New Jersey Institute of Technology
Department of Civil & Environmental Engineering

CE 431 – Construction Materials Laboratory	Fall 2017
Text: No Text	
Instructor: Professor Walter Konon, Room 223 Colton Hall, Phone#: 973-596-2476, konon@njit.edu, Office Hours: Monday 10:00-11:30 AM and Wednesday 1:00-2:30 PM or by appointment	
Prerequisite: Mech 237, CE 210.	

Description: 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.

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, Air Cylinder Preparation	ASTM C192, ASTM C31, ASTM C143, ASTM C231 ASTM C173 ASTM 172
4	Concrete Cylinder Testing (7 Day)	ASTM C39, ASTM C496, ASTM C805
5	Welding & Weld Testing	Handout
6	Welding and Weld Testing –Epoxy Sample Prep	ANSI/AWSP1.1
7	Concrete Cylinder Testing (28 day), Windsor Probe, Concrete Hammer, Ec, Indirect Tension	ASTM C31, ASTM C805 ASTM C803, ASTM C496, C469
8	Strain Gauges	Handout
9	Student Designed Lab-Topic, Research and Testing Proposal	
10	Asphalt Pavements; Epoxy Strength Testing-Tension, Shear	Handout
11	Student Designed Lab	
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.

Basis of Grading: Lab Reports = 60%, Final Project = 30%, Class Participation = 10%.
Honor Code: Students are advised that the NJIT Honor Code will be upheld in this course, and any violations will be brought to the immediate attention of the Dean of Students.
Lab Introduction:

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.

Most of the experiments ae performed by student groups of four to five person. 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, the groups report their results to form a collective body of data.

You will have the opportunity to design and conduct your own custom laboratory experiment. 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 report, 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. For some experiments, and abbreviated lab format report will be submitted.

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 the 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!

Department of Civil and Environmental Engineering

CE 431 Construction Materials Laboratory

Description:

The course explores the principles of standardized and self designed laboratory testing of the mechanical properties and response of civil engineering materials and assemblies. The laboratory is hands on, and its aim is to build confidence in using laboratory and field testing as a tool for the solution of physical engineering problems.

Prerequisites: Mech 237, CE 210

Textbook (s) Materials Required: None (Class handouts)

Course Objectives:

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. Design and conduct a custom laboratory experiment, analyze and interpret the data, and make a presentation on the results of the testing.
5. Research and cite reference standards.

Topics:

Orientation and Lab Safety
Concrete mix design -
ACI 211
Concrete mixing and testing – ASTM C192, C143, C231, C173,C138
Welding and weld inspection and testing
Glued connections – ASTM D897, D1002
Hardened concrete testing – ASTM C39, C469, C496, C78
Strain gages
Asphalt pavements gas, noise, light, vibrations, moisture-measurement and standards
Electronic Data Acquition

Student Designed Lab

Student presentation of self designed testing
Schedule: (0-3-1)
Professional Component: Engineering Topics, Standards
Program Objectives Addressed: 1,2
Prepared By: Prof. Konon Date: 7/10/12

CEE Mission, Program Educatiional 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: Recent alumni will successfully engage in the practice of civil engineering with 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.

2 - Professional Growth: Recent alumni will advance their skills through professional growth and development activities such as graduate study in engineering, professional registration, and continuing education; some graduates will transition into other professional fields such as business and law through further education.

3 - Service: Recent Alumni will perform service to society and the engineering profession through membership and participation in professional societies, government, educational institutions, civil organizations, and humanitarian endeavors.

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

(a) an ability to apply knowledge of math, science, and engineering
(b) an ability to design and conduct experiments, as well as to analyze and interpret data
(c) an ability to design a system, component or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(d) an ability to function on multi-disciplinary teams
(e) an ability to identify, formulate, and solve engineering problems
(f) an understanding of ethical and professional responsibility
(g) an ability to communicate effectively
(h) the broad education necessary to understand the impact of engineering solutions in

a global, economic, environmental, and societal context
(i) a recognition of need for, and an ability to engage in life-long learning
(j) a knowledge of contemporary issues
(k) an ability to use techniques, skills and modern engineering tools necessary for engineering practice

Rev. 8/28/13

Course Objectives Matrix – CE 431 Construction Materials Laboratory

Strategies and Actions	Student Learning Objectives	Student Outcomes (a-k)	Program Educational Objectives	Assessment Methods/Metrics
Course Objective 1: Investigate the properties and behavior of engineering materials and assemblies				
Conducts experiments that measure the physical properties of materials and assemblies	Understand the physical characteristics and properties of engineering materials and assemblies	**a,b**	1	Class participation, lab reports
Apply different measuring systems including load cells, strain gages, pressure sensors, thermocouples and electronic data acquisition	Familiarization with the application and use of various physical measurement systems, including their advantages and disadvantages	a, b, k	1	Class participation, lab reports
Course Objective 2: Become familiar with ASTM specifications and testing procedures and with construction field monitoring and testing practices.				
Perform material testing and identification as per ASTM and ACI standards and procedures	Familiarization with and use of ASTM and ACI standards and procedures for physical testing	b, i, k	1,2	Class participation, Lab reports
Course Objective 3: Develop skills for analyzing experimental data and working in teams				
Conduct fully interactive physical testing	Learn the proper procedures for experimental set-up, operation, measuremet, adjustment, data gathering, and data reduction	a, b	1	Class participation, Lab reports
Perform	Understand the	b, d, e	1,2	Class participation,

experiments in students groups that require exchange and analysis of data during the laboratory period, as well as after class	value of teamwork in solving scientific and engineering problems			lab reports
Prepare written laboratory reports	Ability to present experimental results using explanatory text, data tables, and graphs	a, b, g	1,2	Lab reports
Course Objective 4: Design and conduct a custom laboratory experiment, analyze and interpret the data, and make a presentation on the results of the testing				

Students identify a unique laboratory testing topic, design and conduct their own experiment, analyze the results and present their findings.	Learn to use the laboratory to solve unique engineering problems	a, c, d, e, g	1, 2	Class participation lab report, oral presenttion