

Western University - Faculty of Engineering
Department of Civil and Environmental Engineering

CEE 3358b – Reinforced and Prestressed Concrete Design
Course Outline - January 2024

This one-term course integrates material from previous structural analysis and design courses and extends the knowledge and abilities of students in structural behaviour and design. It enables students to understand the behaviour of Reinforced and Prestressed Concrete Structures. In this course, students develop skills for the design of such structures by applying their knowledge of mathematics, science, and engineering while identifying, formulating, and solving structural design problems. The course techniques and skills prepare students for engineering practice. Upon the completion of this course, students will be able to analyze and design the following reinforced concrete elements: two-way slabs, slender columns, bearing walls, basement walls, shear walls, strip footings, spread footings, combined footings, and pile caps. They will also develop the ability to design statically determinate prestressed-concrete one-way slabs and beams.

Calendar Copy:

Behaviour and design of Reinforced Concrete (RC) and Prestressed Concrete (PC) elements: RC two-way slabs, RC slender columns in non-sway frames, RC bearing walls, RC basement walls, RC shear walls, RC footings, RC pile caps, PC one-way slabs and PC beams.

Prerequisites:

CEE 2202A/B, CEE 2221A/B, CEE 3347A/B.

Corequisites:

None

Antirequisite:

None

Note: It is the **student's responsibility** to ensure that all Prerequisite and Corequisite conditions are met or that special permission to waive these requirements has been granted by the Faculty. It is also the **student's responsibility** to ensure that they have not taken a course listed as an Antirequisite. The student may be dropped from the course or not given credit for the course towards their degree if they violate the Prerequisite, Corequisite or Antirequisite conditions.

Contact Hours:

3 lecture hours/week; 3 tutorial hours/week.

Attendance:

Attendance in lectures and tutorials will be monitored. Any student who, in the opinion of the instructor, is absent too frequently from class or tutorial periods will be reported to the Dean. On the recommendation of the Department concerned, and with the permission of the Dean, the student will be debarred from taking the regular final examination in the course.

Students must follow University policies and public health directives, or they will be referred to the Dean, and their actions might be considered a violation of the Student Code of Conduct.

Instructor:

Dr. M. A. Youssef, P. Eng., SEB 3043, email: youssef@uwo.ca

References:

Required: Prepared class notes can be downloaded from the course website (<http://owl.uwo.ca>).

- Students are responsible for regularly checking their email, and course OWL site (<https://owl.uwo.ca>). If students need assistance with the course OWL site, they can seek support on the OWL Help page. Alternatively, they can contact the Western Technology Services Helpdesk. They can be contacted by phone at 519-661-3800 or ext. 83800.

Recommended: Concrete Design Handbook, Cement Association of Canada, Ottawa, ON.

Recommended: Reinforced Concrete Design: A Practical Approach, S. Brzev and J. Pao, Pearson Education.

Units:

SI units will be used in lectures, tutorials, and examinations.

Specific Learning Objectives:

At the end of this course, students should be able to:

1. REINFORCED CONCRETE

- a) Design different types of two-way slabs for flexure, one-way shear, and two-way shear (ET2, **PA2, D4, CS2, PR1**).
- b) Design slender reinforced concrete columns (**PA2, D4, PR1**).
- c) Design bearing, basement, and shear walls (**PA2, D4, PR1**).
- d) Structural design of shallow foundations (**PA2, D4, CS2, PR1**):
 - 1. Strip footings.
 - 2. Spread footings.
 - 3. Eccentrically loaded footings.
 - 4. Combined footings.
- e) Structural design of pile caps using the sectional method (**PA2, D4, CS2, PR1**).

2. PRESTRESSED CONCRETE

- a) Acquire knowledge about prestressing techniques, materials, and prestress losses (KB4).
- b) Calculate losses due to friction, anchorage slip, and elastic shortening (KB4).
- c) Design prestress concrete flexural members to satisfy the serviceability and ultimate limit clauses in A23.3 (ET2, **PA2, D4, PR1**).
- d) Design prestress concrete members to satisfy the shear requirements in A23.3 (**PA2, D4, PR1**).

The instructor may expand, or revise material presented in the course as appropriate.

General Learning Objectives

E=Evaluate, T=Teach, I=Introduce (*Advanced Level*)

Knowledge Base	I	Engineering Tools	T	Impact on Society	
Problem Analysis	E	Teamwork		Ethics and Equity	
Investigation		Communication	I	Economics and Project Management	
Design	E	Professionalism	I	Life-Long Learning	

Evaluation:

The final mark will be determined as follows:

Assignments & Participation (includes 5% bonus)	15 %
1 st Quiz (February 2024)	25 %
2 nd Quiz (March 2024)	25 %
Final Exam	40 %

Total	100 % + 5% Bonus
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- Note:**
- (a) Students **must pass the final examination to pass this course**. Students who fail the final examination will be assigned the aggregate mark, as determined above, or 48%, whichever is less. **Students who have failed this course previously must repeat all components** of the course. No special permissions will be granted enabling a student to retain laboratory, assignment, or test marks from previous years. Previously completed assignments and laboratories cannot be resubmitted.
 - (b) Following Senate and Faculty Policy, students may be penalized up to 10% of the marks for the improper use of English. Additionally, poorly written work, with the exception, of the final examination may be returned without grading. If resubmission of the work is permitted, it may be graded with marks deducted for poor English and/or late submission.

1. Assignments & Participation:

10% of the mark will be assigned based on the weekly “gradescope.ca” assignments. The additional 5% will be assigned based on your attendance, participation in the lectures and tutorials, and solution of bonus assignments.

2. Quizzes and Examinations:

Two 120-minute quizzes will be scheduled during tutorial periods. The quizzes and the final exam are OPEN BOOK. Hand-held programmable calculators may be used, but programs and information stored in advance of the examination may not be used.

Cheating:

University policy states that cheating is a scholastic offence. The commission of a scholastic offence is attended by academic penalties that might include expulsion from the program. If you are caught cheating, there will be no second warning.

For more information on scholastic offenses, please see:

http://www.uwo.ca/univsec/handbook/appeals/scholastic_discipline_undergrad.pdf

Conduct:

Students are expected to arrive at lectures on time and to conduct themselves during class professionally and respectfully so that are not disruptive to others. Please turn off your cell phone before coming to a class, tutorial, quiz or exam. On the premises of the University or at a University-sponsored program, students must abide by the Student Code of Conduct: <https://www.uwo.ca/univsec/pdf/board/code.pdf>

Scholastic offences are taken seriously, and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site:

http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf

All required papers may be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database to detect plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com (<http://www.turnitin.com>).

Consultation:

Students are encouraged to discuss problems with their teaching assistant and/or the instructor. Office hours will be arranged for the students to meet with the instructor and teaching assistants. Other individual consultations can be arranged by appointment.

Course breakdown:

Engineering design = 100%