

PELLISSIPPI STATE TECHNICAL COMMUNITY COLLEGE  
MASTER SYLLABUS

**CONSTRUCTION MATERIALS W/LAB  
CET 1022**

**Class Hours: 3.0**

**Credit Hours: 4.0**

**Laboratory Hours: 3.0**

**Date Revised: Spring  
02**

**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 test on construction materials; and the preparation of proper technical reports on test results.

**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 Reference Materials Basic to the Course:**

Textbook:

*Basic Construction Materials*, 3rd Edition, Herubin & Marotta; Reston Publishing Co.

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:**

| <b>Week</b> | <b>Topic</b>  |
|-------------|---|
| 1           | Lecture: Introduction<br>Lab: Introduction to the materials laboratory      |
| 2           | Lecture: Basic Concepts of Strength of Materials<br>Lab: Excel Spreadsheets |
| 3           | Lecture: Basic Concepts of Strength of Materials<br>Lab: Tensile Test       |

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| 4  | Lecture: Basic Concepts of Strength of Materials; Exam I<br>Lab: Water Content       |
| 5  | Lecture: Aggregates<br>Lab: Sieve Analysis of Coarse Aggregate                       |
| 6  | Lecture: Aggregates<br>Lab: Unit Weight  |
| 7  | Lecture: Asphalt<br>Lab: Specific Gravity & Absorption                               |
| 8  | Lecture: Asphalt; Exam II<br>Lab: Asphalt  |
| 9  | Lecture: Portland Cement Concrete<br>Lab: Concrete Mix Design                        |
| 10 | Lecture: Portland Cement Concrete<br>Lab: Field Trip                                 |
| 11 | Lecture: Iron and Steel<br>Lab: Concrete Trial Mix-Slump, Air Content, & Unit Weight |
| 12 | Lecture: Iron and Steel; Exam III<br>Lab: Concrete Final Mix-Cast samples            |
| 13 | Lecture: Wood<br>Lab: Concrete Compression Test                                      |
| 14 | Lecture: Wood<br>Lab: Field Trip   |
| 15 | Lecture: Masonry<br>Lab: Compression and Flexural Tests                              |
| 16 | Final Exam   |

**II. Course Objectives\*:**

- A. Understand the basic concepts of strength of materials. I, II, & VI
- B. Understand the basic characteristics of selected construction materials. I, II, & VI
- C. Understand the applications for selected construction materials. I, II, & VI
- D. Perform calculations to determine size and quantities of materials required for applications. I, II, & VI
- E. Perform the tests on selected construction materials according to ASTM procedures or other accepted references. I, II, III, IV, V, & VI
- F. Maintain a Laboratory Journal and prepare professional quality, technical reports. I, II, III, V, & VI

\*Roman numerals after course objectives reference goals of the CET program.

### III. Instructional Processes\*:

Students will:

1. Participate in classroom discussions which challenge the students' ability to think creatively. *Communication Outcome, Problem Solving and Decision Making Outcome, Active Learning Strategy*
2. Visit materials manufacturing facilities and construction sites and hear guest lecturers from the engineering community to help in the transition from the classroom and laboratory to work. *Transitional Strategy, Communication Outcome, Active Learning Strategy*
3. Work in teams to conduct laboratory tests and solve special problems to foster interpersonal skills of teamwork . Frequently this leads to development and refinement of leadership skills and the ability to express ones' thoughts and ideas and seek, through negotiation, consensus of the team. *Communication Outcome, Personal Development Outcome, Problem Solving and Decision Making Outcome, Technological Literacy Outcome, Numerical Literacy Outcome, Informational Literacy Outcome, Active Learning Strategy*
4. Prepare professional level reports describing standard soil laboratory tests requiring mathematical analysis as well as written communication to advance the basic skills of writing and mathematics. *Communication Outcome, Problem Solving and Decision Making Outcome, Informational Literacy Outcome, Active Learning Strategy*
5. Use computers to process information obtained through laboratory tests and problem assignments to enhance information literacy skills. Spreadsheets are used to record laboratory data, to perform data reduction and to prepare logical tabular and graphical presentations of the laboratory results. Word processing software is used to prepare reports and the Internet is used for special assignments. *Technological Literacy Outcome, Numerical Literacy Outcome, Informational Literacy Outcome*
6. Discuss the importance of such personal qualities as ethics and personal responsibility in school and in the workplace. *Personal Development Outcome*

\*Strategies and outcomes listed after instructional processes reference Pellissippi State' s goals for strengthening general education knowledge and skills, connecting coursework to experiences beyond the classroom, and encouraging students to take active and responsible roles in the educational process.

### IV. Expectations for Student Performance\*:

Upon successful completion of this course, the student should 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. Discuss the manufacture, chemical composition and physical properties of Portland cement. B
6. Discuss the types and applications of Portland cement. C

7. Discuss proportioning concrete ingredients to meet design specifications. D
8. Discuss standard tests on concrete. B, E, & F
9. Discuss 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 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

\*Letters after performance expectations reference the course objectives listed above.

## **V. Evaluation:**

### A. Testing Procedures:

Four examinations will be given covering the lecture materials. These exams will be given as shown on the schedule above. The examinations may consist of problems and essay, short answer or multiple choice questions. One examination may be made up if the student has a valid excuse for missing the examination. The examination must be made up within one week.

The four examinations will account for 60 percent of the final grade.

### B. Laboratory Expectations:

A number of laboratory tests are scheduled and one or more 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 handout ALaboratory Instructions@. The student will be graded on laboratory technique, the journal and the reports. Reports will be graded for technical content but they must meet acceptable grammar standards or they will be returned to the student to be redone. It is suggested that the student consult with an English tutor in the Learning Center regarding the preparation of reports.

A short quiz will be given at the beginning of each laboratory period on the procedure for the test being conducted that day. The score on the quiz will be added to the grade of the report.

The student must complete all laboratory assignments and submit an acceptable report to receive a passing grade in the course  
The laboratory grade will account for 30 percent of the final grade.

C. Field Work:

Unscheduled short quizzes may be given covering the previous class lecture or the assignment for the current day. Quizzes may not be made up.  
Homework will be assigned regularly.  
Quizzes and homework will account for 10 percent of the final grade.

D. Other Evaluation Methods:

N/A

E. Grading Scale:

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

**VI. Policies:**

Attendance Policy:

Pellissippi State Technical Community College expects students to attend all scheduled instructional activities. As a minimum, students in all courses must be present for at least 75 percent of their scheduled class and laboratory meetings in order to receive credit for the course (Pellissippi State Catalog). Individual departments/programs/disciplines, with the approval of the vice president of Academic and Student Affairs, may have requirements that are more stringent.