Course Syllabus
CE 360: Sustainable Civil Engineering Materials Fall 2017
John A. Reif, Jr. Department of Civil and Environmental Engineering

Course Information

Title: CE 360, Sustainable Civil Engineering Materials
Class Location: CKB 215
Meeting Times: Wednesdays and Fridays 1:00 PM – 2:25 PM
Credit Hours: 3 Credits

Instructor

Matthew P. Adams, Ph.D.
Office: Colton 237
E-mail: matthew.p.adams@njit.edu
I respond to course e-mails twice a day, and do not check e-mails on Saturday or Sunday.

Office Hours

Mondays 1:00 PM - 3:00 PM
Wednesdays 2:30 – 4:00 PM
Open door policy (if the door is open, come on by).
By appointment, skype appointments also available

Required Pre-requisites

The required prerequisite for this course are MECH 237 and CHEM 122.

Course Description

The course provides instruction on civil and construction engineering materials used in the construction of civil engineering projects such as pavements, bridges, buildings, retaining walls, tanks, etc. Additionally, the fundamentals of sustainability within the context of civil engineering will be discussed. In particular, the course concentrates on the engineering properties of aggregates, wood, metals, portland cement concrete (PCC) and hot-mix asphalt (HMA) as well as the mixture design of PCC and HMA, as well as other advanced civil engineering materials. These materials will be used to discuss sustainability and sustainable design within civil engineering contexts.

Topics: Civil and construction engineering materials; aggregate, portland cement concrete, asphalt concrete, wood, metals. Standard test methods. Sustainability. Sustainable design. Chemistry, mechanics, and durability of materials.

Learning Outcomes

Upon completion of this course, students will be able to:

1. Define sustainability in their own words and relate how sustainability is defined in the context of new construction as well as renovation and rehabilitation.
2. Demonstrate concepts of life-cycle analysis including economic and sustainability aspects and apply these concepts to sustainable construction.
3. Identify key material properties important to the successful application of aggregates, asphalt concrete, portland cement concrete, wood and metals to a variety of civil works.

4. Specify aggregates, concrete and asphalt mixtures, metals, and wood for typical construction applications including the use of appropriate standards (i.e. ASTM) for testing and specification of said materials.
5. Design a PCC mixture and an HMA mixture using sustainability concepts that will be durable and meet the requirements of a particular construction project.

Required Reading Materials

Required

A. *Design and Control of Concrete Mixtures*, Kosmatka, S.H. and Wilson, M.L., 16th Edition, Portland Cement Association, 2015

B. Pavement Guide Interactive: http://www.pavementinteractive.org/ (free internet resource)

C. Additional course reading materials will be posted on the Moodle course website throughout the term.

Additional

Virtual Superpave Laboratory: http://training.ce.washington.edu/VSL/
Portland Cement Association: www.cement.org
American Concrete Institute: www.aci-int.org

Course Schedule

Note: Course schedule is tentative and may change throughout the term. The instructor will communicate any changes. Class time is provided for topics of particular interest to students, or to provide additional instruction if class is running behind. Students wishing to suggest a special topic should speak with the instructor. (Note: Lectures are based on a twice per week, 1.5 hour class period, 14 week schedule)

Week	Topics
Week 1	Course introduction and introduction to sustainability and sustainable design
Week 2	Sustainable construction rating programs: LEED, Greenroads, Living Building Challenge
Week 3	Aggregates, Intro to portland cement concrete
Week 4	Cement production and hydration
Week 5	Properties of fresh and hardened concrete (EXAM 1)
Week 6	Concrete mixture proportioning and durability
Week 7	Asphaltic concrete, binder type and aggregate selection
Week 8	Distress and deformation of asphaltic concrete
Week 9	Material life cycles, Sustainable concrete and asphalt mixture design
Week 10	Metals and Crystalline Materials
Week 11	Wood materials (Exam 2)
Week 12	End of life and material recycling, reuse, and re-engineering
Week 13	Life cycle assessments
Week 14	Plastics, Fiber reinforced polymers, and innovative materials.
Finals Week	Final Exam (Cumulative)

Attendance and Participation Policy

Attendance will be monitored through receipt of your reading questions (see section on Course Readings below). Students are expected to be on time for class, and to remain in class during the entire period. Chronic lateness or leaving of class for extended periods of time will result in a reduction of a student's participation grade. Class participation is part of your grade, and missing class regularly will affect your participation grade. Regular attendance in class will greatly increase your ability to perform well on the exams, final project, and class assignments. Participation includes: questions or discussion during class, participation in group projects, participation on in class assignments, questions during office hours. Students will be allowed to miss one class session without penalty. If a student must miss more than this please contact the professor to discuss the issue at least 24 hours **prior** to missing the class.

Homework Assignment Requirements and Grading

Homework assignments will be posted on the course website regularly throughout the term. Students will have at least 7 days to complete homework assignments from the date they are posted. Homework assignments are due by the end of class on the due date. Assignments must be printed out and handed in to the professor in class.

Homework assignments are expected to look professional and be legible. Up to 20% of each homework will include points for meeting the criteria below. Homework assignments will meet the following requirements:

- Each page will have a header that includes student name, date, course number, assignment, and page number.
- All homework will be completed on fresh paper with clean edges (not ripped out of a notebook)
- Written sections have correct grammar and spelling.
- Handwriting is legible
- Each question is clearly labeled, with the given information, what you are required to answer, and the solution clearly marked.
- Each homework answer is properly cited and referenced when using any source other than course notes or the course book.

An example of a correctly formatted homework is attached at the end of this syllabus.

Each homework will be graded out of 15 points total for a total homework grade of 75 points by the end of the term.

Grade Determination

The course grade will be determined using the following point breakdown:

Homework Assignments	75 Points total (5 Homeworks at 15 points each)
Quizzes	100 Points total (10 Quizzes at 10 points each)
Exam 1	75 Points total
Exam 2	75 Points total

Final Examination	125 Points total
Class Attendance and Participation	50 Points total (Readings and in class participation)

All grades will be rounded to the nearest tenth. Letter grades will be determined using the following breakdown of grade percentage:

A = 450 points and above	C+ = 375 – 399 points
B+ = 425 – 449 points	C = 350 – 375 points
B = 400 – 425 points	F = Below 350 point

Course Exams

Three exams will be given during the term, two during the term and a final exam. Each regular exam will be out of 75 points, and the final exam will be out of 125 points. The final exam will be cumulative of the whole semester. Exams will include both a multiple-choice portion, and a written response portion.

Late Homework and Missed Exam Policy

Assignments are due by the end of class on the date they are due. Any assignment turned in later than the end of class will be considered late unless prior arrangements are made with the instructor. Late homework will be accepted up to 24 hours after the assigned due date and time for a loss of 50% of the total possible points. No late homework will be accepted after 24 hours. Assignments must be turned in via Moodle.

Missed examinations will not be allowed to be made up without prior consent from the professor. If a student will be missing an examination please contact the professor at least **24 hours prior** to missing the exam.

Course Reading

You are required to complete the readings for the course prior to each class and come to class with a small notecard that includes at least two questions or comments regarding the reading. These questions will be collected at the beginning of class and will be used to monitor attendance. These questions will also be used to determine if students are understanding the reading and coursework to help keep the lectures dynamic. Students may also share any concerns over general course material on these cards each week. Each notecard should be labeled with your name and the date of class. An example of a reading notecard is included at the end of this syllabus.

Students with Disabilities

NJIT is committed to providing students with documented disabilities equal access to programs and activities. If you have, or believe that you may have, a physical, medical, psychological, or learning disability that may require accommodations, please contact the Coordinator of Student Disability Services located in the Center for Counseling and Psychological Services, in Campbell Hall, room 205, (973) 596-3414. Further information on disability services related to the self-identification, documentation and accommodation processes can be found on the webpage at: (http://www.njit.edu/counseling/services/disabilities.php)

Academic Dishonesty and Student Conduct

(Taken from the NJIT Academic Integrity Code linked below)

New Jersey Institute of Technology is an institution dedicated to the pursuit of knowledge through teaching and research. The university expects that its graduates will assume positions of leadership within their professions and communities. Within this context, the university strives to develop and maintain a high level of ethics and honesty among all members of its community.

Imperative to this goal is the commitment to truth and academic integrity. This commitment is confirmed in this NJIT University Code on Academic Integrity. The essential quality of this Code is that each student shall demonstrate honesty and integrity in the completion of all assignments and in the participation of the learning process. Adherence to the University Code on Academic Integrity promotes the level of integrity required within the university and professional communities and assures students that their work is being judged fairly with the work of others. For more information on the code of academic integrity please see: http://www.njit.edu/education/pdf/academic-integrity-code.pdf

Class Behavior

While the university is a place where the free exchange of ideas allows for debate and disagreement, all classroom behavior and discourse should reflect the values of respect and civility. Behaviors that are disruptive to the learning environment will not be tolerated and students will be asked to leave the classroom. This includes but is not limited to aggressive behavior, sleeping in class, disruptive behavior, use of electronic devices for activities not related to coursework, racist, sexist, ableist, or homophobic language, and inappropriate or crude language.

Any student that prefers to use a particular pronoun should let the professor know so that this can be accommodated.

E-mail communication with the professor and each other is expected to be professional. Any e-mails received by the professor that are not professionally formatted and stated will not be answered. Examples of professional e-mail etiquette can be found at the following links:

http://www.wikihow.com/Write-a-Formal-Email
http://englishlive.ef.com/blog/write-perfect-professional-email-english-5-steps/
https://owl.english.purdue.edu/owl/resource/636/01/

Legal Disclaimer

Students' ability to meet outcomes listed may vary, regardless of grade. They will achieve all outcomes if they attend class regularly, complete all assignments with a high degree of accuracy, and participate regularly in class discussions.

This syllabus is subject to change at the discretion of the instructor throughout the term.

Sample Homework Layout

Question 1

Given:

List the resources and emissions associated with the life of a washing machine. Provide both the resources input to each step, and the emissions output. Your answer should be in the form of a cycle diagram as done in class.

Solution:

Figure 1 presents the inputs and outputs from the manufacture of a washing machine.

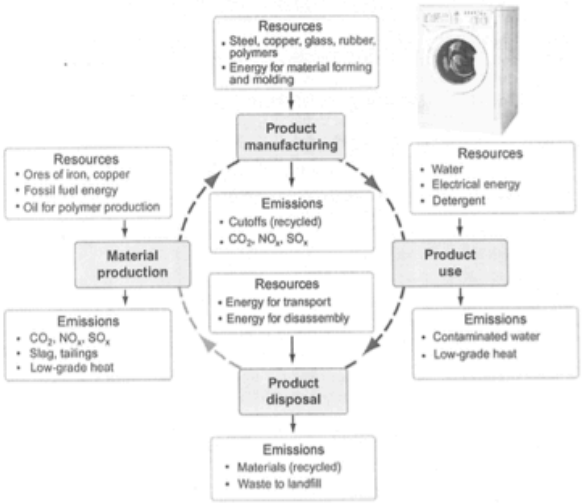


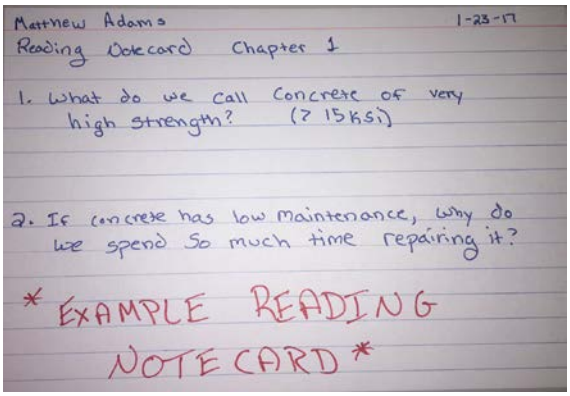
Figure 1: Inputs and outputs from the manufacture of a washing machine (Ashby 2014)

This image shows the resources required and emissions from each step of the manufacture of a washing machine. Significant greenhouse gas emissions can be noted during the material production and product manufacturing phase and energy is required as an input for each phase of the cycle.

References:

Ashby, Michael F., 2014, Materials and the Environment: Eco-informed Material Choice, Elsevier Science, St. Louis

Sample Reading Notecard



Matthew Adams 1-23-17

Reading Notecard Chapter 1

1. What do we call Concrete of very high strength? (> 15ksi)

2. If concrete has low maintenance, why do we spend so much time repairing it?

* EXAMPLE READING NOTECARD *