CONSTRUCTION MATERIALS W/LAB
CET 1022

Class Hours: 3.0  Credit Hours: 4.0
Laboratory Hours: 3.0  Revised: Spring 2011

Catalog Course Description:

This is an introductory course in the basic properties, testing and inspection of construction materials and the methods of production of these materials. Topics include an introduction to basic concepts of strength of materials and properties of construction materials such as aggregates, asphalt, steel, and wood; their proper application; performance of standard tests on construction materials and the preparation of proper technical reports on test results. Word processing and spreadsheet software are used to prepare reports that include text, tables, data reduction and graphs. Spreadsheet templates are developed for use in data reduction.

Entry Level Standards:

Students should be capable of critical and analytical thinking and should have sufficient mathematical skills to formulate and solve simple algebraic equations. They should have the ability to perform laboratory tests, record data, draw conclusions and prepare reports that meet prescribed technical and grammatical standards.

Prerequisites:

None

Textbook(s) and Other Course Materials:

Textbook:

Basic Construction Materials, Herubin & Marotta; Reston Publishing Co. (latest edition)

References:

American Society for Testing and Materials
Design and Control of Concrete Mixtures, Portland Cement Association
Laboratory Instructions
Instructor Handout

I. Week/Unit/Topic Basis:

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
</tr>
</thead>
</table>
| 1    | Lecture: Introduction to Construction Materials  
     | Lab: Introduction to the materials laboratory and testing standards |
| 2    | Lecture: Properties of Materials  
     | Lab: Excel Spreadsheets |
3 Lecture: Stress – Strain relationships
   Lab: Tensile Testing of Metallic Materials

4 Lecture: Elastic and Plastic properties of Materials; Exam I
   Lab: Review Tensile Test Reports

5 Lecture: Aggregates
   Lab: Total Moisture Content of Aggregate

6 Lecture: Aggregates
   Lab: Sieve Analysis of Fine and Coarse Aggregate
   Specifications for Concrete Aggregates

7 Lecture: Aggregates; Exam II
   Lab: Unit Weight
   Specific Gravity & Absorption of Coarse Aggregate

8 Lecture: Portland Cement Concrete
   Lab: Concrete Mix Design; ACI 211

9 Lecture: Portland Cement Concrete
   Lab: Concrete Trial Mix Slump
   Air Content; Unit Weight

10 Lecture: Iron and Steel
    Lab: Concrete Final Mix-Cast samples

11 Lecture: Iron and Steel; Exam III
    Lab: Concrete mix design; 7-Day Compression Test

12 Lecture: Asphalt
    Lab: Concrete mix design; 14-Day Compression Test

13 Lecture: Asphalt
    Lab: Concrete mix design; 21-Day Compression and Flexural Tests

14 Lecture: Wood / Masonry
    Lab: Concrete design; PowerPoint Presentation

15 Final Exam Period

II. Course Goals*:

The course will:

A. Expand student understanding of the basic concepts of strength of materials. II, V

B. Enhance the student's knowledge of selected construction materials. II, V

C. Guide students to understand applications for selected construction materials. II, V

D. Allow students to perform calculations to determine size and quantities of materials required for applications. I, II

E. Enhance the student's knowledge in performing tests on selected construction materials according to ASTM procedures or other accepted references. I, II, IV
F. Improve the effective use of the English language essential to success in school and in the world by way of learning to read and to write technical reports. III, IV

*Roman numerals after course objectives reference goals of the Engineering Technology Program.

III. Expected Student Learning Outcomes*:

The student will be able to:

1. Explain the basic properties of materials: thermal expansion and conductivity, stress and strain, elastic and plastic properties, modulus of elasticity, and specific gravity. A & B
2. Explain the basic production processes for selected construction materials. B & C
3. Explain the use and properties of aggregates in construction. B, C, & D
4. Explain the standard laboratory tests for aggregates. B, E, & F
5. Understand the manufacture, chemical composition and physical properties of Portland cement. B
6. Understand the types and applications of Portland cement. C
7. Understand proportioning concrete ingredients to meet design specifications. D
8. Understand standard tests on concrete. B, E, & F
9. Understand the manufacture, chemical composition and physical properties of asphalt. B
10. Name the tests conducted on asphalt. B
11. Determine the asphalt thickness for pavement. D
12. Discuss the types of road surfaces and preparation for paving with asphalt. D
13. Discuss the structure and composition of ferrous materials. A & B
14. Explain the production of ferrous materials. B
15. Test steel tensile strength and determine modulus of elasticity. A & E
16. Calculate the stress and strain and how these relate to the design of steel structures. D
17. Describe structural connections. C & D
18. Discuss the basic characteristics of wood and its application in construction. B & C
19. Discuss the different types of structural wood products. B & C
20. Discuss the properties and use of Masonry in construction. B & C
21. Select the appropriate ASTM procedure or other acceptable procedures to conduct material tests. E
22. Prepare written technical reports describing the test procedure, results and conclusions of a laboratory test. F
* Capital letters after Expected Student Learning Outcomes reference the course goals listed above.

IV. Evaluation:

A. Testing Procedures: 50 - 60%

Four examinations will be given covering the lecture materials. The approximate dates of these exams is shown above. The examinations may consist of problems and essay, short answer or multiple choice questions. It is the student's responsibility to know when an exam is scheduled.

B. Laboratory Expectations: 20 - 30%

A number of laboratory tests are scheduled and field trips will be scheduled. A laboratory journal will be kept by each student and reports prepared for all laboratory tests in accordance with the procedure described in the Laboratory Instructions. The student will be graded on laboratory technique, the journal and the reports. Reports will be graded for technical content and grammar standards. Reports are due one week after the test is done. Late reports will be penalized 10 points for each week they are late. The student must complete all laboratory assignments and submit an acceptable report to receive a passing grade in the course.

C. Final Lab Report: 5 - 10%

An oral PowerPoint presentation and a written report will be required from each student and / or group.

D. Field Work:

N/A

E. Other Evaluation Methods: 10 – 20 %

Homework assignments, participation in classroom and laboratory discussions will count a maximum of 20 percent of the final grade.

F. Grading Scale:

90-100  A
86-89   B+
80-85   B
76-79   C+
70-75   C
60-69   D
0-59    F

V. Policies:

A. Attendance Policy:

Pellissippi State expects students to attend all scheduled instructional activities. As a minimum, students in all courses (excluding distance learning courses) must be present for at least 75 percent of their scheduled class and laboratory meetings in order to receive credit for the course. Individual departments/programs/disciplines, with the approval of the vice president of the Learning Division, may have requirements that are more stringent. In very specific circumstances, an appeal of the policy may be addressed to the head of the department in which
the course was taken. If further action is warranted, the appeal may be addressed to the vice president of the Learning Division.

B. Academic Dishonesty:

Academic misconduct committed either directly or indirectly by an individual or group is subject to disciplinary action. Prohibited activities include but are not limited to the following practices:
• Cheating, including but not limited to unauthorized assistance from material, people, or devices when taking a test, quiz, or examination; writing papers or reports; solving problems; or completing academic assignments.
• Plagiarism, including but not limited to paraphrasing, summarizing, or directly quoting published or unpublished work of another person, including online or computerized services, without proper documentation of the original source.
• Purchasing or otherwise obtaining prewritten essays, research papers, or materials prepared by another person or agency that sells term papers or other academic materials to be presented as one’s own work.
• Taking an exam for another student.
• Providing others with information and/or answers regarding exams, quizzes, homework or other classroom assignments unless explicitly authorized by the instructor.
• Any of the above occurring within the Web or distance learning environment.

C. Accommodations for disabilities:

Students who need accommodations because of a disability, have emergency medical information to share, or need special arrangements in case the building must be evacuated should inform the instructor immediately, privately after class or in her or his office. Students must present a current accommodation plan from a staff member in Services for Students with Disabilities (SSWD) in order to receive accommodations in this course. Services for Students with Disabilities may be contacted by going to Goins 127, 132, 134, 135, 131 or by phone: 539-7153 or TTY 694-6429. More information is available at www.pstcc.edu/departments/swd/.

D. Use of Equipment:

Any act of misuse, vandalism, malicious or unwarranted damage or destruction, defacing, disfiguring, or unauthorized use of property/equipment belonging to Pellissippi State is subject to disciplinary sanction.