GEORGIA INSTITUTE OF TECHNOLOGY
School of Civil and Environmental Engineering

CEE 8813J Durability of Cement-Based Materials
Course Syllabus
Spring 2012

Instructor: Dr. Kimberly E. Kurtis
Office: 315 Mason
Office Hours: MW 2-3, open door and by appt.
E-mail: kkurtis@ce.gatech.edu
Phone: 404-385-0825

Lecture: M,W 3-4:30
Classroom: 311 Mason
Web: T-Square

Course Objectives
- To develop a fundamental understanding of the chemical, physical, and mechanical aspects surrounding the durability of cement-based materials.
- To identify effective material selection, mixture design, and structural design characteristics that promote durability.
- To understand and apply existing models describing the structure and durability of cement-based materials.
- To develop an appreciation for the seminal research which forms the foundation for current understanding and for the emerging technologies which will allow advances in the state-of-the-art in the development of more durable cement-based materials.
- To integrate research and learning.
- To improve critical thinking and written and oral technical communication skills.

Honor Code:
This course will be conducted under the guidelines of the Georgia Tech Academic Honor Code. A copy of the code can be found at http://www.honor.gatech.edu/honorcode.html

Course Requirements:
Grading will reflect performance on 2 exams and several assignments, including:

HW1: Inspection Reports	5%	January 23
HW2: Journal Reviews (Group HW)	5%	February 6
HW3: Virtual Experiment	5%	February 15
Midterm Quiz	25%	February 29
HW4: Critical Review - Proposal	2.5%	March 7
HW5: Critical Review - Progress Report	2.5%	March 28
Journal Paper	15%	April 7 (submitted), April 23 (revised)
Critical Review Presentation	5%	April 16, 18, 23
HWs 6/7: Peer Reviews	5%	April 16
Final Quiz	25%	April 25
Class participation	5%	

Course materials:
- See course site at T-square for course notes and announcements
- Required text: none, although reading assignments will be made using library resources
- Recommended resources: (choose one)
  1. Mehta, P.K. and Monteiro, P.J.M., CONCRETE: Microstructure , Properties, and Materials, any edition.
  2. Kosmatka, S.H. and Panarese, W.H. Design and Control of Concrete Mixtures, PCA.
  3. Mindess, S. Young, J.F. and Darwin, D. Concrete, Prentice-Hall, 2nd Edition, 2003.
  4. Neville, A.M. Properties of Concrete, Wiley, 1996.
- Additional materials on library reserve:
  Hewlett, P.C. (Ed.) Lea's Chemistry of Cement and Concrete, Arnold, 1998. (at Ref. Desk)
  Taylor, H.F.W., Cement Chemistry, Thomas Telford, 1997.

Tentative Course Outline

TOPICS COVERED	WEEK
Introduction	1
Condition assessment	1
Cement, SCMs, and hydration	2
Multi-scale structure, characterization, & modeling	3-4
Transport	4-5
Aggregate durability (guest lecturer)	5
Alkali-silica reaction	6-7
Alkali-carbonate reaction	7
MIDTERM QUIZ	
Abrasion/Erosion/Cavitation	9
Fire	9
Crystallization pressure theory	9
Freeze/thaw and salt scaling	10
Sulfate Attack	10
SPRING BREAK	11
Delayed ettringite formation	12
Thaumasite formation	12
Carbonation and Acid Attack	12
Corrosion of steel in concrete	13
Biodeterioration	13
Durability of calcium aluminate cements	14
Durability of novel cementitious systems	14
Service life prediction models (guest lecturer)	14
Critical Review Presentations	15-16
FINAL QUIZ	