



**McGill**

**Department of Civil Engineering**

***CIVE 623 – Durability of Construction Materials***  
**Winter 2023**

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Instructor:	Prof. Andrew J. Boyd Office: ENGMD 482 E-mail: <a href="mailto:andrew.boyd@mcgill.ca">andrew.boyd@mcgill.ca</a>
Lecture:	W 2:35 pm – 5:25 pm [Birks 004A]
Office Hours:	By appointment
Course Objective:	To provide students with the resources to develop a strong familiarity with the durability issues related to construction materials and the impact of durability properties on sustainability in the construction industry; including concrete, wood, steel, asphalt and fiber-reinforced polymers.
Required Text:	There is no required text for this course. Lectures and other handouts will be made available via website postings.
Grading:	Test 1: 30% Test 2: 30% Project: 30% Journal Club: 10%
Course Policies:	Make-up exams will be granted upon presentation of a legitimate and relevant physician's certification. Other requests will be considered IF requested prior to the scheduled week of the exam.
Attendance Policy:	Students are responsible for all information covered in class regardless of whether it appears in the lecture notes or other handouts. Attendance at journal club presentations is mandatory.

## **Tentative List of Topics to be Covered**

### **Sustainability**

- General Concepts
- Material Comparison Techniques
- Material Choice
- Design Strategies
- Life Cycle Considerations

### **Concrete**

- Mass Transport Mechanisms
- Cracking
- Leaching & Efflorescence
- Sulfate Attack
- Acid Attack
- Physical Salt Attack
- Reinforcement Corrosion
- Freezing & Thawing
- Surface Scaling
- Alkali-Aggregate Reaction
- Service Life Prediction
- Diagnosis, Remediation, and Protective Measures

### **Steel**

- Corrosion
- Factors Affecting Durability of Steel
- Environmental Parameters Affecting Steel Durability
- Diagnosis, Remediation, and Protective Measures

### **Wood & Timber**

- Deterioration Mechanisms
- Environmental Parameters Affecting Wood Durability
- Diagnosis, Remediation, and Protective Measures

### **Asphalt**

- Material Property Degradation
- Structural Deterioration
- Diagnosis, Remediation, and Protective Measures

### **Fiber-Reinforced Polymers**

- Matrix Degradation
- Bond Deterioration
- Physical Debonding Mechanisms
- Diagnosis, Remediation, and Protective Measures

## **Course Requirement Details**

### **Test 1**

Will be scheduled near the mid-point of the semester and will include all material covered up to that point.

### **Test 2**

Will be scheduled following the end of classes for the semester and will include only that material covered after the first test.

### **Project**

Students will be required to prepare a term paper detailing a case study in which sustainability techniques were implemented into the decision making and design process for an actual structure. Paper must also include a discussion on the suitability of the material choices made, the effectiveness of design procedures, and the significance of life cycle cost consideration.

### **Journal Club**

Each student will be required to perform one journal club presentation during the semester. This exercise will entail the student choosing a suitable, previously published journal paper related to the course content and presenting that paper to the class in a professional manner. Content of the presentation should be the same as if the student was presenting his own research at a conference, with the exception that a short critique of the paper must also be included, along with a commentary as to the potential impact of the research findings on sustainability within the construction industry.

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## **McGill Policy Statements**

### ***Academic Integrity***

*McGill University values academic integrity. Therefore, all students must understand the meaning and consequences of cheating, plagiarism and other academic offences under the Code of Student Conduct and Disciplinary Procedures. (see [www.mcgill.ca/students/srr/honest/](http://www.mcgill.ca/students/srr/honest/) for more information). (approved by Senate on 29 January 2003)*

***In accord with McGill University's Charter of Students' Rights, students in this course have the right to submit in English or in French any written work that is to be graded.***

*(approved by Senate on 21 January 2009)*

### ***Grading Policy***

*In the Faculty of Engineering, letter grades are assigned according to the grading scheme adopted by the professor in charge of a particular course. This may not correspond to practices in other Faculty and Schools in the University. In the event of extraordinary circumstances beyond the University's control, the content and/or evaluation scheme in this course is subject to change.*