PELLISSIPPI STATE COMMUNITY COLLEGE
MASTER SYLLABUS
METALLURGY & MATERIALS TESTING
WELD 1410

Class Hours: 3.0 Credit Hours: 4.0
Laboratory Hours: 3.0 Revised: Fall 2015

Catalog Course Description:

An introduction to the mechanical testing of metals for strength, hardness and mechanical properties, students process and examine metallographic specimens and identify material microscopically; apply hardness and tensile tests and interpret results; demonstrate an understanding of metals and their crystalline structure; and recognize the effects of heat, rates of heating and cooling, as well as alloying elements on metals.

Entry Level Standards:

Students entering this course must have completed basic skills in reading comprehension, written communication, and mathematics.

Prerequisites:

MATH 1010 or MATH 1530 or MATH 1630 or MATH 1710 or MATH 1720 or MATH 1730 or MATH 1830 or MATH 1910

Textbook(s) and Other Course Materials:


I. Week/Unit/Topic Basis:

<table>
<thead>
<tr>
<th>Week</th>
<th>Chapter</th>
<th>Topic</th>
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<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Introduction to Metallurgy</td>
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<tr>
<td>2</td>
<td>2</td>
<td>Metallurgical and Chemical Terminology</td>
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<tr>
<td>3</td>
<td>6</td>
<td>Hardness</td>
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<tr>
<td></td>
<td></td>
<td>Heat Treating and Quenching</td>
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<tr>
<td>4</td>
<td>7 – 8</td>
<td>Material Properties</td>
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<tr>
<td>5</td>
<td>9</td>
<td>What is Steel</td>
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<tr>
<td>6</td>
<td>10</td>
<td>Manufacture of Iron and Steel</td>
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<tr>
<td>7</td>
<td>11 – 12</td>
<td>Crystal Structure</td>
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<tr>
<td>8</td>
<td>13</td>
<td>Failure and Deformation of Metal</td>
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<tr>
<td>9</td>
<td>14</td>
<td>Microstructural Analysis</td>
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<tr>
<td>10</td>
<td></td>
<td>Annealing and Normalizing</td>
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</tbody>
</table>
II. Welding Technology General Outcomes (Educational objectives)

I. Reach their full potential in the welding field.

II. Use the correct procedure in setting up equipment, and the skills used in welding.

III. Use Shielded Metal Arc Welding, Gas Metal Arc Welding, and Gas Tungsten Arc Welding machines in both pipe and plate welding.

IV. Explain the physical characteristics of different metals

V. Develop the cognitive and physical skills necessary to pass certification tests.

VI. Apply welding knowledge to effectively utilize problem solving skills as it relates to the operation of equipment in the industry.

VII. Demonstrate the ability to identify, analyze, and synthesize relevant data from multiple information sources in order to develop acceptable conclusions.

III. Welding Technology Concentration Competencies*

Students will:

A. Demonstrate knowledge to pass a practical examination such as AWS code. I, II, III, V, VI, VII.

B. Demonstrate basic welding techniques for a variety of welding positions and various joint designs related to principals, policies and procedures in the welding industry. I, II, III, V, VI, VII.

C. Perform metal layout processes and prepare metals. I, II, III, V, VI, VII.

D. Examine work pieces for defects and measure work pieces with straightedges or templates to ensure conformance with specifications. I, III, V, VI, VII.

E. Apply the principles of metallurgy toward the metalworking trades. I, III, IV, V, VI, VII.

F. Read and interpret blueprints and welding symbols to fabricate components. I, III, V, VI, VII.
G. Apply math and measurement skills to perform specific tasks. I, II, III, V, VI, VII.

H. Follow industry safety practices. I, II, III, V, VI, VII.

I. Apply written, oral and graphical communication skill in both technical and non-technical environments; identify and use appropriate tech literature. I, II, IV, V, VI, VII.

J. Demonstrate a commitment to quality, timeliness, and continuous improvement. I, II, III, V, VI, VII.

K. Engage and interact as a team in a learning environment. I, V, VI, VII.

* Roman numerals after program competencies reference the Welding Technology General Outcomes (Educational objectives) listed above.

IV. Course Goals*:

The course will

1. Expand student’s understanding of metals and their crystalline structure. (C, D, E)

2. Increase student’s understanding of the effects of heat, heat input, and cooling rates on various engineering materials and welded joints. (B, E)

3. Enhance student’s knowledge in the selection, preparation, and evaluation of metallographic samples. (C)

4. Enhance student’s knowledge in the selection, preparation and evaluation of hardness test specimens. (A, D, E)

5. Expand student’s knowledge in the selection, preparation and evaluation of tensile test specimens. (A, D, E)

*Capital letters after course goals reference the competencies of the Engineering Technology concentrations listed above.

V. Expected Student Learning Outcomes*:

Students will:

a. Identify the effects of alloying elements on steels and other alloy systems. 1, 2

b. Identify the methods of heat treatment on various materials and explain the effects of heat treatment processes. 2, 4

c. Calculate the reduction area of tensile pull test specimens. 5

d. Calculate the tensile strength of different test materials. 3, 5

*Numbers after Expected Student Learning Outcomes reference the course goals listed above.

VI. Evaluation:
A. Testing Procedures:

- Unit tests
- Final comprehensive exam

B. Laboratory Expectations:

- Research Assignment
- Lab work

C. Field Work:

n/a

D. Other Evaluation Methods:

n/a

E. Grading Scale:

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<thead>
<tr>
<th>Score Range</th>
<th>Grade</th>
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<tbody>
<tr>
<td>90-100</td>
<td>A</td>
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<tr>
<td>86-89</td>
<td>B+</td>
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<tr>
<td>80-85</td>
<td>B</td>
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<tr>
<td>76-79</td>
<td>C+</td>
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<tr>
<td>70-75</td>
<td>C</td>
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<tr>
<td>60-69</td>
<td>D</td>
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<tr>
<td>0-59</td>
<td>F</td>
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VII. 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 95 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 Academic Affairs, 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 Academic Affairs.

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.

Please see the Pellissippi State Policies and Procedures Manual, Policy 04:02:00 Academic/Classroom Conduct and Disciplinary Sanctions for the complete policy.

C. Accommodations for disabilities:

Students that 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 Disability Services (DS) in order to receive accommodations in this course. Disability Services may be contacted by sending email to disabilityservices@pstcc.edu, or by visiting Alexander 130. More information is available at http://www.pstcc.edu/sswd/.

D. Other Policies:

Safety and Equipment Abuse:
Repeated safety violations will result in a reduction of final grade, at the instructor's discretion. Flagrant violations which result in equipment damage or personal injury could result in automatic failure of the course.