Welcome to the CEE Construction Materials Laboratory.

This is a place where you will "put to the test" the theory you are learning in the classroom. The Construction Materials Laboratory Course (CE 431) is designed to complement the lecture portions of four construction/structures-oriented courses: Construction Methods and Procedures (CE 210), Construction Engineering (CE 414), Concrete Design (CE 333) and Steel Design (CE 432). The specific objectives of this course are to provide the student with an opportunity to:

1. Investigate the properties and behavior of materials and their assemblies.
2. Become familiar with ASTM specifications and testing procedures and with construction field monitoring and testing practices.
3. Develop skills for analyzing experimental data and working in teams.
4. Learn to design, conduct and analyze data of a custom student-designed laboratory experiment.
5. Research and cite reference standards.

Experiments are performed by student groups of four to five people or as a class demonstration. The experiments are interactive and involve: (1) setup; (2) operation; (3) measurement; (4) adjustment; (5) data gathering; and (6) data reduction. The group approach teaches the value of teamwork in problem-solving during the laboratory period and after class as data are exchanged and reduced. Some experiments are performed as class demonstrations in which each group is assigned a single data set to analyze. Later, towards the end of the period, each group reports their results to form a collective body of data, or research testing.

You will have the opportunity to design and conduct your own custom laboratory experiment of construction material or assembly. It will be both an interesting and challenging experience since you must translate a stated problem into a physical experiment, research and cite standards, testing procedures, and expected results, making decisions on set-up, experimental parameters, and analysis methods, and report and present your finding. This experiment will require you to apply the various experimental techniques that you have learned throughout the semester.

Written assignments must be submitted for each laboratory experiment. Most lab reports will be written and submitted individually by the student. In completing individual reports, students in the same group will share data, although all analyses and written text must be the student's own work. A few group-written reports will be assigned during the semester.

Your safety and the safety of those around you are of prime importance. Efforts have been made to reduce the hazard in the lab as much as possible. Students should follow the general safety rules included on the following page. If you should see anything that you consider to be a safety hazard report this condition to your lab instructor. If you have any questions about the safety of the lab you are going to conduct, consult the lab instructor. Take your experiments seriously. Forces into thousands of pounds will be used throughout the course and if these forces are released in an uncontrolled manner injuries are possible.

Good luck with your experiments this semester and work safe!

JOHN A. REIF, JR. DEPARTMENT OF
CIVIL AND ENVIRONMENTAL ENGINEERING
NJIT New Jersey Institute of Technology

CE 431–001: Construction Materials Laboratory

(1 credit)

Lectures Thursday 11:30 – 2:25
Tiernan 107

Instructor **Walter Konon** Office Hours: Thursday 8:30-11:25
Colton 223 konon@njit.edu (973) 596-2476

Prerequisite **MECH 237 with a C or better, CE210**

Required Textbook

None

Other Recommended Texts & Reading

Class Handouts

Course Description *(from NJIT's course catalog)*

This course provides an understanding of the basic properties of construction materials and presents current field and laboratory standards and testing requirements for these materials. Students select a material or component assembly for testing, design a testing procedure, and present their results or the result of research of a construction material testing topic.

http://catalog.njit.edu/undergraduate/newark-college-engineering/civil-environmental/civilengineering-bs/

Course Objectives (General)

By the end of this course, the student will be able to:

Course Topic 1: Investigate the properties and behavior of materials and assemblies.

Course Topic 2: Become familiar with ASTM specifications, testing procedures, and construction field monitoring and testing practices.

Course Topic 3: Develop skills for analyzing experimental data and working in teams.

Course Topic 4: Design and conduct a custom laboratory experiment, analyze and interpret the data, and make a presentation on the results of the testing.

Course Topic 5: Research and cite reference standards.

POLICIES & PROCEDURES

Academic Integrity: It is expected that NJIT's University Code on Academic Integrity will be followed in all matters related to this course. Refer to NJIT's Dean of Students website to become familiar with the Code on Academic Integrity and how to avoid Code violations. https://www.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: Canvas/Email

Lectures/Class: Attendance is required to perform labs.

Handouts: Both online and in class handouts.

Homework: Reports only.

Homework Format: Report format available in Canvas(week one) and handout.

AI: Students are expected to complete all work without AI assistance to develop their skills in this subject area.

Late Homework: Late reports: If submitted before the graded reports are returned-Late reduced grade. If submitted after reports are returned "F".

Exams: No exams.

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

Class Participation	10%
Lab Reports	60%
Student Designed Lab Report and Presentation	30%

The minimum requirements for final letter grades are as follows:
A = 90%, B+ = 87%, B = 80%, C+ = 77%, C = 70%, D = 60%, F < 60%

Instructor Commitment: You can expect the 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 office hours are moved; to provide a suitable guest lecturer or pre-recorded lecture when they are traveling or unavailable; and to grade uniformly and consistently.

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) 5963414. 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)

Course Schedule:

Week	Topic	Reference
1	Introduction, Safety, Lab Report Format	
2	Portland Cement Concrete (PCC) Mix Design	ACI 211
3	PCC Batch and Test Mix, Slump, Temperature, Air Cylinder Preparation	ASTM C31, ASTM C138, ASTM C143, ASTM C231, ASTM 172, ASTM C1064
4	Concrete Cylinder Testing (7 Day)	ASTM C39, ASTM C496, ASTM C94
5	Welding	HANDOUT

6	Welding and Weld Testing –Epoxy Sample Prep	ANSI/AWSP1.1
7	Concrete Cylinder Testing (28 day), Concrete Hammer	ASTM C31, ASTM C805, ASTM C496, ASTM C94
8	Wood Testing	ASTM D 143, D245
9	Student Designed Lab-Topic, Research and Testing Proposal	
10	Asphalt Pavements; Epoxy Strength TestingTension, Shear	ASTM D897, ASTM D1002
11	Anchor Pullout Testing	ASTM E1512, ASTM E3121
12	Construction Vibrations, Noise Measurement, Moisture, Light, Gas	Handout
13	Student Designed Lab	
14	Presentation of Results of Student Testing	

Note: Students will be consulted on any substantial changes to the course syllabus. Changes will be discussed and announced in advance

Course Objectives Matrix -CE431

Strategies and Actions	Course Student Learning Outcomes	ABET Student Outcomes (1-7)	Program Educational Objectives	Assessment Methods/Metrics
Course Objective 1: Investigate the properties and behavior of engineering materials and assemblies				
Conduct experiments that measure the physical properties of materials and assemblies	Conduct testing, analyze data results, compare results to expected values	6	1	Class participation, lab reports
Course Objective 2: Incorporate and use ASTM specifications and testing procedures in testing, reports, and presentations.				
Perform material testing as per ASTM and ACI standards	Follow ASTM testing requirements	6	1, 2	Class participation, lab reports
Course Objective 3: Develop skills for analyzing experimental data and working in teams.				
Conduct fully interactive physical testing	Work in teams doing the lab, analyze data results	5,6	1	Class participation, lab reports
Perform experiments in students groups that require exchange and analysis of data during the laboratory period, as well as after class	Work in groups in the lab and analyze the data results	5,6	1,2	Class participation, lab reports
Prepare written laboratory reports	Wright a clear report	3	1,2	Lab reports
Course Objective 4: Develop skills for analyzing experimental data and working in teams.				

Students identify a unique laboratory testing topic, design and conduct their own experiment, analyze the results and present their findings.	Identify a construction material lab test, perform the test as a team, present the results of the testing as a team presentation	3,5,6	1,2	Class participation lab report, oral presentation

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 scholarships among our faculty and students
- to promote service to the engineering profession and society

Program Educational Objectives

Our **Program Educational Objectives** are reflected in the achievements of our recent alumni:

1. **Engineering Practice:** Alumni will successfully engage in the ethical practice of civil engineering within industry, government, and private practice, working towards safe, practical, resilient and sustainable solutions in a wide array of technical specialties including construction, environmental, geotechnical, structural, transportation, and water resources.
2. **Professional Growth:** Alumni will advance their technical and interpersonal skills through professional growth and development activities such as graduate study in engineering, research and development, professional registration and continuing education; some graduates will transition into other professional fields such as academia, business, and law through further education.
3. **Service:** 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.

Student Outcomes

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 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 conclusion
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies Updated 8/2025