School of Civil and Environmental Engineering

UNSW Engineering

CVEN2303

Structural Analysis and Modelling

Summer, 2022

Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
Daniel O'Shea	d.oshea@unsw.edu.au	Email for appointment. Available Fridays	Room 108, H20	

Lecturers

Name	Email	Availability	Location	Phone
Ulrike Dackermann	u.dackermann@unsw.edu.au			

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 course introduces students to structural analysis and computer modelling of structures. It explains the theory and physics behind existing computer software that are used for the analysis of complicated structures. It also provides students with a better understanding of the structural behaviour of beams, frames and trusses under different loading conditions. The tools and knowledge gained in this course are inevitable for the design of structures. The topics that are covered in this course include revision of statics with emphasise on drawing internal forces diagrams; conjugate beam method, energy of structures, principles of virtual work; the force (flexibility) method; stiffness method; and moment distribution method applied to continuous beams.

Course Aims

The aim of this course is to introduce students to the fundamental concepts and principles applied by engineers in the analysis and design of structures. We will build upon the mathematics, physics, statics and mechanics of solids courses to address and understand the behaviour of trusses, beams and frames. Also, the course aims to engage students in the formulation and resolution of open-ended, design-type exercises, thereby bridging the divide between scientific theories and engineering practice.

This course will also provide studnets with opportunities to develop the following **graduate attributes**:

- the capacity for analytical and independent critical thinking;
- skills related to lifelong learning, such as self-reflection (ability to apply theory to practice in familiar and unfamiliar situations); and

- collaborative and teamwork skills.

Course Learning Outcomes

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

Learning Outcome	EA Stage 1 Competencies
1. Demonstrate and understand concepts of structural analysis	PE1.1, PE1.2, PE2.1
2. Become proficient in developing and drawing internal actions diagrams, solve statically indeterminate structures, determine and calculate structural deformations.	PE1.1, PE1.2, PE2.1
3. Become proficient in solving structures with large number of degrees of freedom using computer based codes	PE1.5, PE2.1, PE2.2
4. Demonstrate collaborative skills by working with other students in teams	PE3.2, PE3.6

Teaching Strategies

Following are our suggested approaches to learning in the course.

Private Study

- Review lecture material and read textbook
- Do set problems and assignments
- Reflect on class problems and assignments
- Contribute to discussions on MSTeams

Lectures

- Find out what you must learn and read ahead.
- See methods that are not in the textbook
- Follow worked examples
- Listen for announcements on course changes

Tutorials

- Be guided by tutors
- Practice solving set problems
- Ask questions

Assessments (multiple choice, tests, examinations, assignments, hand-in tutorials, laboratory reports etc.)

- Demonstrate your knowledge and skills
- Demonstrate higher understanding and problem solving

Assessment

Assessment task	Weight	Due Date	Course Learning Outcomes Assessed
1. Weekly Assignments	25%	See Moodle for Details	1, 2, 3, 4
2. Quiz	25%	Friday Week 3, 10am	1, 2
3. Final Exam	50%	See Exam Timetable	1, 2

Assessment 1: Weekly Assignments

Assessment length: One week to complete each assignment
Due date: See Moodle for Details

9 Assignments will be available online on moodle. They need to be submitted online by the due date shown on Moodle. There are unlimited attempts whilst the quiz is open, and highest mark is recorded.

Assessment 2: Quiz

Start date: Friday Week 3 (10am AEST)
Due date: Friday Week 3, 10am

The quiz will be assessed on the basis of technical accuracy of calculations and evidence of good engineering judgement. The entire solution procedure will be marked and not just the final answers. The quiz will be held under open book conditions and will be 90 minutes in duration.

Assessment 3: Final Exam

Start date: See Exam Timetable
Due date: See Exam Timetable

The final exam will be held under open book conditions and will be 2hr duration. You need to score at least 40% in the final exam to be able to pass the course.

Attendance Requirements

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

Course Schedule

View class timetable

Timetable

Date	Type	Content
Week 1: 4 January - 7 January	Topic	Tuesday - Introduction, Revision of Statics (note: no workshop today)
	Topic	Thursday - Conjugate Beam Method
Week 2: 10 January - 14 January	Topic	Tuesday - Principle of Work
	Topic	Thursday - Force/Flexibility Method for Trusses
Week 3: 17 January - 21 January	Topic	Tuesday - Force/Flexibility Method for Beams and Frames
	Topic	Thursday - Stiffness Analysis of Trusses
	Assessment	Quiz - 10am Friday 21nd January (ONLINE)
Week 4: 24 January - 28 January	Topic	Tuesday - Thermal Effects and Fit Loads for Trusses
	Topic	Thursday - Stiffness Analysis for Frames
Week 5: 31 January - 4 February	Topic	Tuesday - Moment Distribution Method
	Topic	Thursday - Revision for Final Exam (Demonstration class only)
	Assessment	Final Exam - see Exam Timetable

Resources

Prescribed Resources

Textbook: "Structural Analysis, 10th Edition, SI Units", R.C. Hibbeler

Submission of Assessment Tasks

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

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 Summer 2022 will be held online between 5th - 7th February inclusive. You are required to be available on these dates. Please do not to make any personal or travel arrangements during this period.

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
- Refer to Academic Advice on the School website available at: https://www.engineering.unsw.edu.au/civil-engineering/student-resources/policies-procedures-and-forms/academic-advice

Image Credit

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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	✓