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

Course Information

Title: CE 360, Sustainable Civil Engineering Materials Section: 002 Class Location: KUPF 209 Meeting Times: Monday and Wednesday 11:30 AM to 12:50 PM Credit Hours: 3 Credits

Instructor

Matthew P. Adams, Ph.D. He/His Pronouns Office: Colton 237 E-mail: <u>adams@njit.edu</u> You can also contact me via Canvas I respond to course e-mails once a day, and do not check e-mails after 6PM or on Saturday or Sunday. **Office Hours**

Mondays: 10:00 – 11:30 AM Wednesdays: 10:00 – 11:30 M Location: Colton 237 or By Appointment on Zoom

Course Modality: Face to Face

Per NJIT a face-to-face course is structured around in-person classroom meeting times. Instruction is delivered in person and students are expected to attend class. The course will meet in person during the listed course times above. Students are expected to attend each session in-person. Some sessions will be held asynchronous online due to the Professor's travel schedule for conferences. Please refer to the schedule on Canvas for these dates.

Required Pre-requisites

The required prerequisites for this course are MECH 237 and CHEM 121.

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

This course is an Open and Affordable Textbook course at NJIT, meaning all reading materials are available for free either through the internet, the library, or other means. You are expected to access the reading materials throughout the term. You are expected to read the materials.

Required

- A. ACI Committee 211.91: Standard Practice for Selecting Proportions for Normal Heavyweight and Mass Concrete. (Reapproved in 2009). This resource is available for free through a Free student membership from the American Concrete Institute. Directions for signing up for an ACI membership can be found at https://www.concrete.org/membership/studentmembership.aspx. Once you have signed up, you can navigate to the to the page for the ACI 211 standard practice and download it as a PDF.
- B. Pavement Guide Interactive: <u>http://www.pavementinteractive.org/</u> (free internet resource)
- C. Additional course reading materials will be posted on the Canvas course website throughout the term.

Additional Resources

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

Course Equipment Expectations

You are required to have access to the following to participate in this course:

• A working computer that has access to word processing software (Microsoft word, Google Docs, etc.) and spreadsheet software (Microsoft Excel, Google Sheets etc.) and Zoom (Available in the Civil Engineering Computer Laboratory).

- A device that can access the course website on Canvas to submit homework assignments and view asynchronous video content (available in the Civil Engineering Computer Laboratory).
- A working computer camera and microphone in-case we need to switch to online modality.
- A working calculator that meets the requirements of the NCEES Calculator Policy:
 - **Casio:** All fx-115 and fx-991 models (Any Casio calculator must have "fx-115" or "fx-991" in its model name.)
 - Hewlett Packard: The HP 33s and HP 35s models, but no others
 - **Texas Instruments:** All TI-30X and TI-36X models (Any Texas Instruments calculator must have "TI-30X" or "TI-36X" in its model name.)
 - Calculators not on this list will not be permitted for use on exams
- An internet capable device to use during class-time: this can include a laptop, smartphone, tablet, etc.

Grade Determination

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

Homework Assignments	100 Points (8 Assignments, 3 Dropped, 20 Points Each)
Unannounced Quizzes and	100 Points (12+ Assignments, top 10 counted, 10 Points
In-Class Exercises	Each)
Midterm 1	100 Points
Midterm 2	100 Points
Final Examination	100 Points

The course is scored out of a total of 500 points.

Letter grades will be determined using the following guidelines:

A = 450 points and above	C = 350 - 374 points
B + = 425 - 449 points	D = 325 - 349 points
B = 400 - 425 points	F = Below 325 points
C + = 375 - 399 points	

<u>Calculating your grade</u>: To calculate your grade please see the grades available on Canvas for each assignment. Calculate your Homework grade and your Unannounced Quiz and Exercise grade by using your top 5 (homework) and top 12 (Quiz/Exercises) only! For example, if you take all 15 quizzes and receive 12.5 points for each, the maximum number of points you can get is 150, not 187.5.

Lectures and Attendance Policy

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 poor performance. Regular attendance in class will greatly increase your ability to perform well on the exams, homework, and class exercises. Make-ups for missed classes will be allowed if the student gets an excused absence from the dean of students. If a student had a serious medical issue, death in the family, or other excusable emergency absence, the student is required to obtain an excused absence from the Dean of Students prior to asking for a make-up.

In the event of having to move to remote learning because of COVID-19, lectures will be held synchronously. Any quizzes or exercises scheduled for a day will instead be posted to Canvas and you will have 24 hours to complete them from the end of the class period. You will be notified of the quiz or exercise during the synchronous class time.

Unannounced Quizzes and Exercises

15 graded unannounced quizzes or in class exercises will be given throughout the course. The lowest three will be dropped from your final score. Some days may include both a quiz and an exercise.

The <u>unannounced quizzes</u> will take up the first ten minutes of class on the days they will be given. Students who are late to class will not be allowed to take the quiz without an excused absence from the Dean of Students. The quizzes will be open notes and will cover material from the previous class session. Notes must be on paper or in a notebook, no open computers or other electronic devices will be allowed. A pre-prepared study sheet is acceptable.

<u>In-class exercises</u> will generally take up a significant portion of class-time and will be done in pairs or groups. Exercises will not be scored, but instead students will get full credit for completing the exercise. No makeups will be allowed for a missed in-class without an excused absence from the Dean of Students.

Course Exams

Three exams will be given, two during the term and a final exam. All exams will be scored out of 100 total points. You will have the class period to complete the midterm exams.

The final exam will be cumulative of the whole semester. Exams will include a multiple-choice portion, calculation sections, and a written response portion.

Missed examinations will not be allowed to be made up without prior consent from the professor or an excused absence from the Dean of Students. If you have an emergency and miss an exam without prior approval from the professor, you must contact the Dean of Students who will review your case and determine whether an excused absence should be allowed.

Day of Exam Policies:

- Exams will be closed book and in-person.
- Each student can bring one 3 in x 5 in study card to the exam, handwritten, one side only.
- All students must put all personal belongings including phones, smart watches, notebooks, computers, tablets, etc. in their backpacks and the backpacks must be placed on the floor.

- The only items allowed on a student's desk during an exam are the following: Calculator, pens/pencils (removed from a pencil case), an eraser, study card, the exam papers, a clear bottle containing a drink.
- Students will sit only in the seat assigned to them for the examination period.
- Students must use an approved calculator for the exam (see Course Equipment section above). Students cannot share calculators during exams. Evidence of sharing calculators will result in an immediate grade of zero on the exam for all students involved.
- Evidence of cheating either by looking at another person's exam, speaking with another person, looking at your phone or other device, or other item that breaks the honor code will result in an immediate grade of zero on the exam.
- Students should use the restroom prior to the exam. Leaving the room during the examination will not be permitted.
- Students handwriting must be legible and understandable. If your writing is illegible, you will receive no points for the sections that can't be understood.

Homework Assignment Requirements and Grading

Homework assignments will be posted on the course website regularly throughout the term. Students will have <u>at least</u> 7 days to complete homework assignments from the date they are posted. Homework assignments are due by 11:30 AM on the due date. Homework will be collected and graded in the following manner:

- Homework will be done through the Canvas online assignment system.
- Students will have unlimited attempts to complete the homework before the due date.
- Students may receive different questions from their peers, and in a different order. Do not copy from your peers.
- Late homework will not be accepted without an appropriate excused absence from the Dean of Students.
- Assignments will close at the time they are due. Extensions for excused absences or other accommodations will be provided on an as needed basis.
- Homework is graded out of 10 points for each assignment.
- Up to eight assignments will be posted throughout the term, but only 5 will be counted. Therefore, you can miss or not turn in up to 3 assignments and still without penalty.
- Evidence of cheating or plagiarism will result in a grade of zero.

Plagiarism and Copying

Plagiarism and copying will *not* be tolerated in this course. While it is encouraged that you discuss and work together on homework problems, direct copying of each-others answers is prohibited. Many homework assignments require written responses, and each student is expected to write their own response.

Plagiarism is also not tolerated. Plagiarism is when you use someone else's words, ideas, assertions, data, or figures and do not acknowledge that you have done that (i.e. pass it off as your own original work). If you use the words, ideas, or even phrases from someone else or any published material you must:

1. Use quotation marks around the copied words or phrases AND cite the source; or

2. Paraphrase or summarize using your own words and phrases AND cite the source.

Any charts, graphs, data, images, or numerical information used from another source or published material must also be cited. If you are not familiar with citations please work with an NJIT librarian to learn more. This is all material that should have been covered in your first-year writing courses.

Any evidence of plagiarism, copying, or cheating during exams, on homework, or on quizzes will result in an immediate grade of zero for the assignment and will be reported to the dean of students. A second instance of this will result in a failing grade for the course.

Extra Credit

No extra credit beyond that which is described in this syllabus will be offered for the course. The grading is designed to give students many chances to do well in the course. For more information why extra credit is not offered please review the following website:

https://www.math.uh.edu/~tomforde/NoExtraCredit.html

Course Reading

You are required to complete the readings for the course prior to each class. The reading has been chosen to support the material given in class and should be given full attention.

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). If you send me a message via Canvas answering the following question, you will receive an extra five points on your total grade. Question: how many homework assignments will be dropped? If you find this, don't tell your classmates, I want to see who reads the syllabus. You must send this response by January 26, 2023 to receive credit. The course schedule is attached at the end of this syllabus.

Students with Disabilities

NIIT 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 processes be found accommodation can the webpage on 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.

Tentative Class Schedule

This schedule is tentative and subject to modification throughout the term. All schedules will be posted to Canvas if/when the schedule is modified.

ABET Matrix – CE 360 Sustainable Civil Engineering Materials

Strategies, Actions and Assignments	ABET Student Outcomes (1-7)	Program Educational Objectives	Assessment Measures			
Objective 1. Define sustainability in their own words and relate how sustainability is						
defined in the context of new construc	defined in the context of new construction as well as renovation and rehabilitation.					
Discuss what sustainability is in the context of construction and construction materials.	1, 3, 4, 7	1, 3	Homework, quizzes, exams, in-class exercises			
Write a cohesive definition that incorporates the ideas of the three pillars of sustainability.	1, 2	1	Quizzes, exams			
Objective 2. Demonstrate concepts of life-cycle analysis including economic and						
sustainability aspects and apply these concepts to sustainable construction.						
List and explain the various steps of completing a life cycle analysis.	2, 4	1	Quizzes, Exams			
Describe the different types of life cycle analyses and the reasons why someone may choose a particular method.	1, 4	1	Quizzes, Exams			
Objective 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						
List and define the key components of aggregates, concrete, asphalt, wood, and metals.	1, 4, 7	1	Quizzes, Exams			
Describe the different material properties that affect fresh properties, mechanical properties, and durability properties.	2, 4	1, 2	Quizzes, Exams			
Objective 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.						
Identify the properties needed for specific applications of each material.	1, 4	1	Homework, In-Class Exercises, Exams			
Discuss the various service and environmental loadings that a constructed element may experience and what properties are needed to resist those loadings.	2, 3	1, 2	Homework, Exams, Quizzes, In-class exercises			
Objective 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.						
Design a concrete mixture using the volumetric method.	1, 2	1, 2	Homework, Exams, In-Class Exercises			
Choose materials for and design an asphalt mixture according to the Superpave process	1, 2	1, 2	Homework, Exams, In-Class Exerccises			

CEE Mission, Program Educational Objectives and Student Outcomes

The mission of the Department of Civil and Environmental Engineering is:

- to educate a diverse student body to be employed in the engineering profession
- to encourage research and scholarship among our faculty and students
- to promote service to the engineering profession and society

Our program educational objectives are reflected in the achievements of our recent alumni:

1 - Engineering Practice: Alumni will successfully engage in the practice of civil engineering within industry, government, and private practice, working toward sustainable solutions in a wide array of technical specialties including construction, environmental, geotechnical, structural, transportation, and water resources.

 $\frac{3 - \text{Service:}}{2 - \text{Service:}} \text{Alumni will perform service to society and the engineering profession through membership and participation in professional societies, government, educational institutions, civic organizations, charitable giving and other humanitarian endeavors.}$

Our Student Outcomes are what students are expected to know and be able to do by the time of their graduation:

- 1. an ability to identify, formulate and solve complex engineering problems by applying principles of engineering, science and mathematics
- 2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety and welfare, as well as global, cultural, social, environmental and economic factors
- 3. an ability to communicate effectively with a range of audiences
- 4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental and societal contexts
- 5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks and meet objectives
- 6. an ability to develop and conduct appropriate experimentation, analyze and interpret data and use engineering judgment to draw conclusions
- 7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Revised: 2/13/18