

ENGG1300

Engineering Mechanics

Term 2, 2023



Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
Wei Gao	w.gao@unsw.edu.au	1:00pm-2:00pm on Mondays	Room 608, Building H20	9385 4123

School Contact Information

[Engineering Student Support Services](#) – The Nucleus - enrolment, progression checks, 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

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)

Course Details

Units of Credit 6

Summary of the Course

This is the foundational mechanics course for students in Aerospace, Civil, Environmental, Manufacturing, Mechanical, Mechatronics and Mining Engineering, with content as follows: Revision of vectors, resultants and components, moments; The free body diagram; Equilibrium of planar rigid objects; Equilibrium of systems of co-planar multi-force members and planar trusses; Frames and Machines; Springs; Friction; Mass centre, centroids, distributed forces; Internal forces in beams; Introduction to 3-dimensional statics; Plane particle kinematics, including curvilinear and relative motion; Plane particle kinetics, including equations of motion, work-energy-power, friction, impulse-momentum, impact; Kinetics of systems of particles; Introduction to plane kinematics of rigid bodies, types of rigid body motion (translation, rotation about a fixed axis); Mass moment of inertia, parallel axis theorem, moment of inertia for various shapes, Introduction to plane kinetics of rigid bodies, rigid body in plane motion, equations of motion, work-energy for a rigid body.

Course Aims

This is a first course in Engineering Mechanics, which is the study of the interaction of matter and forces in engineering contexts. It is evident that all objects in the world around us are composed of matter, and they are all subject to forces. As such, Engineering Mechanics is the foundational tool for engineers, and forms the underlying basis for understanding more advanced fields such as Solid Mechanics, Fluid Dynamics, Rigid Body Dynamics, Aerodynamics, Structures, Control and many aspects of Advanced Design.

This course is a direct pre-cursor to second stage courses such as ENGG2400 Mechanics of Solids 1 and MMAN2300 Engineering Mechanics 2.

The aim of this course can be stated simply: For everyone involved (staff, students, demonstrators) to progress further towards becoming really good engineers.

Our field of endeavour will be the concepts and applications of Introductory Engineering Mechanics. Additionally, we will not measure our progress as the number of equations or facts or theories that we know. Rather, as our degree of transformation into someone who sees, understands, can make relevant and accurate predictions, and communicates about the world around us through the lens of Engineering Mechanics.

Course Learning Outcomes

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

Learning Outcome	EA Stage 1 Competencies
1. Understand and apply principles of Engineering Mechanics: forces, moments, equilibrium, structural analysis, and momentum and energy for particles and rigid bodies.	PE1.1, PE1.2, PE2.1

Learning Outcome	EA Stage 1 Competencies
2. Discern the relevant principles that must be applied to describe the equilibrium or motion of engineering systems and identify necessary information in the context.	PE1.1, PE1.2, PE2.1
3. Demonstrate an ability to communicate clearly and precisely about technical matters related to Engineering Mechanics.	PE3.2, PE3.5, PE3.6
4. Accomplish hands on tasks that require the application of knowledge of Engineering Mechanics.	PE2.1, PE2.2, PE3.6
5. Demonstrate professional communication, both written and oral, that includes mathematical, graphical and diagrammatic elements.	PE2.1, PE2.2, PE3.4
6. Produce individual work by leveraging a collaborative environment, helping and receiving help from peers professionally and ethically.	PE3.2, PE3.5, PE3.6

Teaching Strategies

This course is designed for student-centred learning. Students are encouraged to think critically to solve engineering problems and to ask questions. Students should participate in-class in order to best achieve the learning outcomes

The following teaching strategies are implemented in this course:

- **Lectures**

Focus on the development and application of generalised problem-solving processes for engineering mechanics. Lectures will also emphasise the relationship of the content to engineering practice and will provide an opportunity for reflection on learning. You are strongly encouraged to attend the face-to-face lectures.

- **Workshops**

Help you to further develop and consolidate problem solving skills. You will be encouraged, from time to time, to work in small groups to solve problems. The class problem sessions (workshops) begin in **Week 1** of term. We encourage you to develop a close working relationship with your demonstrators and the rest of your class.

- **Laboratory**

Help you to learn how to implement the virtual reality experiments by using a structural analysis and design software SPACE GASS. You will install this software on your own PC and complete the relevant tasks given in the lab assignment.

- **Moodle Course Page**

Provides a step-by-step guide to complete the course. There is a discussion forum to help provide interaction and help from your peers. Links to video recordings and Online Learning Modules to help you

learn the solution techniques for many of the subject areas.

- **Pre-recorded Problem Solving Classes**

Concentrate on developing strategies for solving problems in engineering mechanics. You are expected to watch the pre-recorded problem solving classes and attempt the problems prior to attending workshops.

Self-centred and self-directed learning (expectations of the students):

In addition to the class problem sessions, you are expected to commit **at least 6 hours per week** to independent learning and general problem solving.

Suggested approaches to learning in this course include:

- Regular participation in lectures and workshop class problem sessions. *Review lecture and class problem material. Follow worked examples. Reflect on class problems and quizzes.*
- Complete all the required tasks in the Moodle course page for this course.
- Weekly reading and recording of your learning.
- Appropriate preparation for class problem activities.
- Planning your time to achieve all assessment requirements (see assessment).
- We encourage you to work with your peers. A good way to learn the material is in small study groups. Such groups work best if members have attempted the problems individually before meeting as a group. A valued and honest collaboration occurs when, for example, you “get stuck” early on in attacking a Quiz and go to your classmate with a relevant question. Your classmate then has the opportunity to learn from your question as well as help you. You then bring something to the collaboration.
- Students who perform poorly in the quizzes are strongly encouraged to discuss their progress with the lecturers during the term. Please do not suffer in silence – seek the help at an early stage! We would like you to make most of this learning process and receive a high grade in the course.

Assessment

Assessment task	Weight	Due Date	Course Learning Outcomes Assessed
1. 9 Weekly Online Quizzes (7 best ones counted-3 marks each)	21%	Midnight on the following Monday	1, 2, 3, 6
2. Statics and Dynamics Quizzes	24%	Weeks 5 and 9, Friday workshop, 3pm-3.50pm	1, 2, 3
3. Lab Assignment	5%	Week 7	1, 2, 3, 4, 5, 6
4. Final Examination	50%	Exam period: Date TBC	1, 2, 3

Assessment 1: 9 Weekly Online Quizzes (7 best ones counted-3 marks each)

Start date: Each Monday

Assessment length: 9 Weekly Quizzes and marks of the 7 best ones are counted

Due date: Midnight on the following Monday

Deadline for absolute fail: No late submissions

Marks returned: Immediately on the Moodle

These quizzes will keep you up-to-date with the course material. They will encourage you to practice some workshop problems on a weekly basis. Each quiz involves a set of calculation problems and is worthy of 3 marks. Only the final answer is submitted. **You have the chance to attempt the solution multiple times in order to receive a full mark of each quiz.** You are encouraged to collaborate with your peers in order to discover the solutions. The quizzes open on each Monday and are due midnight on the following Monday. No late submissions allowed. **Marks of the 7 best ones will be counted in your final results and grade.**

Assessment criteria

Continued learning Demonstrate understanding of concepts by applying problem solving and critical thinking.

Assessment 2: Statics and Dynamics Quizzes

Start date: Weeks 5 and 9, Friday workshop, 3pm-3.50pm

Assessment length: 50 minutes

Due date: Weeks 5 and 9, Friday workshop, 3pm-3.50pm

Marks returned: Within 10 days

Statics quiz (12%) will be run during the workshop in Week 5 and dynamics quiz (12%) will be run during the workshop in Week 9.

Assessment criteria

The quizzes will be assessed on the basis of technical accuracy of calculations and evidence of good engineering judgment. The entire solution procedure will be marked and not just the final answers.

Assessment 3: Lab Assignment

Start date: Week 4

Assessment length: 3 weeks

Due date: Week 7

Marks returned: Within one week

Lab reports

Assessment 4: Final Examination

Start date: Exam period: Date TBC

Assessment length: 2 hours

Due date: Exam period: Date TBC

Deadline for absolute fail: N/A

Marks returned: Release of final results

The final exam is a **2hr Open Book examination**. The exam covers all course content delivered during the course. You will be assessed based on:

- Technical accuracy of calculations
- Evidence of good engineering practice including sketches, diagrams and correct use of units
- The entire solution procedure will be marked and not just the final answers.

Assessment criteria

Demonstrate understanding of the total course content

Hurdle requirement

Students need to achieve at least 40% in the final exam in order to pass the course.

Attendance Requirements

For courses with Workshops and/or Labs, attendance for those classes is a necessary part of the course. You must attend at least 80% of the workshop/lab in which you are enrolled for the duration of the session.

Course Schedule

Please note the following schedule of Topics covered in each week is a guide only and subject to change based on time constraints. Please attend the lectures each week to ensure you are up to date with the content and know which material to revise prior to the upcoming class.

[View class timetable](#)

Timetable

Date	Type	Content
O-Week: 22 May - 26 May		
Week 1: 29 May - 2 June	Topic	M1 (M-main topics): Introduction; Vectors; Concurrent and non-concurrent forces; Forces; M2: Moments and Couples
	Assessment	Week 1 Quiz: M1
Week 2: 5 June - 9 June	Topic	M3: Equilibrium; Types of Supports; Free Body Diagrams
	Assessment	Week 2 Quiz: M1-M2
Week 3: 12 June - 16 June	Topic	M4: Internal Actions; Beams; Axial Force Diagram; Shear Force Diagram; Bending Moment Diagram
	Assessment	Week 3 Quiz: M1-M3
Week 4: 19 June - 23 June	Topic	M5: Trusses; Method of Joints; Method of Sections
	Assessment	Week 4 Quiz: M1-M4
Week 5: 26 June - 30 June	Topic	M6: 2D Frames; Structures with Internal Hinges; M7: Friction; Fluid Statics
	Assessment	Statics Quiz: Friday 3pm-4pm during Workshop (M1-M5) Week 5 Quiz: M1-M5

Week 6: 3 July - 7 July		No classes (lecture or workshop) and no weekly quiz
Week 7: 10 July - 14 July	Topic	M8: Geometric Section Properties of Plane Figures; Centroid; Second Moment of Area; Parallel Axis Theorem; M9: Introduction to Dynamics
	Assessment	Lab Assignment due on Friday at 8pm Week 7 Quiz: M8
Week 8: 17 July - 21 July	Topic	M9: Kinematics of particles; Motion in One Dimension; Rectilinear Motion
	Assessment	Week 8 Quiz: M9
Week 9: 24 July - 28 July	Topic	M10: Kinetics of Particles; M11: Work and Energy
	Assessment	Dynamics Quiz: Friday 3pm-4pm during Workshop (M9-M11) Week 9 Quiz: M9-M11
Week 10: 31 July - 4 August	Topic	M12: Impulse, Momentum and Impact for Particles; M13: Rigid Bodies
	Assessment	Week 10 Quiz: M9-M13
Stuvac: 7 August - 11 August	Topic	Revision and Consultation (no workshop this week)

Resources

Prescribed Resources

Class	Monday 2:00pm – 4:00pm Thursday 3:00pm – 5:00pm	Face to Face
Workshop	Friday 2:00pm – 4:00pm	Face to Face
Laboratory	As scheduled in weeks 4 and 7	Face to Face
Consultation	Monday 1:00pm – 2:00pm	Face to Face

Lecture notes, weekly quizzes, weekly workshops, lab assignment, pass quizzes/exams, and other learning materials are accessible on the Moodle.

All the lectures should be recorded automatically by the system but this is not guaranteed.

Recommended Resources

Textbooks:

- R.C. Hibbeler, “Engineering Mechanics: Statics” – 14th Edition in SI Units
- R.C. Hibbeler, “Engineering Mechanics: Dynamics” – 14th Edition in SI Units

Additional relevant materials:

- Bedford and Fowler, “Engineering Mechanics Statics”, 8th Edition, Prentice Hall, 2008.
- Bedford and Fowler, “Engineering Mechanics Dynamics”, 8th Edition, Prentice Hall, 2008.
- Hall, Archer, Gilbert, “Engineering Statics”, 1999.

Submission of Assessment Tasks

Please refer to the Moodle page of the course for further guidance on assessment submission.

UNSW has a standard late submission penalty of:

- 5% per day, for all assessments where a penalty applies, capped at five days (120 hours), after which a student cannot submit an assessment, and no permitted variation.

Academic Honesty and Plagiarism

Beware! An assignment that includes plagiarised material will receive a 0 fail, and students who plagiarise may fail the course. Students who plagiarise are also liable to disciplinary action, including exclusion from enrolment.

Plagiarism is the use of another person's work or ideas as if they were your own. When it is necessary or desirable to use other people's material you should adequately acknowledge whose words or ideas they are and where you found them (giving the complete reference details, including page number(s)). The Learning Centre provides further information on what constitutes Plagiarism at:

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

Academic Information

Final Examinations:

Final Exams in T2 2023 will be held on campus between Friday 11th and Thursday 24th August (inclusive), and Supplementary Exams between Monday 4th and Friday 8th September (inclusive). You are required to be available on these dates. Please do not to make any personal or travel arrangements during this period.

For students enrolled in the distance offering of a postgraduate course, and who reside further than 100km from UNSW Kensington campus, will be contacted regarding sitting an external exam. The school's External Exam Policy can be found on the Intranet.

ACADEMIC ADVICE

- Key Staff to Contact for Academic Advice (log in with your zID and password): <https://intranet.civeng.unsw.edu.au/key-staff-to-contact-during-your-studies-at-unsw>
- [Key UNSW Dates](#) - eg. Census Date, exam dates, last day to drop a course without academic/financial liability etc.
- CVEN Student Intranet (log in with your zID and password): <https://intranet.civeng.unsw.edu.au/student-intranet>
- Student Life at CVEN, including Student Societies: <https://www.unsw.edu.au/engineering/civil-and-environmental-engineering/student-life>
- Special Consideration: <https://student.unsw.edu.au/special-consideration>
- General and Program-Specific Questions: [The Nucleus: Student Hub](#)
- Book an Academic Advising session: <https://unswengacademcadvising.as.me/schedule.php>

Disclaimer

This course outline sets out description of classes at the date the Course Outline is published. The nature of classes may change during the Term after the Course Outline is published. Moodle should be consulted for the up to date class descriptions. If there is any inconsistency in the description of activities between the University timetable and the Course Outline (as updated in Moodle), the description in the Course Outline/Moodle applies.

Image Credit

Mike Gal.

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	✓