

## **CIVE 5706 – Advanced Mechanics of Reinforced Concrete**

### **Course Outline**

(Fall 2020)

#### **1. Instructor**

Vahid Sadeghian, Ph.D.

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Office hours: TBA (via Zoom)

#### **2. Lecture Schedule**

The course will be taught synchronously through Zoom on Mondays from 2:35 to 5:25 pm with synchronous session being recorded. The Zoom link will be sent to students a week before the first lecture. Additional activities and assignments will be made available via the course page for completion outside of class time. Students are strongly encouraged to participate during the synchronous class time.

Note: The first lecture will be delivered asynchronously. A pre-recorded video of the lecture will be posted on culearn. The rest of the lectures will be held synchronously.

#### **3. Objectives**

The objective of this course is to adapt and apply principles of solid mechanics to the analysis of reinforced concrete, taking into account the nonlinear constitutive behaviour of the materials and other behaviour characteristics particular to reinforced concrete. Through this course students will:

- ✓ review various analytical approaches to modelling reinforced concrete.
- ✓ critically evaluate existing constitutive models and failure criteria.
- ✓ discuss methods of implementation and range of applicability.
- ✓ apply the reviewed methods to practical problems; performance assessment and forensic analyses.
- ✓ be introduced to some of the related state-of-the-art research studies.
- ✓ learn how to use a nonlinear finite element analysis software specifically developed for reinforced concrete.

#### **4. Course Topics (subjected to change)**

1. Introduction

2. Linear and Nonlinear Elastic Models
3. Overview of Failure Criteria for Concrete
4. Analysis Models for Reinforced Concrete
5. Modified Compression Field Theory
6. Accounting for Prestraints (shrinkage, temperature, prestressing, etc.)
7. Finite Element Implementation
8. Advanced Behaviour Modelling
9. Disturbed Stress Field Model
10. Beams, Frames and Shells (time permitting)
11. Assessment and Forensic Analysis (time permitting)

## 5. Evaluation Method

Type	Percentage
Assignments	25%
Project	25%
Final Exam	50%

## 6. Prerequisites

1. CIVE 3206 (Design of Reinforced Concrete Components) or equivalent
2. CIVE 3202 (Mechanics of Solids II) or equivalent

## 7. Academic Regulations, Policies and Support Services

The following electronic resources provide information on academic regulations, policy and support services:

- **Regulations**  
<https://calendar.carleton.ca/grad/gradregulations/>
- **Student Rights and Responsibilities**  
<https://carleton.ca/studentaffairs/student-rights-and-responsibilities/>
- **Academic Support Services**  
<https://carleton.ca/academics/support/>

## 8. Academic Accommodation

The Paul Menton Centre for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairments in mobility, hearing, and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613-520-6608 or [pmc@carleton.ca](mailto:pmc@carleton.ca) for a formal evaluation. If you are already registered with the PMC, contact your PMC coordinator to send me your Letter of Accommodation at the beginning of the term, and no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). Requests made within two weeks will be reviewed on a case-by-case basis. After requesting accommodation from PMC, meet with me to ensure accommodation arrangements are made. Please consult the PMC website ([www.carleton.ca/pmc](http://www.carleton.ca/pmc)) for the deadline to request accommodations for the formally-scheduled exam (if applicable).