

Indiana University – Purdue University Fort Wayne (IPFW)

CE 316

Civil Engineering Materials Laboratory

Fall 2009

Course Info Course # & Title: CE 316 “Civil Engineering Materials Laboratory”
Time & Room: T (12:00-02:50), SS134
CRN: 14329

Instructor Name: Dr. Mohammad Alhassan, Ph.D.
Office: ET 327A, Phone #: (260) 481-6389
Email: alhassan@enr.ipfw.edu
Office Hours: T: 03:00-04:00 pm or by appointment.

Catalogue Course Description Introduction to civil engineering materials laboratory and design of experiments, with focus on mechanical and physical properties of construction materials; including measurement of strains, deformations, and forces using mechanical and electrical gauges, LVDTs, and load cells; experiments on metals, aggregates, Portland cement, concrete, asphalt and asphalt mixtures, and wood. In particular the lab will concentrate on concrete mix design and the mechanical properties of concrete.

Prerequisite CE 315 – Civil Engineering Materials

Textbook Mamlouk, M. and J. Zaniewski, *Materials for Civil and Construction Engineers*, Pearson Prentice-Hall, 2nd Edition, 2006.

Reference Annual Book of ASTM Standards; American Society for Testing and Materials.

Grades Averages will be calculated using the following point distribution:
- Lab Reports.....40%
- Participation/Quizzes.....10%
- Project.....10%
- Term Paper.....10%
- Final Exam.....30%

Grade	GPW (set by IPFW)
$A^+ \geq 95$	4.0
$95 > A \geq 90$	4.0
$90 > A^- \geq 87$	3.7
$87 > B^+ \geq 85$	3.3
$85 > B \geq 80$	3.0
$80 > B^- \geq 77$	2.7
$77 > C^+ \geq 75$	2.3
$75 > C \geq 70$	2.0
$70 > C^- \geq 67$	1.7
$67 > D^+ \geq 65$	1.3
$65 > D \geq 60$	1.0
$60 > D^- \geq 50$	0.7
$F < 50$	0

Course Objectives The objective of this course is to understand the characteristics and behavior of civil engineering materials used in buildings and infrastructure. Students will learn standard principles and procedures to design, prepare, and/or test materials such as concrete. To know how to select materials based on their properties and their proper use for a particular facility under prevailing loads and environmental conditions. Student will also have exposure to practical applications including writing of a technical report related to each experiment.

- Lab Topics**
1. Introduction and lab safety (8/25)
 2. Measurement devices and concepts (9/01)
 3. Impact test on steel (9/08)
 4. Tension test on steel and aluminum (9/15)
 5. Aggregates gradation, bulk unit weight and voids (9/22)
 6. Aggregates moisture conditions and S.G. (9/29)
 7. Normal consistency and setting times of Portland cement (10/06)
 8. Slump test, air content test using the pressure method, unit weight test, and preparation of concrete cylinders and beams (10/20)
 9. **Project:** Design conventional and high performance concretes to meet specific requirements and limitations in the plastic and hardened concrete states. Students will verify their design by making and breaking specimens to test their compressive and flexural on and flexure tests (10/27 & 11/03)
*** 11/10 (field trip to Erie Haven Concrete, Inc., Fort Wayne, IN)
 10. Microscopic inspection of concrete and metal samples (11/17)
 11. Nondestructive testing of concrete using the rebound hammer (11/17)
 12. Compression test on wood (11/24) **** One hour review will follow
 13. Preparation of AC specimens using the gyratory compactor and measuring the bulk S.G. of asphalt concrete samples (12/01) *** Experiments will be conducted at Brooks Construction Company Asphalt Lab, Fort Wayne, In.

- Lab Report** The lab report must be typed and printed on 8½ x 11 in. paper size, one face only using a 10-12 point-single spacing font (Times New Roman). The headings and subheading should be in bold. The report typically includes the following sections:
1. Cover Page (use the attached cover page as a template)
 2. Experiment title and the associated ASTM standards at the top of the first page
 3. Introduction (one or two short paragraphs)
 4. Objective: (state the objective of the experiment in a simple and direct manner)
 5. Apparatus and Equipments: (with figures and/or sketches)
 6. Procedure: (summarize the procedure using your own words)
 7. Test Results: (use tables and figures to present your results, do not include the raw data in this section (just present the final results). Make sure to give number and title to each table or figure to refer them in your discussion)
 8. Discussion of Test Results: (discuss the results in details, compare between them and the standard values, indicate if there is any sources of errors, etc.)
 9. Conclusions: (make concise conclusions based on test results & observations).
 10. Deviation from the ASTM standards: (indicate if there any deviation between the procedure and the ASTM standard and whether this affected the results or not)

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CE 316

Civil Engineering Materials Laboratory

Fall 2009

11. References: (Textbook, ASTM standards, and others if you referred to)
12. Appendix: (attach the raw data sheet and other helpful information).

***As engineering student, you are expected to give attention to the presentation of your report so that it will be neat and concise and adequately demonstrate your knowledge of the subject. Sloppy or carelessly presented reports may be penalized by the loss of grade points or may be returned to you to be done over again.

***Do not give 8 and 10 place readouts unless you deal with very small quantities such as strain readings. Do not make unnecessary subtotal computations. Round off final answer to 3 significant figures.

Course Learning Outcomes

Upon successful completion of this course, students shall be able to:

1. Prove good understanding of concepts and their applications in the lab. [**a (1)**]
2. Write formal technical report & convey engineering message efficiently. [**a (1), g (8)**]
3. Understand ethical issues associated with engineering experiments and professional practice. [**f (7)**]
4. Work in teams to perform experimental tasks. [**g (8)**]
5. Use commercial engineering test equipment (Tinus Olsen Test Machine and Charpy Impact Tester) to determine mechanical properties of engineering materials. [**k (6)**]
6. Experimentally verify the assumptions made in the study of CE Materials. [**a (1)**]
7. Evaluate the strength and toughness properties of steel and aluminum. [**a (1), b (3)**]
8. Determine the gradation, moisture content, unit weight, absorption capacity, voids content, and specific gravity of coarse and fine aggregate samples. [**a (1), b (3)**]
9. Determine the initial and final setting times of Portland cement. [**a (1), b (3)**]
10. Design and make conventional and high performance Portland cement concrete mixtures and evaluate their fresh and hardened properties. [**a (1), c (4), k (6)**]
11. Prepare asphalt concrete specimens using the gyratory compactor and determine the bulk S.G. of asphalt concrete specimens and the binder content. [**a (1), k (6)**]
12. Evaluate the strength of wood. [**a (1)**]
13. Statistically analyze and interpret laboratory test results. [**b (3)**]

Letters and numbers in parentheses refer to ABET outcomes and their correspondence BSCE/BSME program Outcomes.

ABET Program Outcomes

Engineering programs must demonstrate that their graduates have:

- (a) an ability to apply knowledge of mathematics, science, and engineering
- (b) an ability to design and conduct experiments, and to analyze and interpret data
- (c) an ability to design a system, component, or process to meet desired needs
- (d) an ability to function on multi-disciplinary teams
- (e) an ability to identify, formulate, and solve engineering problems
- (f) an understanding of professional and ethical responsibility
- (g) an ability to communicate effectively
- (h) the broad education necessary to understand the impact of engineering solutions in a global and societal context
- (i) a recognition of the need for, and an ability to engage in life-long learning
- (j) a knowledge of contemporary issues
- (k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Indiana University – Purdue University Fort Wayne (IPFW)

CE 316

Civil Engineering Materials Laboratory

Fall 2008

Policies

- I expect that you will receive any emails I send to your IPFW email account. Check this account daily or forward the messages to another account you do check daily.
- Students are to perform tests and record the data accordingly. If test data is required for other groups in answering questions about your lab, **the data needs to be posted on the door prior to your group leaving the lab. Groups failing to perform this activity will have their lab scores significantly reduced.**
- Each party must clean up the equipment before leaving the laboratory. Failure to do so will result in **ZERO marks** for the particular test.
- Laboratory experiments will be carried out by PARTIES. For each experiment one party member will act as a foreman. The foreman is appointed on a **rotating basis** with the first man in each party foreman for the first experiment.
- **DUTIES OF FOREMAN:**
 1. To become familiar with test procedure and apparatus BEFORE the lab period.
 2. To assign duties to party members.
 3. To ensure that all pertinent readings are taken and that experimental work is carried out expeditiously.
 4. To supervise production of results and calculations.
 5. To assign persons to act as scribes for all experimental data and calculations.
 6. To ensure that equipment and area of laboratory used during test is cleaned up at the end of the experiment.
- As a courtesy to the instructor and other students, do not be late for class and turn off your cell phone.
- You are expected to attend all labs. If you miss any lab for any reason you have to schedule a time to do it by yourself and you will be responsible for determining what material was covered, what assignments and announcements were made. You may be dropped from the course or have your grade penalized for absence/lateness exceeding one lab without acceptable reason such as illness or emergencies.
- No make-up exams or quizzes are allowed. However, documented special circumstances such as illness or emergencies will be considered. Please notify me by email or by phone as early as possible.
- Lab report is due at the beginning of the next lab meeting (unless the instructor announced other than that). Late reports will not be accepted for credit, except as approved by the instructor.
- Pop quizzes may be given at any time during the semester. The pop quiz will be a part of the associated lab report grade. A grade of zero will be given for quizzes missed due to unexcused absence.
- Instructor reserves the right to raise the resultant grade when, in his opinion it is proper to do so. Factors being considered will be attendance, lateness, class participation, and attentiveness.
- Many students have found an advantage in studying together in small groups. In this way, the resources of each student are used to benefit all members of the group. Each lab report can be discussed in principle by the group. Each in-

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CE 316

Civil Engineering Materials Laboratory

Fall 2009

dividual, however, is expected to do his own report.

- Students with a disability should contact the SSD office at Walb 113 (481-6657) or visit the SSD website at www.ipfw.edu/ssd for a description of services available.
- Students are expected to above reproach in all scholastic activities. Students who engage in scholastic dishonesty are subject to disciplinary penalties, including the possibility of failure in the course. Scholastic dishonesty included but not limited to submission for credit of any work or materials that are attributable in whole or in part to another person. For more information about academic honesty rules and regulations, you may visit IPFW regulations at:
<http://www.ipfw.edu/academics/regulations/honesty.shtml>

Center for Academic Support and Advancement (CASA), www.ipfw.edu/casa

The place to go for concentrated study time!

The SPOT Learning Center: Make your study time not only more effective, but also more efficient by signing up for free tutoring available in the SPOT in Kettler G21 (next door to the Writing Center). You are entitled to 2 free hours per week of one-to-one, course-specific help in understanding concepts, practicing the application or explanation of material being learned, and developing effective test-taking strategies. Make all appointments online through TutorTrac at www.ipfw.edu/casa. If you don't see a tutor available for your class, contact us in Kettler G21!

Drop-in tutoring is also available for math (schedule on Web site) and a few other subjects. If you need help with study skills in general, drop by the SPOT to view our self-paced tutorials or make a one-to-one appointment. Information about STEPS (Student Technology Education ProgramS) classes can be found on the CASA Web site, too. Also, check with your instructor about whether Supplemental Instruction (group study) is available for this class. Questions? Call 481-5419.

SPOT Learning Center Hours Fall 2009: Monday-Thursday 8 a.m. to 8 p.m.; Friday 8 a.m. to 4 p.m.

The WRITING CENTER: Save time and write better papers or presentations for any class through free one-to-one or small group consultations in The Writing Center, Kettler G19 (next door to the SPOT Learning Center). Bring assignments, questions, ideas, and a draft (if you have one). Consultants can help you get started, write more clearly, revise, edit, and cite sources responsibly. Come as you begin writing and as you revise. Drop-ins are welcome if time is available, but appointments, made online through TutorTrac, receive preference. For TutorTrac, online consulting, and resources to make your writing process easier, go to www.ipfw.edu/casa/writing. Questions? Call 481-5740.

Writing Center Hours Fall 2009: M-Th 10 a.m. to 6 p.m.; F 10 a.m. to 2 p.m.; Su 1 to 5 p.m.

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Laboratory No. 1

Introduction to Measuring Devices (According to ASTM.....)

Report Submitted By: Mohammad Alhassan

Report Submitted To: Dr. Alhassan

Members of group No. 1

Mohammad Alhassan (foreman)

Mohammad Alhassan

Mohammad Alhassan

Due Date: September 10, 2009