Carleton University Department of Civil and Environmental Engineering

CIVE 3206 –Design of Reinforced Concrete Components

Instructor: **Ted Sherwood** ted.sherwood@carleton.ca
Office: ME 3366
Office Hours: tbd. I am also easily reached by email. Please use "CIVE 3206" in subject header.

TA: tbd. TA contact info will be posted on Brightspace.

Lectures: **A:** Mon/Wed 11:35pm-12:55pm TB 340
B: Mon/Wed 4:05pm-5:25pm TB 208
No lectures during the week of Feb 20
Last lecture Monday, April 8

PA/Lab: Alternate Tuesdays, 2:35 – 5:25pm
(Jan 16, Jan 30, Feb 13, Mar 5, Mar 19, Apr 2)
A and **B:** AT 301

Topics Covered:

1.	Introduction	-history of concrete -constituents of reinforced concrete, portland cement, hydration
2.	Material Properties	-steel, concrete tensile and compressive response -time-dependant properties: shrinkage, thermal and creep effects
3.	Behaviour of Axially-Loaded Elements	-axial load-axial deformation response -short-term and long-term properties
4.	Members in Flexure	-moment-curvature response, uncracked and cracked response -rectangular stress blocks, linear-elastic simplifications
5.	Flexural Design of Beams	-limit-states design -nominal flexural capacity, factored flexural resistance -tension, compression and balanced failures -doubly-reinforced sections, T-sections, one-way slabs -cracking, durability considerations
6.	Deflections	-effective moment of inertia -instantaneous and long-term deflections, deflection limits
7.	Shear Design of Beams	-shear stresses in uncracked and cracked beams -variable-angle truss model -CSA A23.3 methods of shear design
8.	Bond and Development of Reinforcement	-development length, bond stresses, radial stresses, splitting -hooked anchorages -development of reinforcement and design of bar cutoffs
9.	Short Columns	-types of columns -strength of axially-loaded columns and columns subjected to combined axial load and bending -design of columns, interaction diagrams
10.	Footings	-types of footings -structural actions, soils pressures and distribution, kern distance -isolated footings, strip footing

Note: topics may be added, modified or removed as the term progresses

Required Text:
Concrete Design Handbook, 4th Edition, Cement Association of Canada

The handbook is available for purchase at a discounted price from the Civil Engineering office, ME 3432 (limited supply, first-come first-served). It can also be purchased online through "Orderline" but this is a more expensive option. Refer to Brightspace for instructions on how to do this. If ordering through Orderline, the book will be mailed to you, with an added delivery cost and uncertain delivery date.

Older editions of the handbook are out of date and should be avoided.

Useful Textbook: (can be purchased online)
Reinforced Concrete: Mechanics and Design (1st Canadian Edition), J.G. MacGregor and F.M. Bartlett, Prentice-Hall Canada Publishers, Scarborough, Ontario, Canada. 2000. ISBN 013101403-x, 1042 pages.

Referenced Textbooks:
Prestressed Concrete Structures, M.P. Collins, D. Mitchell, Response Publications, 1997, 766pp.
Reinforced Concrete Design (3rd Edition), S.U. Pillai, D.W. Kirk and M.A. Erki, 1999, McGraw-Hill Ryerson Ltd, Whitby, On, 630 pp. ISBN 0075608294
Reinforced Concrete Design: a Practical Approach, S. Brzev and J. Pao, 2006, Pearson Prentice Hall, Toronto, On, ISBN 0130391255

Mark Breakdown:

Weekly Assignments	**25%**	Approx 10-11 in total, lowest 2 assignment grades dropped
Midterm Exam	**20%**	March 5
Final Exam	**55%**	Date to be scheduled by Carleton Exam Services

In order to receive credit for the course (1) a minimum grade of 40 out of 100 must be obtained on the final exam and (2) the average assignment grade *of all assignments* (including the 2 lowest grades) must be 40 out of 100 or greater. No accommodation is possible for writing a midterm on a different date for any reason.

Assignments must be completed entirely in pencil on engineering computation paper. They must be neat, clear and of professional quality. All drawings are to be done by hand, are to follow standard engineering technique and drawn to scale using appropriate drafting instruments. Each assignment is marked out of 100, and 10 of these marks will assess the assignment's professionalism.

Assignments, or any parts thereof, that have been copied from a previous year's solution sets or from another student's assignment will be forwarded to the Associate Dean for academic sanction. This happens every year and is a traumatic experience for everyone…don't do it!

Students are responsible for meeting assignment submission deadlines. Assignments that are not handed in before they are due will immediately receive a 50% penalty, with an additional penalty of 10% per day. Deadlines are strictly enforced. Refer to the US Naval Observatory's Master Clock Time for the official CIVE 3206 time. (http://www.time.gov).

Concerns about a grade on an assignment or midterm will be addressed only if brought to the attention of the grader within seven working days of handing back the graded work (or the work being made available to be picked up), as per Section 3.3.4 of the undergraduate calendar. After this time, the grade is final.

General:
Attendance at lectures and PA/Lab sessions is mandatory. The method of teaching in this course is exclusively through blackboard-based lecturing. There is no textbook for the course (the CAC Concrete Design Handbook is not a textbook). Handouts that supplement the lectures will be given out from time-to-time during the term, and are only available in the lectures. Experience has shown that there is a direct relationship between regular lecture attendance and the student's final grade (and can be the difference between a pass or fail). Students are required to check Brightspace and their email regularly for messages, updates and supplemental course content.

All electronic devices other than calculators (e.g. cellphones, tablets and laptops) are to be turned off prior to lectures. Open laptops are not permitted. Lectures may not be filmed or recorded.

The wearing of strong perfumes and colognes in class is unprofessional and unsafe for students with environmental sensitivities. As such, their use is strictly prohibited.

Class Behaviour and Expectations:
Students are required to observe standards of behaviour expected in the profession of engineering. Talking amongst students during lectures is rude, unprofessional, disruptive of the learning atmosphere, a distraction for the instructor and disrespectful of your classmates. Please maintain a quiet, attentive, respectful, engaging and safe class environment. Students who are unable to meet standards of professionalism will be asked to leave the lecture.

Furthermore, please observe the following standards:

- Be on time for class. Plan for the possibility of transportation delays.
- If you are late to class, minimize disruption to both the instructor and other students by doing the following:
  - **Prior to entering the lecture room** (in the hallway outside) remove your jacket or any outerwear and remove any required books, notes, papers and writing utensils from your bag.
  - **Upon entering the lecture room**, quickly and quietly find a seat.
- Do not eat food during lectures or tutorials. You are welcome to have a bottle of water/juice or coffee/tea, however.
- Do not speak to your classmates during the lectures. If you have a question about the material, please raise your hand at any time to ask the instructor. If you are confused, it is quite likely that other people are confused as well; as such, your question will help everyone's learning.
- Laptops and mobile devices/cell phones are not permitted in lectures or tutorials. Turn these devices off prior to the start of class and tutorials and put them away.
- If you feel affected by the behaviour of other students, please let me know your concerns as soon as possible so that I can address the situation.

CIVE 3206 is a politics and world events-free zone. We are here to learn about the amazing material that is reinforced concrete and nothing more. View and treat the course as a brief respite from the world's problems for everyone enrolled in it.

Academic Integrity

> **"…no legacy is so rich as honesty."**
> -William Shakespeare, *All's Well That Ends Well* (3.5.1618-19)

Academic integrity is essential to both the pursuit of scholarship in a university setting and to ensuring that a degree from Carleton University is a strong signal of a student's individual achievement. Academic dishonesty is profoundly destructive to the values of the university.

Furthermore, it is discouraging and deeply unfair to the overwhelmingly vast majority of students who pursue their studies honestly and honourably.

Both Carleton University and your Professor treat cases of cheating and plagiarism very seriously. Carleton University's Policy on Academic Integrity (https://carleton.ca/registrar/academic-integrity/) describes actions that constitute academic dishonesty and procedures for dealing with it. Students are responsible for reading and understanding these policies. Sanctions for students found to have violated Carleton's policies on academic integrity can range from failure in the course to expulsion from the university.

Assignments, or any parts thereof, that have been copied from a previous year's solution sets or from another student's assignment will be forwarded to the Associate Dean for academic sanction. This happens every year and is a traumatic experience for everyone…don't do it!

Academic Accommodations

Students with diverse learning needs are very welcome to take this course. I ask that all students in the class work with me to create a welcoming environment that is respectful of all forms of diversity, including diversity of learning needs, background and parenting status. While I maintain the same very high expectations of all students in the class regardless of personal situations, if you require accommodation I am happy to problem-solve with you in a way that makes you feel supported and understood.

Students requiring accommodations to meet their learning needs should contact the Paul Menton Centre for Students with Disabilities (UC 500; 613-520-6608) and advise the instructor in person of any accommodations that may be required at a minimum of two weeks prior to requiring the accommodation. No accommodation can be arranged until the instructor is advised in person by the student.

Policy on Children in Class:

I am not sure if Carleton has a policy on children in the classroom. The policy described below reflects my own philosophy about the importance of parenthood, the importance of post-secondary education and my understanding of the challenges of combining the two.

(1) All exclusively breastfeeding babies are welcome in class at any time for any reason, and as often as necessary. Parents should feel perfectly free to breastfeed or bottle-feed in class if required.
(2) Unforeseen disruptions in childcare can put parents in the position of feeling the need to miss class in order to stay home with a child. For CIVE 3206, please do not feel this way! While perhaps not a long-term childcare solution, occasionally bringing a child to class in order to cover gaps in childcare is perfectly fine and welcome.
(3) In all cases where babies and young children come to class, I ask that you sit close to a door so that if your child is requiring of attention you may easily step outside until their needs have been met.
(4) Often the greatest barrier to completing a post-secondary degree while parenting young children is the complete exhaustion parents feel in the evening after children have finally gone to sleep. If you are the parent of young children and consistently find yourself in this situation, do not withdraw from CIVE 3206. Instead, come talk to me –we can work something out.

Your professor would like to acknowledge that the land on which we gather for this course is the traditional and unceded territory of the Algonquin nation.