ideas to such a significant extent that what is submitted is your own work. It is a good idea to keep copies of the initial prompts, if there is any uncertainty about the originality of your work.

* Please note that the outputs from these tools are not always accurate, appropriate, nor properly referenced. You should ensure that you have moderated and critically evaluated the outputs from generative AI tools such as ChatGPT before submission.

Grading Basis

Standard

Requirements to pass course

To pass this course a minimum of 50% of the maximum score should be attained.

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 15 July - 19 July	Lecture	Introduction to reconnaissance and surveillance
Week 2 : 22 July - 26 July	Lecture	Overview of UAV/UGV/Space surveillance technologies
Week 3 : 29 July - 2 August	Lecture	Radar overview
Week 4 : 5 August - 9 August	Lecture	The radar range equation
Week 5 : 12 August - 16 August	Lecture	: Propagation Effects and Mechanisms, and Doppler Phenomenology and Measurement
Week 6 : 19 August - 23 August	Lecture	Radar Apertures
Week 7 : 9 September - 13 September	Lecture	Digital Signal Processing for radar
Week 8 : 16 September - 20 September	Lecture	Optics, Synthetic Aperture Radar and Radar Imaging
Week 9 : 23 September - 27 September	Lecture	Hyperspectral imaging and basics of Image Processing
Week 10 : 30 September - 4 October	Lecture	Introduction to AI Technologies Used in Surveillance: Basics of Machine Learning and Its Application to Target Detection and Classification
Week 11 : 7 October - 11 October	Lecture	Basics of Deep Learning and Convolutional Neural Networks
Week 12 : 14 October - 18 October	Lecture	Deep Learning and Target/Object Detection and Recognition

Attendance Requirements

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

Course Resources

Prescribed Resources

1. Mark A Richards and William L. Melvin, Principles of Modern Radar, Volume 1: Basic Principles 2nd ed.

2. Radar - MATLAB & Simulink - MathWorks Australia

Recommended Resources

Graham Brooker, Introduction to Sensors for ranging and imaging, 2009

David L. Adamy, EW Against a New Generation of Threats, 2015

Carlos A. Davila, Glenn D. Hopkins, Gregory A. Showman, Radar and EW modelling in Matlab and Simulink, 2024

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

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

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
Convenor	Artem Lensky		302, Bld 16	+61405555553	TBA	No	Yes