



UNSW Course Outline

ZEIT8007 Space Operations - 2024

Published on the 13 Feb 2024

General Course Information

Course Code : ZEIT8007

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

Space Operations examines issues in space operations, such as orbits (including orbit perturbations and orbit determination), launch, rendezvous, re-entry, space environment, space law, coordination. Operations aspects of space applications are examined, such as communications, navigation, remote sensing, space surveillance and space situational

awareness. Mission analysis and design aspects of these applications are also examined.

The major goal of the course is to challenge students to conceive space mission concepts that solve problems facing society and will help grow Australia's capability in the space domain. Students are expected to understand and identify who the end users of their space mission are and form a coherent and sustained argument for the value of their proposed mission. Achieving this aim requires understanding key multidisciplinary space operations concepts, from the basic spacecraft types, the most common orbit types and their parameters, how to investigate the most suitable orbit(s) for a particular task, and the regulatory, strategic, economic, and ethical context in which the mission must operate. The course equips students with the ability to define the mission design and operational requirements to achieve mission goals, providing a suitable requirements brief for subsequent lower level subsystem design to commence

Course Aims

This course aims to:

1. Provide students with a multidisciplinary view of the technical, strategic, regulatory, and commercial drivers that underpin space activity
2. Highlight the rapid change and evolution in the space sector for commercial, civilian, and defence actors
3. Equip students with the technical ability devise novel and creative space missions to meet emerging needs within Australia's domestic and international context
4. Provide students with the technical ability to perform mission analyses, mission design, and mission operations

Course Learning Outcomes

Course Learning Outcomes
CLO1 : On successful completion of this course, students will have developed an advanced multidisciplinary view of the technical, strategic, regulatory, and commercial drivers that underpin space activity through presenting coherent and sustained arguments within an online forum
CLO2 : On successful completion of this course, students will have proposed a novel and creative space mission and justified its value to society through a critical and scholarly analysis of the literature using an appropriate disciplinary style
CLO3 : On successful completion of this course, students will have optimized a space mission to meet defined mission goals through the application of expert technical knowledge and skills derived from the theory of orbits, mission analysis, and payload performance metrics
CLO4 : On successful completion of this course, students will have analysed the performance of different spacecraft types, orbit types and orbital parameters within a space mission proposal using an advanced and integrated understanding of the dynamic space environment

Course Learning Outcomes	Assessment Item
CLO1 : On successful completion of this course, students will have developed an advanced multidisciplinary view of the technical, strategic, regulatory, and commercial drivers that underpin space activity through presenting coherent and sustained arguments within an online forum	<ul style="list-style-type: none"> • Forum Postings • Peer Assessment • Assignment
CLO2 : On successful completion of this course, students will have proposed a novel and creative space mission and justified its value to society through a critical and scholarly analysis of the literature using an appropriate disciplinary style	<ul style="list-style-type: none"> • Forum Postings • Peer Assessment • Assignment
CLO3 : On successful completion of this course, students will have optimized a space mission to meet defined mission goals through the application of expert technical knowledge and skills derived from the theory of orbits, mission analysis, and payload performance metrics	<ul style="list-style-type: none"> • Online Test • Assignment
CLO4 : On successful completion of this course, students will have analysed the performance of different spacecraft types, orbit types and orbital parameters within a space mission proposal using an advanced and integrated understanding of the dynamic space environment	<ul style="list-style-type: none"> • Online Test • Peer Assessment • Assignment

Learning and Teaching Technologies

Moodle - Learning Management System | Blackboard Collaborate | Microsoft Teams

Learning and Teaching in this 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

Other Professional Outcomes

Developing Graduate Capabilities

Successful completion of this course contributes to the acquisition of UNSW graduate capabilities. UNSW aspires to develop globally focused graduates who are **rigorous scholars**, capable of **leadership** and **professional practice** in an **international** community.

Students will be encouraged to develop the following UNSW graduate attributes:

- the skills involved in scholarly enquiry,
- an in-depth engagement with the relevant disciplinary knowledge in its interdisciplinary context,
- the capacity for analytical and critical thinking and for creative problem solving, and

the ability to engage in independent and reflective learning

Additional Course Information

Referencing

In this course, students are required to reference following the APA 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
Forum Postings Assessment Format: Individual	20%	Due Date: Week 6: 01 April - 05 April Post Date: 05/04/2024 11:00 PM
Peer Assessment Assessment Format: Individual	10%	Due Date: Week 8: 29 April - 03 May Post Date: 29/04/2024 09:00 AM
Assignment Assessment Format: Individual	60%	Due Date: Week 13: 03 June - 07 June Post Date: 03/06/2024 09:00 AM
Online Test Assessment Format: Individual	10%	Due Date: 07/06/2024 11:00 PM

Assessment Details

Forum Postings

Assessment Overview

The two forum postings are intended to guide your literature search for the assignment and provide a platform for discussion within the group around the broader issues affecting space activity into the future. A question will be posed and you are required to identify relevant articles from the literature and provide a critical summary in the designated online Moodle Forum.

Postings are expected to be around 800-1000words (1 A4 page) excluding references. Posts must be a minimum of 300 words and not exceed 1300 words (excluding references). Posts outside these limits will receive a grade of 0%.

Course Learning Outcomes

- CLO1 : On successful completion of this course, students will have developed an advanced multidisciplinary view of the technical, strategic, regulatory, and commercial drivers that underpin space activity through presenting coherent and sustained arguments within an online forum
- CLO2 : On successful completion of this course, students will have proposed a novel and creative space mission and justified its value to society through a critical and scholarly analysis of the literature using an appropriate disciplinary style

Detailed Assessment Description

For 2024, only 1 forum post is required with the maximum word limit increased from 1300 to 1500 words

Assessment Length

1000-1500 words

Assessment information

Full details of the assessment requirements can be found in the Moodle page

Assignment submission Turnitin type

This is not a Turnitin assignment

Peer Assessment

Assessment Overview

For each of the 2 forum posts, you are required to critically engage with 2 posts from your peers. The grade for this assessment item will be governed by the quality of the critical summary and analysis within each peer assessment. The peer assessment activity is designed to demonstrate

that you have attained the following UNSW graduate attributes: “the skills involved in scholarly enquiry”, “an in-depth engagement with the relevant disciplinary knowledge in its interdisciplinary context”, and “the ability to engage in independent and reflective learning”.

Course Learning Outcomes

- CLO1 : On successful completion of this course, students will have developed an advanced multidisciplinary view of the technical, strategic, regulatory, and commercial drivers that underpin space activity through presenting coherent and sustained arguments within an online forum
- CLO2 : On successful completion of this course, students will have proposed a novel and creative space mission and justified its value to society through a critical and scholarly analysis of the literature using an appropriate disciplinary style
- CLO4 : On successful completion of this course, students will have analysed the performance of different spacecraft types, orbit types and orbital parameters within a space mission proposal using an advanced and integrated understanding of the dynamic space environment

Detailed Assessment Description

For 2024, only 1 peer assessment is required.

Students are encouraged to enter into free-flowing discussion on the forum, however you must clearly identify the post for formal evaluation by writing "FOR ASSESSMENT" at the top of your post. Formal forum post replies must be a minimum of 100 words and not exceed 1000 words (excluding references). Assessed posts outside these limits will receive a grade of 0%.

Assessment Length

500-800 words

Assignment submission Turnitin type

This is not a Turnitin assignment

Assignment

Assessment Overview

The assignment (posted in the online site) provides you with an opportunity to demonstrate your ability to apply the knowledge and understanding you have gained throughout the course. The assignment requires higher order independent thinking beyond the ability to remember the information provided in the textbook. Along with the forum postings, it will help you draw together all of the discrete areas studied in each section and demonstrate your mastery of the discipline

Course Learning Outcomes

- CLO1 : On successful completion of this course, students will have developed an advanced multidisciplinary view of the technical, strategic, regulatory, and commercial drivers that underpin space activity through presenting coherent and sustained arguments within an online forum

- CLO2 : On successful completion of this course, students will have proposed a novel and creative space mission and justified its value to society through a critical and scholarly analysis of the literature using an appropriate disciplinary style
- CLO3 : On successful completion of this course, students will have optimized a space mission to meet defined mission goals through the application of expert technical knowledge and skills derived from the theory of orbits, mission analysis, and payload performance metrics
- CLO4 : On successful completion of this course, students will have analysed the performance of different spacecraft types, orbit types and orbital parameters within a space mission proposal using an advanced and integrated understanding of the dynamic space environment

Assignment submission Turnitin type

This assignment is submitted through Turnitin and students can see Turnitin similarity reports.

Online Test

Assessment Overview

The timed online test can be attempted only once. The test covers the lecture material in weeks 1-9, with the online quizzes providing the necessary revision, review, and feedback opportunities. The test can be attempted anytime from week 10 onwards. The online quizzes and GMAT Lab activities are designed to provide the required revision and feedback to prepare you for the test. Please utilize the course Q&A forums and/or contact the course convenor if there are concepts that require further clarity.

Course Learning Outcomes

- CLO3 : On successful completion of this course, students will have optimized a space mission to meet defined mission goals through the application of expert technical knowledge and skills derived from the theory of orbits, mission analysis, and payload performance metrics
- CLO4 : On successful completion of this course, students will have analysed the performance of different spacecraft types, orbit types and orbital parameters within a space mission proposal using an advanced and integrated understanding of the dynamic space environment

Assignment submission Turnitin type

This is not a Turnitin assignment

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**.

There are four formal assessment items in this course: One forum posting (20% in total), a

multiple-choice test (10%), a major design assignment (60%), and a peer-review activity (10%). You are not required to pass any one particular piece of assessment; you simply need to achieve at least 50 marks out of a total 100 marks to pass this course

Online Practice Quizzes

Online revision (practice) quizzes are provided throughout the course to provide on-going feedback to the student and course convenor. These will provide you with a chance to confirm your understanding of the content of the text chapters and prepare you for the timed online test. No marks are awarded for their completion and no time limit is applied.

It is a requirement to complete the first quiz (week 1 material) prior to the census date. Student will get feedback of the first quiz by the census date (24th of March)

Forum Post (20%)

The forum post is intended to guide your literature search for the assignment and provide a platform for discussion within the group around the broader issues affecting space activity into the future. A question will be posed and you are required to identify relevant articles from the literature and provide a critical summary in the designated online Moodle Forum.

Postings are expected to be around 800-1000 words (2 A4 page) excluding references. Posts must be a minimum of 300 words and not exceed 1500 words (excluding references). Posts outside these limits will receive a grade of 0%.

Assignment (60%)

The assignment (posted in the online site) provides you with an opportunity to demonstrate your ability to apply the knowledge and understanding you have gained throughout the course. The assignment requires higher order independent thinking beyond the ability to remember the information provided in the textbook. Along with the forum postings, it will help you draw together all of the discrete areas studied in each section and demonstrate your mastery of the discipline.

Peer Assessment (10%)

You are required to critically engage with 1 forum post from your peers. The grade for this assessment item will be governed by the quality of the critical summary and analysis within each peer assessment. The peer assessment activity is designed to demonstrate that you have

attained the following UNSW graduate attributes: “*the skills involved in scholarly enquiry*”, “*an in-depth engagement with the relevant disciplinary knowledge in its interdisciplinary context*”, and “*the ability to engage in independent and reflective learning*”.

Students are encouraged to enter into free-flowing discussion on the forum, however you must clearly identify the 2 replies for formal evaluation by writing “FOR ASSESSMENT” at the top of the posts. Formal forum post replies must be a minimum of 100 words and not exceed 1000 words (excluding references). Assessed posts outside these limits will receive a grade of 0%. Replies selected for assessment must be on separate threads.

Online Test (10%)

The timed online test can be attempted only once. The test covers the lecture material in weeks 1-9, with the online quizzes providing the necessary revision, review, and feedback opportunities. The test can be attempted anytime from week 10 onwards. The online quizzes and GMAT Lab activities are designed to provide the required revision and feedback to prepare you for the test. Please utilize the course Q&A forums and/or contact the course convenor if there are concepts that require further clarity.

Late Submission of Assessment

Unless a formal application for special consideration is submitted and approved via <https://specialconsideration.unsw.edu.au/>, 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.

Referencing

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

Use of Generative AI

As the major assignment involves some planning or creative processes, you are permitted to use software to generate initial drafts [or ideas, structures, etc]. However, **you must develop or edit those ideas to such a significant extent that what is submitted is your own work**, i.e., what is

generated by the software should not be a part of your final submission. It is a good idea to keep copies of your initial drafts to show your lecturer if there is any uncertainty about the originality of your work. Please note that **your submission will be passed through an AI-text detection tool**. If your marker has concerns that your answer contains passages of AI-generated text that have not been sufficiently modified you may be asked to explain your work, but we recognise that **you are permitted to use AI generated text as a starting point and some traces may remain**. If you are unable to satisfactorily demonstrate your understanding of your submission you may be referred to UNSW Conduct & Integrity Office for investigation for academic misconduct and possible penalties.

Grading Basis

Standard

Requirements to pass course

You are not required to pass any one particular piece of assessment; you simply need to achieve at least 50 marks out of a total 100 marks to pass this course

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 26 February - 1 March	Module	Uses, users, and the monitoring of space
Week 2 : 4 March - 8 March	Module	Space Domain Awareness and Space Law
Week 3 : 11 March - 15 March	Module	Orbits and the Space Environment 1
Week 4 : 18 March - 22 March	Module	Orbits and the Space Environment 2
	Assessment	Online Quiz 1 completed or attempted 3 times The online quizzes do not count towards your final grade, however it is a requirement of the course that you tackle online quiz 1 before the census date.
Week 5 : 25 March - 29 March	Module	Orbit selection, mission geometry, analysis and design
Week 6 : 1 April - 5 April	Module	Orbit selection; mission geometry, analysis and design 2
	Homework	Complete GMAT Tutorials
	Assessment	Forum post 1 due 23:00 5 April
	Laboratory	Complete GMAT Lab1
	Homework	Complete Online Quizzes 2 and 3
Week 7 : 22 April - 26 April	Module	Launch, on-orbit, and ground operations
Week 8 : 29 April - 3 May	Assessment	Peer assessment due 09:00 29th April
	Module	Assignment
Week 9 : 6 May - 10 May	Module	Assignment
Week 10 : 13 May - 17 May	Module	Assignment
Week 11 : 20 May - 24 May	Module	Assignment
Week 12 : 27 May - 31 May	Module	Assignment
Week 13 : 3 June - 7 June	Assessment	Assignment due 09:00 3rd June
	Assessment	Online Test completed 23:00 7th June

Attendance Requirements

Not Applicable - as no class attendance is required

General Schedule Information

Please use the Moodle Q/A discussion forums and the online tutorial sessions as the first point of access for course related matters. To arrange a private consultation, or discuss a private matter, please email Dr Melrose Brown to arrange a suitable time.

Your email subject line must always include the course code ZEIT8007

Course Resources

Prescribed Resources

Students must download and install the NASA General Mission Analysis Tool (GMAT) <https://gmat.atlassian.net/wiki/spaces/GW/overview> (Please see the README file in the GMAT bin directory for instructions on installing GMAT on Mac)

No hard copy textbook is required. All resources will be provided digitally through the Moodle page and/or the UNSW library service.

Recommended Resources

The main text used in the course for orbital analysis:

Maini, Anil Kumar and Varsha Agrawal, *Satellite Technology: Principles and Applications* (Wiley, 3rd edition., 2014) https://primoa.library.unsw.edu.au/permalink/f/vhr5b5/UNSW_ALMA51163476210001731

Other texts referenced in the course include:

Handbook of Space Technology, edited by Wilfried Ley, et al., John Wiley & Sons, Incorporated, 2009. ProQuest Ebook Central, <https://ebookcentral.proquest.com/lib/unsw/detail.action?docID=427945>.

Tronchetti, F. (2013). *Fundamentals of Space Law and Policy*. New York, NY: Springer New York : Imprint: Springer. https://primoa.library.unsw.edu.au/permalink/f/11u50sd/UNSW_ALMA51206822530001731

Badescu, Viorel and Malcolm Macdonald, The International Handbook of Space Technology (Springer Berlin Heidelberg® Imprint: Springer, 2014) https://primoa.library.unsw.edu.au/permalink/f/vhr5b5/UNSW_ALMA51206492810001731

Brown, C. D. (1998). Spacecraft mission design (2nd ed.). Reston, Va.: American Institute of Aeronautics and Astronautics. https://primoa.library.unsw.edu.au/permalink/f/vhr5b5/UNSW_ALMA51152159430001731

Suresh, BN and K Sivan, Integrated Design for Space Transportation System (Springer, 2016) https://primoa.library.unsw.edu.au/permalink/f/vhr5b5/UNSW_ALMA51179280770001731

Schmidhuber, Michael, Florian Sellmaier and Thomas Uhlig, Spacecraft Operations (Springer Vienna® Imprint: Springer, 2015) https://primoa.library.unsw.edu.au/permalink/f/11u50sd/UNSW_ALMA51206554820001731

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	Melrose Brown		B16, Level 2	0251145129	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.

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 (where applicable). Student opinions really do make a difference. Refer to the Moodle site for your 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.

<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.