



## UNSW Course Outline

# ZEIT3603 Design of Steel and Timber Structures - 2024

Published on the 30 Jun 2024

## General Course Information

Course Code : ZEIT3603

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 course introduces the design of a range of steel and timber members and member connections using relevant Australian Standards. Students are also introduced to the determination of appropriate design loads for structures and their components - in particular

normal gravity induced loads and wind loads.

## Course Aims

This course aims to introduce the latest design methods of steel and timber members and member connections using relevant Australian Standards.

## Relationship to Other Courses

This is a **six unit course** offered to the 3<sup>rd</sup> year Civil Engineering students in S2. This course will introduce students to the design of a range of steel and timber members and member connections using the relevant Australian Standards. Students will also be introduced to the determination of appropriate design loads for structures and their components - in particular normal gravity induced loads and wind loads. As this is a design course students will be expected to be proficient in the basic concepts of structural analysis and mechanics of solids. The prerequisite of this course is **ZEIT2504, Mechanics of Solids**.

# Course Learning Outcomes

Course Learning Outcomes	Engineers Australia - Professional Engineer (Stage 1)
CLO1 : Explain the basic concepts and principles of loadings on structures including wind loading.	<ul style="list-style-type: none"> <li>• PEE1.1 : Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline</li> <li>• PEE1.5 : Knowledge of engineering design practice and contextual factors impacting the engineering discipline</li> <li>• PEE2.3 : Application of systematic engineering synthesis and design processes</li> </ul>
CLO2 : Analyse and design steel and timber members subjected to individual and combined actions.	<ul style="list-style-type: none"> <li>• PEE1.1 : Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline</li> <li>• PEE1.3 : In-depth understanding of specialist bodies of knowledge within the engineering discipline</li> <li>• PEE1.5 : Knowledge of engineering design practice and contextual factors impacting the engineering discipline</li> <li>• PEE2.3 : Application of systematic engineering synthesis and design processes</li> <li>• PEE3.2 : Effective oral and written communication in professional and lay domains</li> </ul>
CLO3 : Analyse and design steel connections	<ul style="list-style-type: none"> <li>• PEE3.2 : Effective oral and written communication in professional and lay domains</li> </ul>
CLO4 : Analyse and design simple timber connections	<ul style="list-style-type: none"> <li>• PEE1.3 : In-depth understanding of specialist bodies of knowledge within the engineering discipline</li> <li>• PEE1.5 : Knowledge of engineering design practice and contextual factors impacting the engineering discipline</li> <li>• PEE2.2 : Fluent application of engineering techniques, tools and resources</li> <li>• PEE2.3 : Application of systematic engineering synthesis and design processes</li> </ul>
CLO5 : Perform basic design of timber structures.	<ul style="list-style-type: none"> <li>• PEE1.1 : Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline</li> <li>• PEE1.3 : In-depth understanding of specialist bodies of knowledge within the engineering discipline</li> </ul>

	<ul style="list-style-type: none"> <li>• PEE1.5 : Knowledge of engineering design practice and contextual factors impacting the engineering discipline</li> <li>• PEE2.3 : Application of systematic engineering synthesis and design processes</li> <li>• PEE3.2 : Effective oral and written communication in professional and lay domains</li> </ul>
CLO6 : Apply the relevant Australian (AS/NZS) Codes whilst designing Steel and Timber structures.	<ul style="list-style-type: none"> <li>• PEE1.1 : Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline</li> <li>• PEE1.3 : In-depth understanding of specialist bodies of knowledge within the engineering discipline</li> <li>• PEE1.5 : Knowledge of engineering design practice and contextual factors impacting the engineering discipline</li> <li>• PEE2.2 : Fluent application of engineering techniques, tools and resources</li> <li>• PEE2.3 : Application of systematic engineering synthesis and design processes</li> <li>• PEE3.2 : Effective oral and written communication in professional and lay domains</li> </ul>

Course Learning Outcomes	Assessment Item
CLO1 : Explain the basic concepts and principles of loadings on structures including wind loading.	<ul style="list-style-type: none"> <li>• Quizzes and Tests</li> <li>• Examination</li> </ul>
CLO2 : Analyse and design steel and timber members subjected to individual and combined actions.	<ul style="list-style-type: none"> <li>• Quizzes and Tests</li> <li>• Examination</li> </ul>
CLO3 : Analyse and design steel connections	<ul style="list-style-type: none"> <li>• Quizzes and Tests</li> <li>• Examination</li> </ul>
CLO4 : Analyse and design simple timber connections	<ul style="list-style-type: none"> <li>• Quizzes and Tests</li> <li>• Examination</li> </ul>
CLO5 : Perform basic design of timber structures.	<ul style="list-style-type: none"> <li>• Quizzes and Tests</li> <li>• Examination</li> </ul>
CLO6 : Apply the relevant Australian (AS/NZS) Codes whilst designing Steel and Timber structures.	<ul style="list-style-type: none"> <li>• Quizzes and Tests</li> <li>• Examination</li> </ul>

## Learning and Teaching Technologies

Moodle - Learning Management System

# Learning and Teaching in this course

## Teaching Strategies

The course will be presented in the form of face-to-face lectures and tutorials (synchronous online lectures and tutorials using Collaborate Ultra in case of urgent shutdown of UNSW Canberra due to COVID-19). As understanding of the subject involves the capacity to perform detailed engineering calculations for each of the various aspects considered, four tests involving such calculations will be set at significant stages throughout the course. Active engagements in face-to-face lectures and tutorials (or synchronous online lectures and tutorials) are strongly encouraged.

## 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](mailto: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](mailto: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

NA

## 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>

## **Other Information**

*All students are expected to download and print out the relevant design codes and use them during their quizzes, tests and final examination.*

### **COVID-19 Roll back to fully online Contingency Plan**

For this course, it is expected that all lectures, class test and the final examination will be conducted in face-to-face manner. In case of an urgent shutdown of UNSW Canberra due to COVID-19, all lectures will be switched back to online mode. All lectures will be delivered online through Moodle/Blackboard. For the class tests and the final examination, it will be conducted in the format of an online invigilated examination

### **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 and Tests	50%	Start Date: Not Applicable Due Date: Not Applicable	<ul style="list-style-type: none"> <li>• PEE1.1 : Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline</li> <li>• PEE1.3 : In-depth understanding of specialist bodies of knowledge within the engineering discipline</li> <li>• PEE2.1 : Application of established engineering methods to complex engineering problem solving</li> <li>• PEE2.2 : Fluent application of engineering techniques, tools and resources</li> <li>• PEE2.3 : Application of systematic engineering synthesis and design processes</li> <li>• PEE3.2 : Effective oral and written communication in professional and lay domains</li> </ul>
Examination	50%	Start Date: Not Applicable Due Date: Not Applicable	<ul style="list-style-type: none"> <li>• PEE1.1 : Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline</li> <li>• PEE1.3 : In-depth understanding of specialist bodies of knowledge within the engineering discipline</li> <li>• PEE1.5 : Knowledge of engineering design practice and contextual factors impacting the engineering discipline</li> <li>• PEE2.1 : Application of established engineering methods to complex engineering problem solving</li> <li>• PEE2.2 : Fluent application of engineering techniques, tools and resources</li> <li>• PEE2.4 : Application of systematic approaches to the conduct and management of projects within the technology domain</li> <li>• PEE2.3 : Application of systematic engineering synthesis and design processes</li> </ul>



			• PEE3.2 : Effective oral and written communication in professional and lay domains
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## Assessment Details

### Quizzes and Tests

#### Assessment Overview

The three tests will be held during the semester in to cover the topics of (i) Loads on Structures, (ii) Bolted and Welded Steel Connections, and (iii) Timber Engineering. In addition, for the steel design part, three quizzes will be conducted on the topics of (i) tension members, (ii) compression members and (iii) Beam design.

#### Course Learning Outcomes

- CL01 : Explain the basic concepts and principles of loadings on structures including wind loading.
- CL02 : Analyse and design steel and timber members subjected to individual and combined actions.
- CL03 : Analyse and design steel connections
- CL04 : Analyse and design simple timber connections
- CL05 : Perform basic design of timber structures.
- CL06 : Apply the relevant Australian (AS/NZS) Codes whilst designing Steel and Timber structures.

#### Detailed Assessment Description

Class test 1 during Week 3 on Loads on Structures: 10% of total course mark

Class test 2 during Week 6 on Timber design: 15% of total course marks

Class test 3 during Week 9 on Steel tension member design: 10% of total course mark

Class test 4 during Week 12 on Steel compression and bending member design: 15% of total course marks

#### Assessment Length

60 to 90 mins (details will be given before the tests)

#### Submission notes

Online submission during the class

## Assessment information

### Materials allowed or provided at tests:

All tests and the final examination will be open book so that students are allowed to refer to their lecture notes and relevant design codes only.

## Assessment Criteria

Marks for the assessment tasks will be given with consideration to:

☒ *Understanding of principles* – we are looking to see that you are able to apply basic concepts to the engineering questions.

☒ *Correctness* – look for ways to check your results with redundant calculations or checking back to the original question.

☒ *Clarity* – all steps should be shown to check every calculation. This is very important from the point of view of effective communication.

☒ *Completeness* – all answers should include any relevant units, neat clear diagrams, graphs, etc. All assumptions, approximations and simplifications shall be clearly stated.

## Supplementary Assessment

Supplementary assessment in the event of failure of the course is generally **not available** and should not be expected. Exceptions may be made for students in the final year of their program where there is a single failure preventing graduation.

To pass this course, a student must achieve (1) **an aggregate minimum of 40% for tests and (2) a minimum of 40% of the final examination, and (3) a minimum of 50% of the overall mark.** Final marks in this course may be moderated.

## **Use of Generative AI in Assessments**

*For all the class tests and final examination, it is prohibited to use any software or service to search for or generate information or answers. If its use is detected, it will be regarded as serious academic misconduct and subject to the standard penalties, which may include 00FL, suspension and exclusion.*

### Assignment submission Turnitin type

Not Applicable

## **Examination**

### Assessment Overview

All topics covered in the course will be assessed in open book examination.

The total weight of the examination 50% of overall course total.

### Course Learning Outcomes

- CL01 : Explain the basic concepts and principles of loadings on structures including wind loading.
- CL02 : Analyse and design steel and timber members subjected to individual and combined actions.
- CL03 : Analyse and design steel connections
- CL04 : Analyse and design simple timber connections
- CL05 : Perform basic design of timber structures.
- CL06 : Apply the relevant Australian (AS/NZS) Codes whilst designing Steel and Timber structures.

### Detailed Assessment Description

Final examination will be held during the examination week.

### Assessment Length

3 hours

### Submission notes

Online or hardcopy submission

### Assessment information

#### Materials allowed or provided at tests:

All tests and the final examination will be open book so that students are allowed to refer to their lecture notes and relevant design codes only.

To pass this course, a student must achieve (1) an aggregate minimum of 40% for tests and (2) a minimum of 40% of the final examination, and (3) a minimum of 50% of the overall mark. Final marks in this course may be moderated.

## **Use of Generative AI in Assessments**

*For all the class tests and final examination, it is prohibited to use any software or service to search for or generate information or answers. If its use is detected, it will be regarded as serious academic misconduct and subject to the standard penalties, which may include 00FL, suspension and exclusion.*

#### Assignment submission Turnitin type

Not Applicable

## **General Assessment Information**

### **Feedback before census date**

Class test 1 will be held in week 3, feedback, grades and worked solutions will be given to students during week 4

### **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**

*For all the class tests and final examination, it is prohibited to use any software or service to search for or generate information or answers. If its use is detected, it will be regarded as serious academic misconduct and subject to the standard penalties, which may include 00FL, suspension and exclusion.*

#### Grading Basis

Standard

#### Requirements to pass course

To pass this course, a student must achieve (1) an aggregate minimum of 40% for tests and (2) a minimum of 40% of the final examination, and (3) a minimum of 50% of the overall mark. Final marks in this course may be moderated.

# Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 15 July - 19 July	Lecture	L1: Outline of the course. Basics of material properties and design loading concepts L2: Limit state design actions and load combinations for structural design
Week 2 : 22 July - 26 July	Lecture	L3: Load calculation of structures L4: Introduction to wind loading and design wind load estimations.
Week 3 : 29 July - 2 August	Lecture	L5: Design pressure coefficients & wind drag on particular shapes.
	Assessment	CLASS TEST 1: LOADS ON STRUCTURES (10%)
Week 4 : 5 August - 9 August	Lecture	L6: Introduction to timber grading, classification & strength Timber design methods. L7: Design of timber tension members and timber beams.
Week 5 : 12 August - 16 August	Lecture	L8: Design of timber compression members
Week 6 : 19 August - 23 August	Lecture	L9: Design of flexural members
	Assessment	CLASS TEST 2: TIMBER (15%)
Week 7 : 9 September - 13 September	Lecture	L10: Introduction, basics of steel design L11: Design of tension members
Week 8 : 16 September - 20 September	Lecture	L12: Introduction to design for compression, Design for compression: Cross-sections
Week 9 : 23 September - 27 September	Lecture	L13: Design for compression members, Introduction to design for bending Design for Bending: cross-sections Design for Bending members I
	Assessment	CLASS TEST 3: TENSION MEMBERS (10%)
Week 10 : 30 September - 4 October	Lecture	L14: Design for Bending members II L15: Design for Bending members III, Introduction to steel Connection, Bolted connections I
Week 11 : 7 October - 11 October	Lecture	L16: Bolted connections II: Bolt group L17: Welded connection I
Week 12 : 14 October - 18 October	Lecture	L18: Welded connection II: Complex connections
	Assessment	CLASS TEST 4: COMPRESSION AND BENDING MEMBERS (15%)
Week 13 : 21 October - 25 October	Lecture	Revision 1 and Revision 2 (no new materials)

## Attendance Requirements

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

## General Schedule Information

Two three-hour lectures per week.

For details, please refer to the Detailed teaching schedule in the Moodle site.

## Course Resources

### Prescribed Resources

Students will need to obtain the following essential texts.

- Australian / New Zealand Standard AS/NZS 1170 Parts 0, 1, 2 and 3 (available for printing via *On-line Standards* at the ADFA library)

- Australian Standard AS 4100 – Steel Structures as well as Standards Australia AS4100 Steel Structures - Commentary (available for printing via *On-line Standards* at the ADFA library)
- Australian Standard “AS1720.1:2010 - Timber Structures, Part 1 (available for printing via *On-line Standards* at the ADFA library)
- Australian Steel Institute “Design Capacity Tables, vol 1: Open Sections”, 4<sup>th</sup> edition
- Bootle, Keith R; 'Wood in Australia, Types, Properties and Uses'; (2nd ed); 2010; ISBN-13 9780071014014

It is also noted that no text, or for that matter series of lectures, can hope to cover in detail every aspect associated with the design of steel or timber structures. Students are therefore encouraged to read widely.

## Recommended Resources

Additional texts that you would find useful include:

- Gorenc, Tinyou and Syam “Steel Designers Handbook”, 8<sup>th</sup> edition
- Trahair and Bradford, The Behaviour and Design of Steel Structures to AS 4100, 3<sup>rd</sup> Edition

*Addition resources in the forms of video clips, design summary procedure, online tools and links as well as useful reference websites from different professional societies etc. will also be made available in the Moodle site.*

## Additional Costs

NA.

## 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.*

## Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
Convenor	Chi King Lee		B20 R133	0251145173	by email and phone appointment	Yes	Yes
Lecturer	Safat Al-Deen		Room 126, Building 20	02-5114-5113	by email and phone appointment	No	No