Class Hours: 3.0

Credit Hours: 4.0

Laboratory Hours: 3.0

Revised: Fall 07

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>
<tbody>
<tr>
<td>1</td>
<td>Lecture: Introduction/Basic Concepts of Strength of Materials</td>
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<tr>
<td></td>
<td>Lab: Introduction to the materials laboratory</td>
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</tbody>
</table>
II. Course Objectives*:

Lecture: Basic Concepts of Strength of Materials
Lab: Excel Spreadsheets

Lecture: Basic Concepts of Strength of Materials
Lab: Tensile Test

Lecture: Basic Concepts of Strength of Materials; Exam I
Lab: Water Content

Lecture: Aggregates
Lab: Sieve Analysis of Coarse Aggregate

Lecture: Aggregates /Asphalt
Lab: Unit Weight

Lecture: Asphalt
Lab: Specific Gravity & Absorption

Lecture: Exam II; Portland Cement Concrete
Lab: Asphalt

Lecture: Portland Cement Concrete
Lab: Concrete Mix Design

Lecture: Portland Cement Concrete; Exam III
Lab: TBA

Lecture: Iron and Steel
Lab: Concrete Trial Mix-Slump, Air Content, & Unit Weight

Lecture: Wood
Lab: Concrete Final Mix-Cast samples

Lecture: Masonry
Lab: Concrete Compression Test

Lecture: Masonry
Lab: Compression and Flexural Tests

Final Exam Period
A. Understand the basic concepts of strength of materials. A, D, G

B. Understand the basic characteristics of selected construction materials. A, D, G

C. Understand the applications for selected construction materials. A, D, G, K

D. Perform calculations to determine size and quantities of materials required for applications. A, D, G

E. Perform the tests on selected construction materials according to ASTM procedures or other accepted references. A, D, E, F, G, H, I, J, L

F. Maintain a Laboratory Journal and prepare professional quality, technical reports. D, E, F, G, I, J, L

*Letters after course objectives reference CET Program Outcomes (as required by ABET).

III. Instructional Processes*:

Students will:

1. Participate in classroom discussions which challenge the students' ability to think creatively. Communication Outcome, Technological Literacy Outcome, Active Learning Strategies

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 Strategies, Communication Outcome, Active Learning Strategies

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, Technological Literacy Outcome, Mathematics Outcome, Active Learning Strategies

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, Technological Literacy Outcome, Active Learning Strategies

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, Mathematics Outcome

6. Understand the importance of such personal qualities as ethics and personal responsibility in school and in the workplace. Transitional Strategies

*Strategies and outcomes listed after instructional processes reference TBR'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. 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

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

V. Evaluation:

A. Testing Procedures: 60%

Examinations will be given covering the lecture materials. The approximate dates of these exams are shown 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. It is the student's responsibility to know when an exam is scheduled.

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

B. Laboratory Expectations: 20%

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 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.

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 20 percent of the final grade.

C. Final Lab Report: 10%

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

The PowerPoint presentation and written report will account for 10 percent of the final grade.
D. Field Work:

N/A

E. Other Evaluation Methods: 10%

Homework assignments, participation in classroom and laboratory discussions will count a maximum of 10 percent of the final grade.

F. Grading Scale:

<table>
<thead>
<tr>
<th>Score Range</th>
<th>Grade</th>
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<tbody>
<tr>
<td>90-100</td>
<td>A</td>
</tr>
<tr>
<td>86-89</td>
<td>B+</td>
</tr>
<tr>
<td>80-85</td>
<td>B</td>
</tr>
<tr>
<td>76-79</td>
<td>C+</td>
</tr>
<tr>
<td>70-75</td>
<td>C</td>
</tr>
<tr>
<td>60-69</td>
<td>D</td>
</tr>
<tr>
<td>0-59</td>
<td>F</td>
</tr>
</tbody>
</table>

VI. Policies:

A. 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. It is the student's responsibility to attend every scheduled class activity on time. Students are responsible to get assignments missed and to make-up any work missed during an absence.

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. In addition to other possible disciplinary sanctions that may be imposed as a result of academic misconduct, the instructor has the authority to assign either (1) an F or zero for the assignment or (2) an F for the course.

C. Accommodations for disabilities:

If you need accommodations because of a disability, if you have emergency medical information to share, or if you need special arrangements in case the building must be evacuated, please inform the instructor immediately. Please see the instructor privately after class or in his/her 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 or 131 or by phone: 694-6751(Voice/TTY) or 539-7153.
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.