School of Civil and Environmental Engineering

Term 2, 2020

CVEN4301 ADVANCED CONCRETE STRUCTURES

COURSE DETAILS

Units of Credit	6	
Contact hours	5 hours per week (3 hours lecture + 2 hours demonstration) per week	
Class	Wednesday, 15:00 – 18:00	(ONLINE)
Workshop	Thursday,12:00 – 14:00	(ONLINE)
	Thursday,14:00 – 16:00	(ONLINE)
	Thursday,16:00 – 18:00	(ONLINE)

Course Coordinator and Lecturer

A./Prof. Hamid Valipour

email: H.Valipour@unsw.edu.au

office: Civil Engineering Building (H20), Level 7, Room 710

phone 02 9385 6191

INFORMATION ABOUT THE COURSE

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).

HANDBOOK DESCRIPTION

https://www.handbook.unsw.edu.au/undergraduate/courses/2020/CVEN4301/

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 determinate 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.

OBJECTIVES

The main objective of this course is to 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 and creative problem solving
- 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

TEACHING STRATEGIES

Private Study	• Review lecture material and textbook • Do set problems and assignments • Join Moodle discussions of problems • Reflect on class problems, 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 • Keep track of announcements on course changes • Follow and watch the online lectures (Blackboard ultra)
Workshops	• Be guided by demonstrators • Watch YouTube videos provided • Practice solving set problems • Ask questions
Assessments (quizzes and final exam)	• 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 skills

EXPECTED LEARNING OUTCOMES

This course is designed to address the learning outcomes below and the corresponding Engineers Australia Stage 1 Competency Standards for Professional Engineers as shown. The full list of Stage 1 Competency Standards may be found in Appendix A.

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, PE 1.3, 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*

For each hour of contact it is expected that you will put in at least 1.5 hours of private study.

COURSE PROGRAM

Term 2 2020

Date	Topic	Lecture Content	Demonstration Content
01/06/2020 (**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	
08/06/2020 (**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.
15/06/2020 (**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)
22/06/2020 (**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
29/06/2020 (**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
06/07/2020 **(Week 6)**		*Flexibility week for all courses (non-teaching)*	
13/07/2020 (**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
20/07/2020 (**Week 8**)	Retaining walls	Analysis and design of retaining walls	- Analysis & design of strap footing Analysis & design of combined footing;
27/07/2020 (**Week 9**)	Introduction to prestressed concrete members	Introduction to prestressed concrete members; properties of materials; Elastic Stress Analysis due to Prestress; Load Balancing - ***PC Chap 1 & 2***	- Analysis & design of retaining walls - Cracking bending moment of prestressed concrete
03/08/2020 (**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

Note: *This target timetable (topic to be covered in each week) is indicative and subject to change.*

Workshops/demonstration classes *start in* ***Week 2****.*

ASSESSMENT

As a final year design subject, the focus is on works practiced in industry and the subject assessment is set to match these skills and meet the learning outcomes. This course will be assessed on students' demonstrated knowledge on the topics being taught, including analysis and design of one-way slabs, two-way slabs, flat slabs and footings & retaining walls & prestressed concrete members under short- and long-term service and ultimate strength limit state loading conditions.

Students who perform poorly in the online quizzes and demonstrations are recommended to discuss progress with the course coordinator during the semester.

The Final Examination is worth 60% of the Final Mark if class work is included and 100% if class work is not included. The class work/quizzes are worth 40% of the Final Mark if included. A mark of at least 40% in the final examination is required before the class work (e.g. online tasks and/or quizzes) is included in the final mark. The formal exam scripts will not be returned but students are permitted to view the marked script.

***Note:** The course coordinator reserves the right to adjust the final scores by scaling if agreed by the Head of School.*

	Assessment	**Rationale and assessment criteria**
1.	Online Quiz 1	This quiz contains 5 questions on the deemed to comply deflection control and analysis of reinforced concrete (RC) cross section using modular ratio method. The main objective of this assessment 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.
2.	Online Quiz 2	This quiz contains 5 questions. The main objective of this quiz is to provide opportunities for students to reinforce their knowledge and understanding of advanced reinforced concrete design with emphasis on long-term effects, deflection control of slabs under service load and practical design of slabs under ultimate conditions according to AS3600-2018 provisions.
3.	Online Quiz 3	This quiz contains 5 questions. The main objective of this quiz is to provide opportunities for students to reinforce their knowledge about design of footings, retaining walls and principles of prestressed/post-tensioned concrete (PC) design.
4.	Final exam	The main objective of this assessment covering the entire subject contents is to provide opportunities for students to demonstrate their knowledge and understanding of advanced reinforced concrete and basic principles in prestressed concrete design and higher skills in using Australian standard AS3600-2018.

Details of each assessment component, the marks assigned to it, the criteria by which marks will be assigned, and the dates of submission are set out below.

Supplementary Examinations for Term 2 2020 will be held on Monday 7th September – Friday 11th September (inclusive) should you be required to sit one. You are required to be available during these dates. Please do not to make any personal or travel arrangements during this period.

PENALTIES

Late submission of assessments will be penalised at the rate of 10% per minute after the due time and date have expired.

ASSESSMENT OVERVIEW

Item	Length	Weighting	Learning outcomes assessed	Assessment Criteria	Due date and submission requirements	Deadline for absolute fail	Marks returned
1. Quiz-1	15-20 minutes	15%	Application of systematic design processes and ability for analytical thinking in the context of structural design.	Understanding principles of simplified and advanced methods in design of RC structures with emphasis on applications for deflection control	24/06/2020	24/06/2020	27/06/2020
2. Quiz-2	15-20 minutes	15%	Developing skills for confident use of Australian standards for ultimate and serviceability states	Ability for analytical thinking and understanding of the advanced reinforced concrete design with emphasis on long-term effects, and design of slabs under service and ultimate loading condition	15/07/2020	15/07/2020	18/07/2020
3. Quiz-3	15-20 minutes	10%	An understanding of fundamental and advanced concepts in structural concrete and apply the knowledge of structural design practice	Principles of analysis and design of footing, retaining walls and prestressed concrete cross sections/beams	05/08/2020	05/08/2020	08/08/2020
4. Final exam	2 hours	60%	Demonstrate an overall understanding of advanced concepts in structural concrete and fluent use of Australian standards for familiar and unfamiliar situations	The entire subject content covered on analysis and design of RC and PC structures under service and ultimate loading conditions are assessed.	Please see final examination timetable		

RELEVANT RESOURCES

Textbooks

A. Foster, S.J., Kilpatrick A.E., and Warner, R.F., "**R**einforced **C**oncrete **B**asics", Pearson, 2nd Ed., 2010, ISBN: 9781442538450

B. 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.

DATES TO NOTE

Refer to MyUNSW for Important Dates available at:

https://student.unsw.edu.au/dates

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 ADVICE

For information about:

- Notes on assessments and plagiarism;
- Special Considerations: student.unsw.edu.au/special-consideration;
- General and Program-specific questions: The Nucleus: Student Hub
- Year Managers and Grievance Officer of Teaching and Learning Committee, and
- CEVSOC/SURVSOC/CEPCA

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

Appendix A: Engineers Australia (EA) Competencies

Stage 1 Competencies for Professional Engineers

	Program Intended Learning Outcomes
PE1: Knowledge and Skill Base	PE1.1 Comprehensive, theory-based understanding of underpinning fundamentals
	PE1.2 Conceptual understanding of underpinning maths, analysis, statistics, computing
	PE1.3 In-depth understanding of specialist bodies of knowledge
	PE1.4 Discernment of knowledge development and research directions
	PE1.5 Knowledge of engineering design practice
	PE1.6 Understanding of scope, principles, norms, accountabilities of sustainable engineering practice
PE2: Engineering Application Ability	PE2.1 Application of established engineering methods to complex 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
PE3: Professional and Personal Attributes	PE3.1 Ethical conduct and professional accountability
	PE3.2 Effective oral and written communication (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