

Tennessee Technological University
Department of Civil & Environmental Engineering
CEE 4600 (5600) – Civil Engineering Materials II
Elective
Spring Semester 2008

2007 Catalog Data: CEE 4600 (5600): Civil Engineering Materials II. Lecture 2. Lab 2. Credit 3.
High-strength and lightweight, PCC mixture design and adjustment. Concrete framework design. Design and testing of flowable fill and pervious concrete mixtures. Masonry materials evaluation. Aggregate production and improvement. Prerequisite: CEE 3030.

Textbook: Basic Construction Materials, Methods, and Testing, Herubin and Marotta, 5th ed.

Reference: Various ACI and ASTM publications

Coordinator: L.K. Crouch, Professor of Civil Engineering

Goal: To familiarize the student with the techniques used in design and testing of high-strength PCC, self-consolidating PCC, high volume fly ash PCC and pervious PCC. To familiarize the student with masonry materials evaluation, PCC formwork design, controlled low-strength materials and aggregate production and improvement.

Course learning objectives:

1. To familiarize the student with the techniques used in design and testing of high-strength PCC, self-consolidating PCC, high volume fly ash PCC and pervious PCC.
2. To familiarize the student with controlled low-strength materials.
3. To familiarize the student with some ACI design and analysis techniques for PCC formwork.
4. To familiarize the student with several ASTM techniques for evaluating masonry materials.
5. To further familiarize the student with aggregate production and improvement.

Course measurable outcomes:

Students will be expected to:

1. be familiar with the techniques used in design and testing of high-strength PCC, self-consolidating PCC, high volume fly ash PCC and pervious PCC;
2. be familiar with design and testing of controlled low-strength materials.;
3. design and analyze PCC formwork;
4. perform several ASTM laboratory evaluations of masonry materials; and
5. discuss aggregate production and improvement.

Topics covered: (Two lecture classes per week, 55 minutes each; One lab per week, 2 hours each)

1. Design and testing procedures for high-strength PCC, self-consolidating PCC, high volume fly ash PCC and pervious PCC (12 classes).
2. Controlled low-strength materials (2 classes).
3. ACI design and analysis techniques for PCC formwork (6 classes).
4. ASTM techniques for evaluating masonry materials (3 classes).
5. Aggregate production and improvement (4 classes).
6. Tests (1 class)

Contribution of the course to meeting professional component:

This course is a part of engineering topics of the curriculum.

ABET category content as estimated by faculty member who prepared this course description:

Engineering science: 1.5 credits (50%)
Engineering design: 1.5 credits (50%)

Relation of course to program outcomes:

- Outcome 1: The graduates will have a broad understanding of the relevant principles of mathematics, science, and engineering.
- Outcome 2: The graduates will have a general comprehension of four technical areas appropriate to civil engineering.
- Outcome 4: The graduates will be capable of design activities and have the ability to identify, formulate, and solve civil engineering problems.
- Outcome 5: The graduates will have effective communication skills.
- Outcome 7: The graduates will have an understanding of experimental processes.
- Outcome 8: The graduates will have the ability to use techniques, skills, and modern engineering tools needed for engineering practice.
- Outcome 11: The graduates will have an understanding of the importance of fundamental and applied research in the advancement of engineering knowledge.

Relation of course to ABET Criteria:

General Criteria

Bloom's Level of Achievement

- | | | |
|------|---|---|
| (3a) | Knowledge of math, science, engineering | 3 |
| (3b) | Design, conduct experiments; analyze and interpret data | 4 |
| (3c) | Design a system, component, or process | 4 |
| (3e) | Identify, formulate, and solve engineering problems | 4 |
| (3g) | Effective communication | 3 |
| (3k) | Techniques, skills, modern tools for engineering practice | 3 |

Program Criteria

Bloom's Level of Achievement

- | | | |
|----|--|---|
| 1. | Apply knowledge of math and sciences | 3 |
| 2. | Apply knowledge of four technical areas appropriate to civil engineering | 3 |
| 3. | Conduct civil engineering experiments and analyze and interpret the resulting data | 4 |
| 4. | Design a system, component, or process in more than one civil engineering context | 4 |

Computer usage:

1. Word processor generated laboratory reports required
2. Spread sheet data management recommended for lab projects 2 and 3

Laboratory projects:

1. Introduction, safety and lab clean up (2 labs)
2. Plastic and hardened properties of high-strength PCC, self-consolidating PCC, high volume fly ash PCC, pervious PCC and controlled low-strength materials (6 labs).
3. Masonry materials evaluation including ASTM C 67, C 216, C 140, C 90, C 109, C 270, C 1314, C 476, C1019 (6 labs).

Prepared by: L.K. Crouch

Date: September 2007