CVEN4301

Advanced Concrete Structures

Term 2, 2022

Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
Hamid Valipour	h.valipour@unsw.edu.au			+61407247711

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

A course on the advanced analysis and design of concrete structures for students looking towards a career in Structural Engineering. The course deals with the design and behaviour of the following fundamental aspects for reinforced and prestressed concrete member design: one-way and two-way concrete slabs (including the direct design, equivalent frame and simplified strip methods); retaining walls, strip, pad and pile footings; and determinant prestressed concrete members. Additional topics may be drawn from the following: design for torsion, detailing; ductility; preliminary sizing of members and frames; design with high strength and fibre reinforced concretes.

Course Aims

The aim of this elective course is to provide final year students with a more advanced coverage of various topics relating to the design of concrete structures. The course is targeted at students who wish to specialize in Structural Engineering and are planning a career in structural design. The course will build on and reinforce the material covered in the core structural engineering courses.

During this course students will be supported in polishing the core skills, qualities and understandings developed in previous courses and hone their structural engineering skills associated with their role as a future Civil Engineer.

Course Learning Outcomes

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

Learning Outcome	EA Stage 1 Competencies
1. Demonstrate an understanding of fundamental and advanced concepts in structural concrete and apply the knowledge of structural design practice	PE1.1, PE1.2, PE1.3, PE1.5
2. Fluently use the Australian standards (e.g. AS3600 and AS1170) and other structural concrete design resources and develop skills for application of systematic reinforced and prestressed concrete design processes	PE2.2, PE2.3
3. Communicate your design in written and graphical form and develop skills in effective teamwork	PE3.2, PE3.6

Teaching Strategies

TEACHING STRATEGIES

Private Study

- Review lecture material and textbook
- Do set problems and assignments
- Join Moodle discussions of problems
- Reflect on class problems, assignments, quizzes and extra solved examples provided
- Download materials from Moodle
- Keep up with notices and find out marks via Moodle

Lectures

- Find out what you must learn
- See methods that are not in the textbook
- Follow worked examples and watch the lighboard video recordings
- Hear announcements on course changes

Workshops

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

Assessments

(assignments and quizzes)

- Demonstrate your understanding of the fundamentals of structural design
- Demonstrate your knowledge and skills in design of reinforced and pre-stressed concrete structures
- Demonstrate higher understanding and problem solving

The main objective of this course is provide opportunities for students to

- reinforce their knowledge of structural engineering
- further develop and advance skills in structural design
- reinforce their understanding of philosophy of design and link design and analysis
- develop the ability for analytical and independent critical thinking
- develop skills related to lifelong learning, such as self-reflection (ability to apply theory to practice in familiar and unfamiliar situations); and
- acquire the skills for effective collaboration and teamwork

Additional Course Information

Prerequisites

CVEN3301 OR CVEN2303, CVEN3304 OR CVEN3302

This course will continue with and will build on the concepts introduced in Structural Analysis and Modelling (CVEN3301 OR CVEN2303), Concrete Structures (CVEN3304) OR Structural Behaviour and Design (CVEN3302).

Assessment

Assessment task	Weight	Due Date	Course Learning Outcomes Assessed
1. Online short answer (stack) Quiz-1	15%	24/06/2022 08:00 PM	1, 2
2. Online short answer (stack) Quiz-2	15%	15/07/2022 08:00 PM	1, 2, 3
3. Online short answer (stack) Quiz-3	10%	04/08/2022 08:00 PM	1, 2
4. Final Exam	60%	Not Applicable	1, 2

Assessment 1: Online short answer (stack) Quiz-1

Start date: 24/06/2022 06:00 PM
Assessment length: 70 minutes
Due date: 24/06/2022 08:00 PM
Marks returned: 27/06/2022

The main objective of this individual assignment is it to encourage students to engage with the subject content as soon as possible and develop an understanding about principles of simplified and advanced methods in design of RC structures.

Assessment 2: Online short answer (stack) Quiz-2

Start date: 15/07/2022 06:00 PM
Assessment length: 60 minutes
Due date: 15/07/2022 08:00 PM
Marks returned: 21/07/2022

The main objective of this group assessment is to provide opportunities for students to reinforce their knowledge and understanding of advanced reinforced concrete design with emphasis on deflection control of slabs under service load and practical design of slabs under ultimate conditions according to AS3600-2018 provisions.

Assessment 3: Online short answer (stack) Quiz-3

Start date: 04/08/2022 06:00 PM
Assessment length: 70 minutes
Due date: 04/08/2022 08:00 PM

The main objective of this individual assignment is to provide opportunities for students to reinforce their knowledge about principles of prestressed/post-tensioned concrete (PC) design.

Assessment 4: Final Exam

Students are required to answer two questions (2 hour 30 minute exam) that involve different aspects of

reinforced concrete and prestressed concrete design covered throughout the term

Hurdle requirement

A mark of at least 40% in the final examination is required before the class work is included in the final mark.

If students receive <40% in the final exam, their final mark in the subject is the same as final exam mark.

Additional details

Note: Please refer to final exam timetable to be released by school

Attendance Requirements

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

Course Schedule

Date	Topic	Lecture Content	Demonstration Content
01/06 **(Week 1)**	Introduction to slabs & limit states design of slabs and deflection control	Slabs & floor systems, introduction, stress resultants, methods of analysis, design requirements, one-way vs two- way slab, deemed to comply	
08/06 **(Week 2)**	One- and two-way slabs, time effect, deflection and crack control, two-way slabs supported on edges (**Part 1**)	Analysis and design of one-way and two-way slabs, effective second moment of area, modulus ratio- ***RCB Chap 4***	Deemed to comply deflection control of slabs.
15/06 **(Week 3)**	One- and two-way slabs, time effect and crack control, two-way slabs supported on edges (**Part 2**)	Analysis and design of one-way and two-way slabs, time effect, crack control and simplified method (coefficient method) for analysis of two-way slabs	Short-term deflection calculations using simplified method Shrinkage strain and creep coefficient (Long-term effects)
22/06 **(Week 4)**	Flat slabs (**Part 1**)	Flat plates and flat slab design (**Part 1**): direct design (simplified) method **- *RCB Chap 4***	Revisiting flexural strength limit state design Analysis & design of slabs supported on beams
29/06 **(Week 5)**	Flat slabs (**Part 2**) and Punching shear	Flat plates and flat slab design (Part 2): equivalent frame method - ***RCB Chap 4*** Punching shear	Analysis and design of slabs using direct design method
06/07 **(Week 6)**		*Flexibility week for all courses (non-teaching)*	
13/07 **(Week 7)**	Footings	Analysis and design of footings - ***RCB Chap 8***	Analysis and design of flat slabs using equivalent frame method Punching strength of flat slabs
20/07 **(Week 8)**	Retaining walls	Analysis and design of retaining walls	Analysis & design of strap footing Analysis & design of combined footing;
27/07	Introduction to prestressed concrete members	Introduction to prestressed concrete members; properties of materials;	Analysis & design of retaining walls

(Week 9)		Elastic Stress Analysis due to Prestress; Load Balancing - ***PC Chap 1 & 2***	Cracking bending moment of prestressed concrete
03/08 **(Week 10)**	Ultimate states of prestressed members	Prestressed Concrete Beams - Design for flexure/bending moment & shear- ***PC Chap 5,6 & 7***	Ultimate bending moment & shear strength of prestressed members

View class timetable

Timetable

Date	Type	Content
Week 4: 20 June - 24 June	Assessment	Online short answer (stack) Quiz-1
Week 7: 11 July - 15 July	Assessment	Online short answer (stack) Quiz-2
Week 10: 1 August - 5 August	Assessment	Online short answer (stack) Quiz-3

Resources

Prescribed Resources

Textbooks

1. Foster, Kilpatrick and Warner, **R**einforced **C**oncrete **B**asics, 3rd Edition, Pearson Prentice Hall, 2021. Available at UNSW Bookstore or Pearson: http://www.pearson.com.au/
2. Warner R.F., Foster S.J., Gravina, R., and Faulkes, K.A., "**P**restressed **C**oncrete", 4th Ed., Pearson Australia, 2017, 609 pp., ISBN: 978 1 4860 1897 0.

Additional Reading

AS3600-2018, "Concrete Structure", Standards Australia, 2018. Including *Amendments (2019)*

Access to Australian Standards:

Australian Standards may be accessed through the UNSW Library as follows:

1. Go to the UNSW library home page at: **http://www.library.unsw.edu.au/**
2. Click on the "**Database**"
3. Search for and Click on the "**Australian Standards: SAI Global**"
4. You need to enter your UNSW student ID and password
5. Enter the Standard desired (for example enter 3600 to search for AS3600) into the search field.

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 2022 will be held online between 12th - 25th August 2022 inclusive, and supplementary exams between 5th - 9th September 2022 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
- Book an Academic Advising session: https://app.acuityscheduling.com/schedule.php?owner=19024765

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	✓