UNSW Course Outline

ZEIT1503 Engineering Mechanics - 2024

Published on the 03 Jul 2024

General Course Information

Course Code : ZEIT1503
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 : Undergraduate
Units of Credit : 6

Useful Links

Handbook Class Timetable

Course Details & Outcomes

Course Description

This is a six Unit of Credit core first year course in the Bachelors of Engineering in Civil, Mechanical and Aeronautical Engineering, and Bachelor of Technology in Aeronautical Engineering. The aim of the course is to introduce students to the fundamental concepts and

principles of mechanics applied by engineers. This includes both statics and dynamics. The course also aims to foster rigorous problem solving and critical thinking skills. Engineering mechanics builds on the classical mechanics taught in Engineering Physics 1a, ZPEM1503, and applies the mathematical techniques taught in Engineering Mathematics 1a and 1b, ZPEM1303 and ZPEM1304. This course forms the basis for other core engineering courses such as Thermofluids, Mechanics of Solids and Structural Analysis.

Course Aims

The aim of the course is to introduce students to the fundamental concepts and principles of mechanics applied by engineers. This includes both statics and dynamics. The course also aims to foster rigorous problem solving and critical thinking skills.

Relationship to Other Courses

ZEIT1503 requires Engineering Physics 1a, ZPEM1503 and Engineering Mathematics 1a ZPEM1303, as prerequisites.

ZEIT1503 is a prerequisite for ZEIT2500, ZEIT2501, ZEIT2503, ZEIT2504, ZEIT2601 and ZEIT2700.

Course Learning Outcomes

Course Learning Outcomes	Engineers Australia - Professional Engineer (Stage 1)
CLO1 : Explain the basic concepts and principles of Engineering Mechanics using words, diagrams and equations	• PEE1.1 : Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline • PEE1.2 : Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline
CLO2 : Apply the principles of Engineering Mechanics to solve engineering problems	• PEE1.1 : Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline • PEE1.3 : In-depth understanding of specialist bodies of knowledge within the engineering discipline • PEE1.5 : Knowledge of engineering design practice and contextual factors impacting the engineering discipline • PEE2.1 : Application of established engineering methods to complex engineering problem solving • PEE2.2 : Fluent application of engineering techniques, tools and resources
CLO3 : Apply the design-test-evaluate approach to create and evaluate physical solutions (structures and devices) to ill-defined problems	• PEE1.1 : Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline • PEE1.2 : Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline • PEE1.3 : In-depth understanding of specialist bodies of knowledge within the engineering discipline • PEE2.1 : Application of established engineering methods to complex engineering problem solving • PEE2.2 : Fluent application of engineering techniques, tools and resources • PEE2.3 : Application of systematic engineering synthesis and design processes • PEE2.4 : Application of systematic approaches to the conduct and management of projects within the technology domain • PEE3.3 : Creative, innovative and pro-active

	demeanour • PEE3.5 : Orderly management of self, and professional conduct • PEE3.6 : Effective team membership and team leadership
CLO4 : Communicate your solutions to engineering problems in an appropriate format and using appropriate language (including a technical report)	• PEE3.2 : Effective oral and written communication in professional and lay domains

Course Learning Outcomes	Assessment Item
CLO1 : Explain the basic concepts and principles of Engineering Mechanics using words, diagrams and equations	• Quizzes • Assignments • Laboratory Reports • Final Exam
CLO2 : Apply the principles of Engineering Mechanics to solve engineering problems	• Quizzes • Assignments • Laboratory Reports • Final Exam
CLO3 : Apply the design-test-evaluate approach to create and evaluate physical solutions (structures and devices) to ill-defined problems	• Laboratory Reports
CLO4 : Communicate your solutions to engineering problems in an appropriate format and using appropriate language (including a technical report)	• Quizzes • Assignments • Final Exam • Laboratory Reports

Learning and Teaching Technologies

Moodle - Learning Management System | Echo 360

Learning and Teaching in this course

Research shows that learning is most effective when students are actively engaged, work collaboratively and have some autonomy (choice) and responsibility in their learning. Learning also needs to be scaffolded (supported) by effective teaching, which includes strategies such as hands-on activities (experiential learning), and “I do – we do - you do” apprenticeship-style teaching. Feedback on formative assessment (assessment as or for learning) is necessary to support learning and allow students to reflect on their performance and learning needs.

The teaching in Engineering Mechanics is based on these principles.

Students are asked to actively engage in lectures with questions and Peer Instruction discussion. Worked examples provide the first “I do” stage in scaffolding problem solving skills. In tutorials, hands-on activities and theoretical problems provide students with an opportunity to work with support of peers and a tutor (“we do”). The laboratory tasks provide opportunity for hands-on practical work, with some degree of autonomy and choice. This work is done in groups with peers and with the support of demonstrators (“we do”). Class quizzes and the exam (“you do”) are done as individuals, and provide an opportunity for students to demonstrate their problem solving prowess. The class quizzes also provide an opportunity for feedback on learning. Students need to engage with the feedback they receive and reflect upon their learning.

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	Engineers Australia - Professional Engineer (Stage 1)
Quizzes Assessment Format: Individual	20%	Start Date: Not Applicable Due Date: weeks 4 and 9, in class	• PEE1.1 : Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline • PEE1.2 : Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline • PEE1.3 : In-depth understanding of specialist bodies of knowledge within the engineering discipline • PEE3.2 : Effective oral and written communication in professional and lay domains
Assignments Assessment Format: Individual	20%	Start Date: Not Applicable Due Date: Fridays weeks 6 and 11, 5pm	• PEE1.1 : Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline • PEE1.2 : Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline • PEE2.1 : Application of established engineering methods to complex engineering problem solving • PEE3.2 : Effective oral and written communication in professional and lay domains
Laboratory Reports Assessment	30%	Start Date: Not Applicable Due Date: Friday 5pm weeks	• PEE1.1 : Comprehensive, theory based understanding of

Format: Group		7 and 13	the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline • PEE1.3 : In-depth understanding of specialist bodies of knowledge within the engineering discipline • PEE2.1 : Application of established engineering methods to complex engineering problem solving • PEE2.3 : Application of systematic engineering synthesis and design processes • PEE2.4 : Application of systematic approaches to the conduct and management of projects within the technology domain • PEE3.2 : Effective oral and written communication in professional and lay domains • PEE3.3 : Creative, innovative and pro-active demeanour • PEE3.5 : Orderly management of self, and professional conduct • PEE3.6 : Effective team membership and team leadership
Final Exam Assessment Format: Individual	30%	Start Date: Not Applicable Due Date: Not Applicable	• PEE1.1 : Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline • PEE1.3 : In-depth understanding of specialist bodies of knowledge within the engineering discipline • PEE3.2 : Effective oral and written communication in professional and lay domains

Assessment Details

Quizzes

Assessment Overview

2 quizzes weighted 10% each will be used to monitor student's progress and feedback on learning.

Course Learning Outcomes

- CLO1 : Explain the basic concepts and principles of Engineering Mechanics using words, diagrams and equations
- CLO2 : Apply the principles of Engineering Mechanics to solve engineering problems
- CLO4 : Communicate your solutions to engineering problems in an appropriate format and using appropriate language (including a technical report)

Detailed Assessment Description

There will be two quizzes during the course, one at week 4 and one at week 9. These quizzes will take place during the lecture time, in the Wenesday lectures (7th August and 25th September). The quizzes will be done on paper, in invigilated, closed book conditions. One A4 page of notes will be permitted. The quizzes will assess all the content taught in the course up to that point, but the second quiz will focus primarily on content taught from weeks 4 to 8. The quizzes are an opportunity to get feedback on problem solving skills, and identify areas of strength and opportunities for improvement. On both quizzes, the majority of marks will be given for diagrams and problem solving process.

Assessment Length

As long as it needs to be, with big diagrams.

Submission notes

On paper, in class.

Assessment information

See moodle for practice questions. Pay attention in lectures.

Assignment submission Turnitin type

Not Applicable

Assignments

Assessment Overview

2 assignments weighted 10% each

Course Learning Outcomes

- CLO1 : Explain the basic concepts and principles of Engineering Mechanics using words, diagrams and equations
- CLO2 : Apply the principles of Engineering Mechanics to solve engineering problems
- CLO4 : Communicate your solutions to engineering problems in an appropriate format and using appropriate language (including a technical report)

Detailed Assessment Description

The two assignments will cover the content taught in lectures and assessed in quizzes and the exam, but extend the problem solving skills applied in these and tutorials. The assignments will consist of more difficult problems that may require computational problem solving, simple experimental measurements or a literature search for data. Assignment help will be available in the drop-in tutes. The assignments are individual tasks, but students are encouraged to discuss the problems and acknowledge any ideas they get from others. The assignments will be posted on moodle not less than 2 weeks before they are due, and they will be due 5pm Friday of weeks 6 and 11 (23rd August, 11th October). The assignments will be posted with a detailed marking rubric.

Assessment Length

As long as it needs to be and no longer. Make your diagrams bigger.

Submission notes

Submit through moodle turnitin assignment box

Assessment information

Make sure you acknowledge anyone who helped you. Make sure your diagrams are really big.

Assignment submission Turnitin type

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

Laboratory Reports

Assessment Overview

2 lab reports weighted 15% each in groups of 3

Course Learning Outcomes

- CLO1 : Explain the basic concepts and principles of Engineering Mechanics using words, diagrams and equations
- CLO2 : Apply the principles of Engineering Mechanics to solve engineering problems
- CLO3 : Apply the design-test-evaluate approach to create and evaluate physical solutions

(structures and devices) to ill-defined problems
- CLO4 : Communicate your solutions to engineering problems in an appropriate format and using appropriate language (including a technical report)

Detailed Assessment Description

There are two laboratory projects for ZEIT1503. The first is a design, build and test (destructive) of a balsa wood truss bridge. The second is a design, build and test (non-destructive) of a projectile launcher. These labs are done in groups of 3 or 4 students (3 preferred) and a single report is submitted for the group. The reports are each worth 15% of the course grade. A detailed task description and marking rubric will be provided on the course moodle site. Lab reports are due Friday 5pm of weeks 7 and 13 (September 13th and October 25th).

Assessment Length

2500 words max. As many diagrams and photos as you want.

Submission notes

Submit via turnitin assignment box on moodle.

Assessment information

One report per group.

Assignment submission Turnitin type

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

Final Exam

Assessment Overview

Final Exam

Course Learning Outcomes

- CLO1 : Explain the basic concepts and principles of Engineering Mechanics using words, diagrams and equations
- CLO2 : Apply the principles of Engineering Mechanics to solve engineering problems
- CLO4 : Communicate your solutions to engineering problems in an appropriate format and using appropriate language (including a technical report)

Detailed Assessment Description

The exam covers all content taught during the course. This will be held during exam week and centrally scheduled. It will be a 3 hour closed book invigilated exam, on paper. Permitted materials: pens, pencils, ruler, eraser, basic scientific calculator (Casio FX82 or equivalent), one

single sided A4 page of notes.

Assessment Length

As long as it needs to be, with lots of big diagrams.

Submission notes

On paper, in exam hall.

Assessment information

One A4 cheat sheet allowed.

Assignment submission Turnitin type

Not Applicable

General Assessment Information

Feedback by census date

Quiz 1 will be held in week 4, feedback, grades and worked solutions will be given to students by the census date.

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

The use of generative AI is permitted for basic editting on asignments and lab reports only. No use of generative AI is permitted on quizzes or the exam.

Referencing for the assignments and lab reports should be done using APA format.

Grading Basis

Standard

Requirements to pass course

A minimum total final mark of 50% is required to pass the course.

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 15 July - 19 July	Lecture	Tuesday lecture: Introduction Wednesday and Friday lectures: Free Body Diagrams and Newton's laws
	Reading	Chapters 1 to 3
	Tutorial	Free Body Diagrams and Newton's laws
Week 2 : 22 July - 26 July	Lecture	Tuesday lecture: drop-in tute Wednesday and Friday lectures: Forces and Equilibrium, Moments and Couples
	Reading	Chapters 3 and 4.
	Tutorial	Forces and equilibrium.
Week 3 : 29 July - 2 August	Lecture	Tuesday lecture: Equivalent force systems Wednesday lectures: More equivalent force systems and supports Friday lecture: Truss analysis 1: method of joints
	Reading	Chapters 4 and 5.
	Tutorial	Moments and Couples, Equivalent force systems
Week 4 : 5 August - 9 August	Reading	Chapter 6.
	Assessment	Quiz1: 10% of course grade. All content covered so far is assessable. Quiz will be held in the Wednesday lecture (7th August).
	Lecture	Tuesday lecture: lab 1 information session Wednesday lecture: Quiz 1 Friday lecture: Truss analysis 2 - sections
	Tutorial	Supports, truss analysis - method of joints
Week 5 : 12 August - 16 August	Lecture	Note that as Tuesday has a Friday timetable this week, we will lose 2 tutes and the drop-in. Tuesday lecture (in Friday timeslot and venue): distributed loads Wednesday lecture: TBC - most likely tute session.
	Reading	Chapters 6 and 7
	Tutorial	Truss analysis. Note that as Tuesday has a Friday timetable (Tuesday lost) we may use the Wednesday lecture as a replacement tutorial depending on how lectures are going. An announcement will be made on moodle so please make sure you subscribed to the announcements discussion board.
	Laboratory	Lab project 1: balsa wood bridge build session. You must come prepared with your design ready to build. Time is limited in the lab to 3 hours and you must complete your build in this time. If you come without a design ready to go, you will not be able to complete your bridge. This means you need to have formed your group and come up with a design and made good scale drawings BEFORE the lab. Note that with the Friday timetable on Tuesday, students scheduled for Friday labs will need to be ready before Tuesday.
Week 6 : 19 August - 23 August	Assessment	Assignment 1 due Friday 5pm. The assignment will be posted along with the rubric on moodle. Make sure you pay attention to the rubric.
	Lecture	Tuesday lecture: drop-in tute (e.g. lab and assignment help) Wednesday lecture: centroids, centre of gravity, Moment of inertia (2nd moment of area) Friday: TBC
	Reading	Chapters 7 and 8
	Tutorial	Internal forces, truss analysis and lab help
	Laboratory	Lab project 1: balsa wood bridge test. This is a destructive test, in which we load your bridge until it breaks. There will be prizes for the groups with the best overall load bearing bridge and best load to bridge weight rating. Make sure you take lots of photos and a video for your reports.
Week 7 : 9 September - 13 September	Lecture	Tuesday lecture: drop-in (lab report help) Wednesday and Friday lectures: kinematics
	Reading	Chapters 5, 9 and 10
	Tutorial	Centre of gravity and centroids
	Assessment	Lab report 1 due Friday 13th September, 5pm. See moodle for more information.

Week 8 : 16 September - 20 September	Lecture	No Wednesday lecture due to military training. Tuesday: drop-in Friday: more kinematics and relative motion
	Reading	Chapter 12 and 13
	Tutorial	kinematics
Week 9 : 23 September - 27 September	Lecture	Tuesday lecture: drop-in Quiz 2 in Wednesday lecture. Friday lecture: Forces - non-equilibrium (dynamics).
	Reading	Chapter 13
	Tutorial	Relative motion, forces in dynamics
	Assessment	Quiz 2: this quiz will be held in the Wednesday lecture time, closed book, invigilated, on paper. One A4 page of notes is permitted. All content covered up to this point in the courseis asseable on this quiz, but it will focus on the content taught since quiz 1.
Week 10 : 30 September - 4 October	Lecture	Tuesday: TBC Wednesday: More forces - Friction! Friday: more friction
	Reading	Chapter 14
	Tutorial	Forces, Friction
	Laboratory	Lab project 2: build session. You will be able to take your project away from lab to continue working on it, but it's a good idea to have a design (or even 2) ready to build when you get to lab. See the moodle site for the task statement, rubric, and list of materials you'll have available.
Week 11 : 7 October - 11 October	Lecture	Tuesday: TBC Wednesday: Energy and power Note: only Wednesday lecture lecture this week, as Monday is a public holiday and Thursday and Friday are military training days.
	Reading	Chapter 14
	Tutorial	Energy and Power
	Assessment	Assignmnet 2 due 5pm Friday 11th October. Note this is a military training day, so if you think you won't have time to work on it today, make sure you do it in advance.. Lack of planning is not grounds for special consideration.
Week 12 : 14 October - 18 October	Lecture	Tuesday: TBC Wednesday: Conservation of eneergy and momentum Friday: Collisions
	Reading	Chapter 15
	Tutorial	Conservation of Energy and Momentum and Impulse.
	Laboratory	Lab project 2: test session. Venue will be announced on Moodle. This will be held outside on the oval, weather permitting.
Week 13 : 21 October - 25 October	Lecture	Tuesday: TBC Wednesday: Angular momentum Friday: revision and exam Q&A.
	Reading	Chapter 15
	Tutorial	Collisions and Angular momentum
	Assessment	Lab report 2 due, 5pm Friday. See moodle for detailed task statement and rubric. This is a group report, one submission per group please.

Attendance Requirements

ADF personnel are required by ADFA to attend all scheduled classes. Note that from time to time ADFA requires attendance rolls to be taken, or DOs may attend classes to check attendance.

For civilian students, attendance at labs is required and attendance at all other classes is strongly recommended. While lectures are generally recorded, we cannot guarantee the quality of lecture recordings, and they will not capture all interaction in class. Recordings are not a

complete substitute for in-person attendance. Tutorials are not recorded.

General Schedule Information

The chapter numbers in the schedule below refer to the prescribed textbook, Engineering Mechanics: Statics in SI Units, Global Edition + Engineering Mechanics: Dynamics in SI Units, Global Edition, by Hibbeler, 14th Edition. ISBN 9781488685958. Note that any edition is fine.

The content shown in the schedule below is indicative, and may change slightly depending on the needs of the class to either slow down or speed up. Your feedback on the pacing of the course will help us decide if we need to adjust it.

Course Resources

Prescribed Resources

We follow the textbook: Engineering Mechanics: Statics in SI Units, Global Edition + Engineering Mechanics: Dynamics in SI Units, Global Edition, by Hibbeler, 15th Edition, or any earlier edition, so it is a good idea for you to get a copy!

You can order one thorugh the UNSW bookshop:

Engineering Mechanics: Dynamics 15e - SI Units

Print: https://www.bookshop.unsw.edu.au/details.cgi?ITEMNO=9781292451930&12375067

Digital: https://unswbookshop.vitalsource.com/products/-v9781292451978

Engineering Mechanics: Statics 15e - SI Units

Print: https://www.bookshop.unsw.edu.au/details.cgi?ITEMNO=9781292444048&12493626

Digital: https://unswbookshop.vitalsource.com/products/-v9781292443935

Recommended Resources

The best resources you have are each other, and the teaching staff.

Use the undergraduate study room to work on tasks in groups and study together. You'll find that explaining something to someone else is the best way to learn it. So get tother and ask each other questions. There will also be PASS sessions run by past students of the course. They can help you with content, and also give you great advice on how to do well in the course.

There will be weekly drop-in tutes with the lecturers in the Tuesday lecture slot. Please come along to these! You can also make an appointment to see staff.

Additional Costs

There are no additional costs for this course.

Course Evaluation and Development

Student feedback is valued and we go through a yearly review process to improve the course. To do this we use any student feedback provided during the course, and end of semester myExperience feedback. But this only helps next year's cohort! If there is something you think should be changed, tell right away! You can tell us anonympously using the anonymous feedback tool on moodle, or via the SSLCs held twice a semester. Or you can fill in the midsemester survey for all SET courses. You can also just talk to us, or send an email. We'd love to hear from you!

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	Kate Wilson		15-202	5114 5222	Mon - Fri, 0930 to 1430, appointment preferred	Yes	Yes
Lecturer	Yan Kei Chiang		16-226	5114 5335	TBC	No	No
	Pratap Pawar				TBC	No	No