CEE 431 – 141: Construction Materials Laboratory
(1 credit)

Lectures Saturdays 9:00am – 3:00pm; Face to Face
Middle Summer Session (05/27/2025-07/21/2025); COLT 416 & COLT 121

Instructor Dr. Avinash Prasad; PE, PLS, PP, F.ASCE Online by appointment
avinash.prasad@njit.edu
201-873-8089

Prerequisite Mech 237, CE 210

Required Textbook- No

Other Recommended Texts & Reading-No

Course Description *(from NJIT's course catalog)*
This course provides an understanding of the basic properties of construction materials, and presents current field, laboratory standards and requirements for these materials. Students select a material or component assembly for testing, design a testing procedure, and present their results.

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

Course Objectives (General)
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 Method 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 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. Learning to design, conduct and analyze data of custom student designed laboratory experiments; and
5. Research and cite referenced standards.

Most of the experiments are performed by a student group of approx. five people. The experiments are interactive and involve the following

1. Setup
2. Operation
3. Measurement
4. Adjustment
5. Data Gathering
6. Data Reduction

The group approach teaches the value of teamwork in problem solving during the laboratory period and after class as data is exchanged and reduced. Some experiments are performed as class demonstrations in which each group is assigned a single set to analyze. Later towards the end of the period, the group reports their results to form a collective body of data.

Students will have the opportunity to design and conduct their own custom laboratory experiment. It will be both an interesting and challenging experience, since they must translate a stated problem into physical experiment, research and cite standards, testing procedures and expected results, making decisions on set up, experimental parameters, analysis methods and report and present their findings. This experiment will require students to apply the various experimental techniques that they have learned throughout the semester.

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

A few group-written reports will be assigned during the semester. For some experiments an abbreviated lab format will be submitted.

Your safety and the safety of those around you are of prime importance. Efforts have been made to reduce the hazards in the laboratory as much as possible. Students should follow the general safety rules included on the following page. If you see anything you consider to be a safety hazard report this condition to the laboratory instructor. If you have any questions about laboratory safety of the laboratory test you are going to conduct, consult the laboratory instructor. Take your experiments seriously.

Forces in the thousands of pounds will be used throughout this course and if these forces are released in an uncontrolled manner injuries are possible. Good Luck with your experiments!

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

Communication: All communication by the instructor will be done through Canvas/email. It is your responsibility to check your e-mail, and the course page on Canvas/email regularly.

Lectures/Class: This is a Face-to-Face course. Attendance to all lecture/class periods is expected. Please turn all cell phones off during class and be respectful to the course instructor and your classmates.

Handouts: No Handouts; Lectures will be posted on Canvas.

Homework: Homework will be posted on Canvas. It will be worked individually.

Late Homework: No late Homework is allowed.

Homework Solutions: Homework solution will be posted on Canvas after its due date.

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

Laboratory Reports = 50%, Final Project = 35%, Attendance & Class Participation = 15%.

The minimum requirements for final letter grades are as follows:

A = 90.0%, B+ = 85.0%, B = 80.0%, C+ = 75.0%, C = 70.0%, D = 60.0%, F < 60.0%

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) 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)

Course Schedule: Middle Summer Session (05/27/2025-07/21/2025)-Eight Weeks

Week	Topic	Reference
1(May 31; 2025)	Introduction, Safety, Laboratory Report Format; Portland Cement Concrete (PCC) Mix Design; PCC Batch and Test Mix, Slump, Air, Cylinder Preparation	ACI 211, ASTM C125; ASTM C192, ASTM C31, ASTM C143, ASTM C231, ASTM C173, ASTM 172, ASTM 94
2	Concrete Cylinder Testing (7 Day Test)	ASTM C39, ASTM C496, ASTM C805

3	Welding / Epoxy Lab Preparation	ANSI/AWS D1.1
4	Welding / Epoxy sample Testing	ANSI/AWS D1.1
5	Concrete Cylinder Testing (28 Day)	ASTM C39, ASTM C805, ASTM C803, ASTM C496, ASTM C469
6	Student Design Lab – Topic, Research and Testing	
7	Student Design Lab – Topic, Research and Testing	
8 (July 19, 2025)	Presentation of Results of Student Testing	

Strategies and Actions	Course Student Learning Outcomes	Student Outcomes (1-7)	Program Educational Objectives	Assessment Methods/Metrics
Course Objective 1: For each course topic, list the measurable learning outcomes for that topic.				
Engineering Practice:	An ability to identify, formulate and solve complex engineering problems by applying principles of engineering, science and mathematics	1	1	Concrete Mix Design Lab Report; Welding / Epoxy Sample Preparation & Testing
Engineering Practice & Professional Growth:	An ability to communicate effectively with a range of audiences 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	3,5	1,2	Concrete Mix Design Lab Report; Welding / Epoxy Sample Preparation & Testing
Course Objective 2: For each course topic, list the measurables learning outcomes for that topic.				

Professional Growth:	An ability to identify, formulate and solve complex engineering problems by applying principles of engineering, science and mathematics	1	1	Concrete Mix Design Lab Report;
Engineering Practice & Professional Growth	An ability to communicate effectively with a range of audiences 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	3,5	1,2	Welding / Epoxy Sample Preparation & Testing
Course Objective 3: For each course topic, list the measurable learning outcomes for that topic.				
To promote service to the engineering profession and society	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	2	1	Student Designed Lab report.
To promote service to the engineering profession and society	An ability to communicate effectively with a range of audiences 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	3,5	1	Student Designed Lab report.

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 safe, practical, 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 a graduate study in engineering, research and development, professional registration and continuing education; some graduates will transition into other professional fields such as 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.

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