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**DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING  
FACULTY OF ENGINEERING  
THE UNIVERSITY OF WESTERN ONTARIO**

**CEE 9571a/b– Advanced Concrete Technology  
Course Outline – Winter 2017**

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- OBJECTIVES:** The objectives of this course are for the student to:
1. learn the properties of portland cement, its hydration and microstructure.
  2. characterise the engineering properties of cement-based materials
  2. recognise the effects of the rheology and early-age properties of concrete on its long-term behaviour.
  3. develop an advanced knowledge of the mechanical performance of cement-based materials and how it can be controlled
  4. use various chemical admixtures and mineral additives to design cement-based materials with tailor-made mechanical and durability properties.
  5. understand the engineering properties of special concretes such as mass concrete, high-performance concrete, self-consolidating concrete, fibre-reinforced concrete, sprayed concrete, pervious concrete, etc.
  6. acquire knowledge on how sustainability affects the design of and life cycle performance of concrete structures.
  7. bridge the gap between materials science and structural engineering so that concrete can be used properly in structural concrete projects.

**PREREQUISITES:** CEE 3358, CEE 3369b or their equivalent, by permission of the Instructor.

**CO-REQUISITES:** None.

**ANTIREQUISITES:** None.

**TOPICS:**

1. Cement manufacturing, cement types and properties
2. Cement hydration, microstructure and early age behaviour
3. Mineral admixtures in concrete
4. Chemical admixtures in concrete
5. Aggregates in concrete
6. Test methods for cement and concrete
7. Concrete mixture design
8. Batching, mixing, handling, placing and finishing
9. Rheology and properties of fresh concrete
10. Mechanical properties of concrete
11. Dimensional stability of cement-based materials
12. Mass concrete
13. High performance and ultra-high performance concrete
14. Self-consolidating concrete
15. Fibre-reinforced concrete
16. Shotcrete

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17. Pervious concrete
  18. Concrete sustainability

**CONTACT HOURS:** 2 (discussion/lecture) hours/week.

**COURSE DELIVERY:** The instructor will either deliver formal lectures for some chapters, or ask the students to study the chapter material at home and come to class with specific questions to ask, that will form the basis for class discussion.

**REFERENCES:**

The course will be based on recent publications. Copies of lecture presentation and other reference materials will be posted on the OWL web site of the course. The following textbooks are suggested to complement information.

- [1] Properties of Concrete, A.M. Neville, Wiley
- [2] Concrete Admixtures Handbook, Noyes
- [3] Manual of Concrete Practice, ACI
- [4] Concrete Microstructure, Properties and Materials, PK Mehta and PJM Monteiro
- [5] Technical Journals including ACI Materials Journal, Cement and Concrete Research, Materials and Structures, etc.

**UNITS:** SI units will be used in lectures and examinations.

<b>EVALUATION:</b>	Final Examination	40%
	Term paper	50%
	Presentation, attendance and participation	10%
	Total	100%

**TERM PAPER** **Students will be divide in** groups. Group term papers must be submitted by **March 31**. The paper must be written in the format of the ACI Materials Journal. The topic of the paper is selected from a list provided by the instructor. A topic proposed by a group of students can be used if approved by the instructor.

**PRESENTATION** Each group of students will have a 20-minute presentation of their term paper followed by a 5-minute question period scheduled one week before the end of classes.

**ENGLISH:** In accordance with Senate and Faculty Policy, students may be penalised up to 10% of the marks on all assignments, tests and examinations for the improper use of English. Additionally, poorly written work with the exception of final examinations 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.

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**INSTRUCTOR:** Dr. M.L. Nehdi, P. Eng., Professor, SEB-3083, [menhdi@uwo.ca](mailto:menhdi@uwo.ca),  
**Administrative Assistant:** SEB-3010

**CONSULTATION:** Students are encouraged to discuss with their instructor in class and at the end of the lecture, or during individual consultations arranged by appointment.

**ATTENDENCE**

Any student, who, in the opinion of the instructor, is absent too frequently from class, will be reported to the Dean (after due warning has been given). On the recommendation of the Department and with the permission of the Dean, the student will be debarred from taking the regular examination in the course. The instructor can take class attendance at any time.

**SICKNESS / OTHER PROBLEMS:**

Students should immediately consult with the instructor or Department Chair if they have any problems that could affect their performance in the course. Where appropriate, the problems should be documented (see attached). The student should seek advice from the instructor or Department Chair regarding how best to deal with the problem. Failure to notify the instructor or Department Chair immediately (or as soon as possible thereafter) will have a negative effect on any appeal.

**NOTICE:** Students are responsible for regularly checking their email, the OWL site of the course, and notices posted outside the Civil and Environmental Engineering Department Office.

**Graduate Course Health and Wellness**

As part of a successful graduate student experience at Western, we encourage students to make their health and wellness a priority. Western provides several on campus health-related services to help you achieve optimum health and engage in healthy living while pursuing your graduate degree. For example, to support physical activity, all students, as part of their registration, receive membership in Western's Campus Recreation Centre. Numerous cultural events are offered throughout the year. For example, please check out the Faculty of Music web page <http://www.music.uwo.ca/>, and our own McIntosh Gallery <http://www.mcintoshgallery.ca/>. Information regarding health- and wellness-related services available to students may be found at <http://www.health.uwo.ca/>. Students seeking help regarding mental health concerns are advised to speak to someone they feel comfortable confiding in, such as their faculty supervisor, their program director (graduate chair), or other relevant administrators in their unit. Campus mental health resources may be found at [http://www.health.uwo.ca/mental\\_health/resources.html](http://www.health.uwo.ca/mental_health/resources.html)

**Suggested Topics for Term Papers**

List will be posted on the OWL course website. Topics assigned on a first-come first served basis.