CE 702-101: Applications and Modeling of Innovative Structural Materials

(3 credits)

Lectures: Monday 6:00pm – 8:50pm
Central King Building, Room 315

Instructor: Matthew J. Bandelt, Ph.D., P.E.
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Colton Hall, Room 235
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(973) 596-3011

Office Hours: Wednesday: 4:15pm-5:45pm, *or by appointment*
I am available in person or by Zoom at the link below at the posted office hour times.

Zoom Link: https://njit-edu.zoom.us/my/bandelt

Prerequisite: Undergraduate courses in construction materials, structural analysis, and structural design.

Course Themes
In this course, students will be introduced to a range of innovative construction materials and their applications in structural engineering. Materials introduced in the course will include highly-ductile concrete materials, fiber-reinforced polymers, engineered lumber, and shape memory alloys. Students will be introduced to the mechanical and durability properties of the structural materials, and historical scientific development of each material system. Structural applications will then be discussed for each material. Students will develop an understanding of state-of-the-art performance predicting techniques to produce engineered calculations of strength, ductility, and other engineering properties in structural elements.

Learning Objectives (General)
By the end of this course, the student will be able to:

- **Explain** the deficiencies in commonly used building materials in structural applications in modern construction practices.
- **Describe** the mechanical and durability properties of a range of innovative engineered structural materials.
- **Discuss** structural applications of innovative engineered structural materials.
- **Evaluate** published technical literature from professional societies and code-writing organizations.
- **Identify** the strengths and weaknesses of scientific research literature related to novel construction materials and their use in structural engineering.
- **Predict** the behavior of structural components with innovative structural materials.
- **Simulate** the behavior of novel construction materials in structural elements using commercially available finite element software.

POLICIES & PROCEDURES

Academic Integrity: Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at: http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. *Any student found in violation of the code by cheating, plagiarizing, or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university***.** If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu.

Communication: All mass communication by the Course Instructor will be done through Canvas. Individual correspondence can be sent directly to the Course Instructor by e-mail (bandelt@njit.edu). It is your responsibility to check e-mail and the course page on Canvas daily.

Attendance: Attendance at all lecture/class periods is expected. Students are expected to participate through the class 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.

During class, I will often ask you to work on a problem or brainstorm ideas and you will then be called on to provide one of more of your answers. The goal of this in-class work will be to get you started on a problem (not necessarily finish) that we will then discuss. Please be respectful to the course instructor and your classmates. You should always bring a pencil and calculator with you to class.

Handouts: Copies of the lecture handouts used in class will be posted on Canvas throughout the semester. It is highly recommended that you fill in and take notes on these handouts during the lecture period. A “filled in” version of these notes will generally be posted after class; however, if technical issues arise, there may be gaps in the “filled in” version.

Prerequisites: It is assumed that you have a background in undergraduate structural analysis, construction materials, and structural design. You will not necessarily be given every piece of information you need to solve a problem, but enough to be able to solve it with some looking up of expressions or conducting analyses.

Homework: Homework will be assigned to encourage further reading, to extend the material presented in lectures, and to provide practice in arriving at engineering solutions to problems. Completion of the homework is an essential part of the learning process. All homework is to be turned in individually unless specified otherwise on the assignment. If you collaborate with a classmate (or two) be sure to state that collaboration and their names at the top of your assignment.

Homework Format: It is expected that all homework be presented in an organized manner; use green, yellow, or white engineering paper, one side of each page (clear side, not grid side); begin each problem on a new page and number all pages; have your name written clearly on the front page. An example of an acceptable homework solution is available on Canvas.

Late Homework: Homework will be due at 6:00:00pm on the date that it is due. Late homework submissions will be accepted up to two days (48 hours) after the due date with a 10% reduction for each day the assignment is late. After that time, assignments will not be accepted.

Homework Solutions: Homework solutions will be after the homework is due and the late homework submission window closes. It is your responsibility to make sure you understand how to solve the problems by attending office hours with the instructor and/or asking questions in class. As with many engineering problems, multiple solutions may be possible. This means that rational solutions to the assignments that follow the methods and procedures covered in this course, and of the particular assignment, will be accepted.

Homework Grading: All homework will be submitted electronically by students using Gradescope. It is your responsibility to scan your assignment in and upload it to the Gradescope website before 6:00 PM on the day that it is due.

If you believe that an error was made in grading the homework, you should write a short justification of your claim and submit a regrade request through Gradescope. Your homework will be reviewed to address your concern. The deadline for submitting a re-grade request is one week after the homework is returned.

Quizzes: Quizzes will be given to evaluate your preparation for class based on assigned reading and/or concepts discussed in class. Quizzes will generally be unannounced and given at the discretion of the instructor.

Project: A course project will be assigned during the semester. More details will be given when the project is assigned.

Exams: There will be two exams, each equally weighted. Missed examinations will not be allowed to be made up without prior consent from the Course Instructor or an excused absence from the Dean of Students. If a student will be missing an examination, please contact the Course Instructor at least 24 hours prior to missing the exam. 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 absence should be allowed.

Calculation of Course Grade: A weighted average grade will be calculated as follows:

Homework	10%
Quizzes	25%
Project	10%
Exam 1	27.5%
Exam 2	27.5%

The minimum requirements for final letter grades are as follows:

A = 90%, B+ = 84%, B = 77%, C+ = 71%, C = 65%, F < 65%

Your performance depends only on how you do and how much you learn, not on how everyone else in the class does. It is therefore in your best interest to help your classmates, while acting within the bounds of the stated academic integrity policy (i.e., NJIT's Code of Academic Integrity).

Instructor Commitment: You can expect the Course Instructor to be courteous, punctual, organized, and prepared for lecture and other class activities; to answer questions clearly; to be available during office hours or to notify you beforehand if unable to keep them; to provide a suitable guest lecturer when they are traveling; and to grade uniformly and consistently.

Generative AI: Student use of artificial intelligence (AI) is permitted in this course when explicitly stated on assignments. Additionally, if and when students use AI in this course, the AI must be cited as is shown within the NJIT Library AI citation page for AI. If you have any questions or

concerns about AI technology use in this class, please reach out to the Course Instructor prior to submitting any assignments.

In all instances when the use of AI is not permitted, it is expected that students work without AI assistance to better develop their skills in this content area.

Students with Documented 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)