



UNSW Course Outline

ZEIT3605 Design of Concrete and Prestressed Concrete Structures - 2024

Published on the 30 Jun 2024

General Course Information

Course Code : ZEIT3605

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 starts by introducing and discussing concepts and methods of reinforced concrete

design. Students will learn how to analyse and design rectangular and flanged reinforced concrete beams. The acquired skills will be used by the students to design one-way slabs. Deflections of beams and one-way slabs will be analysed and designed for. The skills developed at this stage enable students to learn correct detailing and presentation of their design work. Students will then learn the philosophy and methods of design of two-way reinforced concrete slabs which includes designing for punching shear in flat plates and flat slabs. Students will then be introduced to the design of short and slender reinforced concrete columns and will develop the capacity to design columns for a axial and biaxial effects. This part naturally concludes with principles and methods used in designing reinforced concrete footings. Prestressed concrete will be introduced to the extent of familiarising students with its concepts through simple design examples.

Relationship to Other Courses

The prerequisite of this course: ZEIT 3600 Structural analysis

Course Learning Outcomes

Course Learning Outcomes	Engineers Australia - Professional Engineer (Stage 1)
CLO1 : Apply the principles of statics and mechanics of solids to assess the loads on and the internal stresses experienced by elements.	<ul style="list-style-type: none"> • PEE1.3 : In-depth understanding of specialist bodies of knowledge within the engineering discipline
CLO2 : Identify the relevant loads and load cases to consider in the design of a structure and to apply the rules of the standards to establish appropriate design loads for a member or structure.	<ul style="list-style-type: none"> • 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 • PEE3.2 : Effective oral and written communication in professional and lay domains
CLO3 : Apply the rules of the Australian Concrete Standard AS3600 to the design of beams, slabs, columns and footings. Prepare reinforcing details for the members.	<ul style="list-style-type: none"> • 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 • PEE3.2 : Effective oral and written communication in professional and lay domains
CLO4 : Express design calculations in a legible, structured and traceable format	<ul style="list-style-type: none"> • PEE1.5 : Knowledge of engineering design practice and contextual factors impacting the engineering discipline • PEE3.2 : Effective oral and written communication in professional and lay domains • PEE3.3 : Creative, innovative and pro-active demeanour
CLO5 : Develop simple, neat engineering sketches describing your solution	<ul style="list-style-type: none"> • PEE1.5 : Knowledge of engineering design practice and contextual factors impacting the engineering discipline • PEE3.2 : Effective oral and written communication in professional and lay domains • PEE3.3 : Creative, innovative and pro-active demeanour

Course Learning Outcomes	Assessment Item
CLO1 : Apply the principles of statics and mechanics of solids to assess the loads on and the internal stresses experienced by elements.	<ul style="list-style-type: none"> • Assignment 1 • Assignment 2 • Assignment 3 • Assignment 4 • Assignment 5 • Final Exam
CLO2 : Identify the relevant loads and load cases to consider in the design of a structure and to apply the rules of the standards to establish appropriate design loads for a member or structure.	<ul style="list-style-type: none"> • Assignment 1 • Assignment 2 • Assignment 3 • Assignment 4 • Assignment 5 • Final Exam
CLO3 : Apply the rules of the Australian Concrete Standard AS3600 to the design of beams, slabs, columns and footings. Prepare reinforcing details for the members.	<ul style="list-style-type: none"> • Assignment 1 • Assignment 2 • Assignment 3 • Assignment 4 • Assignment 5 • Final Exam
CLO4 : Express design calculations in a legible, structured and traceable format	<ul style="list-style-type: none"> • Assignment 1 • Assignment 2 • Assignment 3 • Assignment 4 • Assignment 5 • Final Exam
CLO5 : Develop simple, neat engineering sketches describing your solution	<ul style="list-style-type: none"> • Assignment 1 • Assignment 2 • Assignment 3 • Assignment 4 • Assignment 5 • Final Exam

Learning and Teaching Technologies

Moodle - Learning Management System

Learning and Teaching in this course

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

Other Professional Outcomes

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.

Additional Course Information

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>

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>

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)
Assignment 1 Short Extension: Yes (7 days)	10%	Start Date: Not Applicable Due Date: 01/08/2024 11:55 PM	<ul style="list-style-type: none">• 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• PEE1.2 : Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline• PEE1.5 : Knowledge of engineering design practice and contextual factors impacting the engineering discipline• PEE1.6 : Understanding of the scope, principles, norms, accountabilities and bounds of sustainable engineering practice in the specific discipline• PEE2.1 : Application of established engineering methods to complex engineering problem solving• PEE2.3 : Application of systematic engineering synthesis and design processes• PEE3.4 : Professional use and management of information• PEE3.5 : Orderly management of self, and professional conduct
Assignment 2 Short Extension: Yes (7 days)	10%	Start Date: Not Applicable Due Date: 22/08/2024 11:55 PM	<ul style="list-style-type: none">• 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

			<p>understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline</p> <ul style="list-style-type: none"> • 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 • PEE1.6 : Understanding of the scope, principles, norms, accountabilities and bounds of sustainable engineering practice in the specific discipline • PEE2.1 : Application of established engineering methods to complex engineering problem solving • PEE2.3 : Application of systematic engineering synthesis and design processes • PEE3.4 : Professional use and management of information • PEE3.5 : Orderly management of self, and professional conduct
Assignment 3	10%	<p>Start Date: Not Applicable Due Date: 19/09/2024 11:55 PM</p>	<ul style="list-style-type: none"> • 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 • PEE1.5 : Knowledge of engineering design practice and contextual factors impacting the engineering discipline • PEE1.6 : Understanding of the

			<p>scope, principles, norms, accountabilities and bounds of sustainable engineering practice in the specific discipline</p> <ul style="list-style-type: none"> • PEE2.1 : Application of established engineering methods to complex engineering problem solving • PEE2.3 : Application of systematic engineering synthesis and design processes • PEE3.4 : Professional use and management of information • PEE3.5 : Orderly management of self, and professional conduct
Assignment 4	10%	<p>Start Date: Not Applicable Due Date: 03/10/2024 11:55 PM</p>	<ul style="list-style-type: none"> • 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 • PEE1.5 : Knowledge of engineering design practice and contextual factors impacting the engineering discipline • PEE1.6 : Understanding of the scope, principles, norms, accountabilities and bounds of sustainable engineering practice in the specific discipline • PEE2.1 : Application of established engineering methods to complex engineering problem solving • PEE2.3 : Application of systematic engineering synthesis and design processes • PEE3.4 : Professional use and management of information • PEE3.5 : Orderly management of self, and professional conduct

Assignment 5	10%	Start Date: Not Applicable Due Date: 23/10/2024 11:55 PM	<ul style="list-style-type: none"> • 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 • PEE1.5 : Knowledge of engineering design practice and contextual factors impacting the engineering discipline • PEE1.6 : Understanding of the scope, principles, norms, accountabilities and bounds of sustainable engineering practice in the specific discipline • PEE2.1 : Application of established engineering methods to complex engineering problem solving • PEE2.3 : Application of systematic engineering synthesis and design processes • PEE3.4 : Professional use and management of information • PEE3.5 : Orderly management of self, and professional conduct
Final Exam	50%	Start Date: Not Applicable Due Date: During exam week	<ul style="list-style-type: none"> • 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

			<p>understanding of specialist bodies of knowledge within the engineering discipline</p> <ul style="list-style-type: none"> • PEE1.5 : Knowledge of engineering design practice and contextual factors impacting the engineering discipline • PEE1.6 : Understanding of the scope, principles, norms, accountabilities and bounds of sustainable engineering practice in the specific discipline • PEE2.1 : Application of established engineering methods to complex engineering problem solving • PEE2.3 : Application of systematic engineering synthesis and design processes • PEE3.4 : Professional use and management of information • PEE3.5 : Orderly management of self, and professional conduct
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Assessment Details

Assignment 1

Assessment Overview

Assignment on the flexural design on a reinforced concrete beam. Feedback will be provided with the assessed assignment

Course Learning Outcomes

- CLO1 : Apply the principles of statics and mechanics of solids to assess the loads on and the internal stresses experienced by elements.
- CLO2 : Identify the relevant loads and load cases to consider in the design of a structure and to apply the rules of the standards to establish appropriate design loads for a member or structure.
- CLO3 : Apply the rules of the Australian Concrete Standard AS3600 to the design of beams, slabs, columns and footings. Prepare reinforcing details for the members.
- CLO4 : Express design calculations in a legible, structured and traceable format
- CLO5 : Develop simple, neat engineering sketches describing your solution

Detailed Assessment Description

Samll part of the assignemnt is group work and significant part is individual. Submission is individual.

Assignment submission Turnitin type

Not Applicable

Assignment 2

Assessment Overview

Assignment on the shear design on a reinforced concrete beam. Feedback will be provided with the assessed assignment

Course Learning Outcomes

- CLO1 : Apply the principles of statics and mechanics of solids to assess the loads on and the internal stresses experienced by elements.
- CLO2 : Identify the relevant loads and load cases to consider in the design of a structure and to apply the rules of the standards to establish appropriate design loads for a member or structure.
- CLO3 : Apply the rules of the Australian Concrete Standard AS3600 to the design of beams, slabs, columns and footings. Prepare reinforcing details for the members.
- CLO4 : Express design calculations in a legible, structured and traceable format
- CLO5 : Develop simple, neat engineering sketches describing your solution

Detailed Assessment Description

Samll part of the assignemnt is group work and significant part is individual. Submission is individual

Assignment submission Turnitin type

Not Applicable

Assignment 3

Assessment Overview

Assignment on the design on a reinforced concrete slab. Feedback will be provided with the assessed assignment

Course Learning Outcomes

- CLO1 : Apply the principles of statics and mechanics of solids to assess the loads on and the internal stresses experienced by elements.
- CLO2 : Identify the relevant loads and load cases to consider in the design of a structure and to apply the rules of the standards to establish appropriate design loads for a member or structure.
- CLO3 : Apply the rules of the Australian Concrete Standard AS3600 to the design of beams, slabs, columns and footings. Prepare reinforcing details for the members.
- CLO4 : Express design calculations in a legible, structured and traceable format

- CLO5 : Develop simple, neat engineering sketches describing your solution

Detailed Assessment Description

Small part of the assignment is group work and significant part is individual. Submission is individual

Assignment submission Turnitin type

Not Applicable

Assignment 4

Assessment Overview

Assignment on the design on a reinforced concrete column. Feedback will be provided with the assessed assignment

Course Learning Outcomes

- CLO1 : Apply the principles of statics and mechanics of solids to assess the loads on and the internal stresses experienced by elements.
- CLO2 : Identify the relevant loads and load cases to consider in the design of a structure and to apply the rules of the standards to establish appropriate design loads for a member or structure.
- CLO3 : Apply the rules of the Australian Concrete Standard AS3600 to the design of beams, slabs, columns and footings. Prepare reinforcing details for the members.
- CLO4 : Express design calculations in a legible, structured and traceable format
- CLO5 : Develop simple, neat engineering sketches describing your solution

Detailed Assessment Description

Small part of the assignment is group work and significant part is individual. Submission is individual

Assignment submission Turnitin type

Not Applicable

Assignment 5

Assessment Overview

Assignment on the design on a reinforced concrete footing. Feedback will be provided with the assessed assignment

Course Learning Outcomes

- CLO1 : Apply the principles of statics and mechanics of solids to assess the loads on and the internal stresses experienced by elements.
- CLO2 : Identify the relevant loads and load cases to consider in the design of a structure and

- to apply the rules of the standards to establish appropriate design loads for a member or structure.
- CLO3 : Apply the rules of the Australian Concrete Standard AS3600 to the design of beams, slabs, columns and footings. Prepare reinforcing details for the members.
 - CLO4 : Express design calculations in a legible, structured and traceable format
 - CLO5 : Develop simple, neat engineering sketches describing your solution

Detailed Assessment Description

Small part of the assignment is group work and significant part is individual. Submission is individual

Assignment submission Turnitin type

Not Applicable

Final Exam

Assessment Overview

Open Book exam on the topics covered in the course.

Course Learning Outcomes

- CLO1 : Apply the principles of statics and mechanics of solids to assess the loads on and the internal stresses experienced by elements.
- CLO2 : Identify the relevant loads and load cases to consider in the design of a structure and to apply the rules of the standards to establish appropriate design loads for a member or structure.
- CLO3 : Apply the rules of the Australian Concrete Standard AS3600 to the design of beams, slabs, columns and footings. Prepare reinforcing details for the members.
- CLO4 : Express design calculations in a legible, structured and traceable format
- CLO5 : Develop simple, neat engineering sketches describing your solution

Detailed Assessment Description

Individual exam during the exam week

Assessment Length

3 hours

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**.

A diagnostic test will be conducted in week 1. It will not count for the final grade, but written

feedback will be provided by the census date. Feedback of assignment 1 due in week 3 will also be provided by the census date.

The final exam is an Open Book exam and will be scheduled within the Final Exams period. The final exam will contribute 50% to the final assessment, assignments will contribute 50%. Each assignment contributes 10%.

In cases where design tasks are required to be performed by team work, individual students will be asked at random to present the work done by their group on the Design Task and a mark will be allocated for their performance. Note that in such cases, and as any one student may only present on few occasions during the semester, it is vital that on each occasion the student is fully conversant with all aspects of the group's submission.

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

NO ASSISTANCE

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

Overall passing mark is set at 50%

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 15 July - 19 July	Lecture	Introduction to the course and revision of assumed knowledge
	Lecture	Beam Design 1
Week 2 : 22 July - 26 July	Tutorial	ETABS Tutorial
	Lecture	Beam Design 2
Week 3 : 29 July - 2 August	Tutorial	Beam Design Tutorial 1
	Lecture	Beam Design 3
	Assessment	Assignment 1 due
Week 4 : 5 August - 9 August	Tutorial	Beam design Tutorial 2 and 3
Week 5 : 12 August - 16 August	Lecture	Shear Design 1 and 2
Week 6 : 19 August - 23 August	Tutorial	Shear Design Tutorial
	Lecture	Slab Design 1
	Assessment	Assignment 2 due
Week 7 : 9 September - 13 September	Tutorial	Slab Design Tutorial 1
	Lecture	Slab Design 2
Week 8 : 16 September - 20 September	Lecture	Column Design 1
	Assessment	Assignment 3 due
Week 9 : 23 September - 27 September	Tutorial	Column design Tutorial 1
	Lecture	Column Design 2
Week 10 : 30 September - 4 October	Tutorial	Column design Tutorial 2
	Lecture	Foundation design 1
	Assessment	Assignment 4 due
Week 11 : 7 October - 11 October	Tutorial	Foundation design tutorial 1
Week 12 : 14 October - 18 October	Lecture	Foundation Design 2
	Tutorial	Foundation design tutorial 2
Week 13 : 21 October - 25 October	Lecture	Introduction to prestressed concrete
	Lecture	Course revision
	Assessment	Assignment 5 due

Attendance Requirements

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

General Schedule Information

Teaching Strategies

This course, being a senior design course will resemble design office settings. Students will be treated and should consider themselves as engineers in a design office. The lecturer will be presenting topics, principles and issues that are relevant to the task in hand. In other words, the main task will be design assignments and the lectures will revolve around those tasks. Students may be arranged in design teams that serve the purpose of the whole 'design office' purposes vis a vis the design tasks that need to be accomplished during the semester.

The following learning strategies will be applied

- *Formal lectures.*
- *Learning by consultation within a group and with academic staff.*
- *Application of Project Based Learning method.*
- *Tutorials in the form of "Design Tasks".*

Tutorials

Tutorials will occur regularly each week and it is expected that all will attend. The tutorials will be such that students deal with problems of design and analysis in a setting similar to that of a design office. The role of the lecturer is that of a senior engineer and facilitator. The students will be solving the problems of design in consultation with the lecturer. There is no objection to the students consulting with each other in a manner similar to what goes on in a consultancy firm. In fact, we very much encourage this form of learning and consider it an adult and mature method of sharing knowledge in a real life situation.

The students will submit their work continually and receive feedback as they go. When students work in groups, each student is supposed to be completely aware and conversant with the work done by every other member of her/his group. At the end of every design task, members are required to explain their work to the rest of their colleagues. They will be graded according to their performance in the presentation and discussion of their tasks.

Non teaching days

No class on non teching days

Course Resources

Prescribed Resources

The following resources are essential and must be obtained by all students,

Textbook

CONCRETE STRUCTURES;

1. *Reinforced Concrete Basics (3nd Edition) Warner, R.F, Foster, S.J., and Kilpatrick A.E., Pearson, 2021, ISBN: 978 0 7339 8869*

Codes of Practice

1. Australian Standard 3600-2018, CONCRETE STRUCTURES, Published by Standards Association of Australia.

Recommended Resources

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 reinforced concrete structures. The student is therefore encouraged to read widely. The additional references noted here are useful starting point,

CONCRETE STRUCTURES;

1. Concrete Structures, Warner R.F., Rangan B.V., Hall A.S. and Faulkes K.A., Longman, 1998
2. Reinforced Concrete: Mechanics and Design, Wight J.K. and MacGregor J.G., Pearson, 2009, 5th Edition ISBN: 978 0 13 228141 6

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	Safat Al-Deen		B20 R126	02 5114 5113	Wednesday 1:30 PM to 2:30 PM	No	Yes

