

PELLISSIPPI STATE TECHNICAL COMMUNITY COLLEGE  
MASTER SYLLABUS

**DESTRUCTIVE AND NON-DESTRUCTIVE TESTING  
MET 2810**

**Class Hours: 2.0**

**Credit Hours: 3.0**

**Laboratory Hours: 3.0**

**Revised: Fall 06**

**Catalog Course Description:**

A study in the methods, procedures, and equipment associated with physical testing, both destructive and non-destructive. The course will include such topics as gauging, hardness testing, impact testing, tensile and compression testing, magnaflux testing, ultrasonic testing, and dye penetrant testing.

**Entry Level Standards:**

Students entering this course should have a fundamental knowledge of materials, basic metallurgy, and basic machining practices.

**Prerequisites:**

MET 2800

**Textbook(s) and Other Course Materials:**

Textbook: Equipment Operational Manuals & Instructor Developed Material

References:

*Nondestructive Testing* [PI-4-3], 4th Edition, General Dynamics.

*Nondestructive Testing* [CT-6-3], 2nd Edition, General Dynamics.

*Nondestructive Testing Handbook: Vol. 2*, 2nd Edition, American Society for Nondestructive Testing, 1982.

*Inspection of Metals-Destructive Testing: Vol. 2*, Anderson, Carnes Publication Services, 1988.

*Inspection & Gaging*: Kennedy, Industrial Press, 6th Edition, 1987.

Applicable ASTM Standards

**I. Week/Unit/Topic Basis:**

| <b>Week</b> | <b>Topic</b>                    |
|-------------|---------------------------------|
| 1           | Introduction                    |
| 2-3         | Hardness Testing                |
| 4-6         | Tensile and Compression Testing |
| 7-8         | Impact Testing                  |
| 9-10        | Dye Penetrant Testing           |

|       |   |
|-------|---|
| 11    | Magnetic Particle Testing                           |
| 12-14 | Ultrasonic Testing<br>Miscellaneous Testing Methods |
| 15    | Presentations/Final Exam                            |

## II. MET Program Objectives & Outcomes:

### Objectives:

- I. Apply basic engineering theories and concepts.
- II. Apply basic engineering theories and concepts.
- III. Identify and solve work related problems with minimum assistance.
- IV. Operate equipment and instruments with a high degree of skill.
- V. Communicate effectively, including verbal, writing, and graphical skills.
- VI. Apply the principles of good work ethics.
- VII. Obtain gainful employment in the MET discipline or matriculate to a 4-year program in engineering technology.

### Outcomes:

- A. apply the knowledge of mathematics, science, and engineering technology. (I, II, IV, VI)
- B. use the techniques and modern engineering tools needed for engineering technology practices. (I – IV, VI)
- C. identify, formulate, and solve engineering technology-based problems. (I, II, VI)
- D. design and conduct experiments, as well as analyze and interpret collected data. (I– IV, VI)
- E. create or fabricate a system, subsystem, component, or process to meet specified needs. (I – IV, VI)
- F. read and extract information from manuals, journals, and other discipline related literature. (I–IV, VI)
- G. communicate effectively, including verbal, writing, and graphical skills. (IV, V, VI)
- H. function and contribute positively in team situations. (II, IV- VI)
- I. comprehend social, professional, and ethical responsibilities, including development of a respect for diversity and other contemporary issues.(II, V, VI)
- J. realize the impact of engineering technology solutions in a global and societal context. (V, VI)
- K. realize the importance of a commitment to quality, timeliness, and continuous improvement. (V, VI)

- L. recognize the importance of life-long learning.(I – VI)

### III. Course Objectives\*:

- A. Demonstrate their understanding of destructive and non-destructive testing principles. (A-C)
- B. Prepare test samples, set-up, and functionally operate testing equipment. (A-C)
- C. Collect data and analyze results. (D)
- D. Communicate technical information. (F, G)

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

### IV. Instructional Processes\*:

Students will:

1. Actively listen to class lectures and participate in class discussions that develop and reinforce an understanding of the theories, concepts, principles, and applications of destructive and non-destructive testing. *Communication Outcome, Mathematics Outcome, Technological Literacy Outcome, Active Learning Strategies*
2. Work individually or in teams to complete projects, lab experiments, and assignments related to the theories, concepts, principles, and applications covered in the lecture or demonstration portion of the course. *Communication Outcome, Mathematics Outcome, Technological Literacy Outcome, Active Learning Strategies*
3. Collect, analyze, and tabulate data in an orderly format to prepare a college level technical report using computer software packages such as AutoCAD, Microsoft Word, Word Perfect, Excel, FeatureCAM Manufacturing Software, Coordinate Measuring software, MD Solids, Working Model 2D. *Communication Outcome, Mathematics Outcome, Technological Literacy Outcome, Active Learning Strategies*
4. Use research and oral presentation skills to present findings to a subject matter expert, peer group or an evaluation team from industry. *Communication Outcome, Mathematics Outcome, Technological Literacy Outcome, Active Learning Strategies*

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

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

Upon successful completion of this course, the student should be able to:

1. Define, explain, and associate the terminology used in destructive and non-destructive testing. A
2. Select appropriate testing methods and identify equipment required for the testing process. A
3. Select appropriate test samples. B

4. Calibrate equipment as required. B
5. Determine material hardness using both Rockwell and Brinell testing methods. B
6. Perform tensile and compression tests on various types and shapes of materials. B
7. Determine shear strength of a material by performing a Charpy/Izod impact test. B
8. Perform a dye penetrant and magnetic particle test to detect surface defects. B
9. Perform a basic ultrasonic test to detect internal material defects. B
10. Select appropriate data collection method. C
11. Determine acceptability of data and "accept or reject" results. C
12. Document technical information in a neat and orderly format. D
13. Locate and extract needed information from ANSI standards and technical manuals. D
14. Complete assignments based on oral instructions. D

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

## **VI. Evaluation:**

### A. Testing Procedures:

Quizzes (25 Points): Approximately 6-8 quizzes will be administered during the course. They will include discussion questions, short answer questions, true/false questions, and problem solving.

### B. Laboratory Expectations:

Equipment Proficiency Evaluation (30 Points)

Physical Testing Proficiency (35 Points)

Guidelines and requirements for each project will be provided by the instructor.

### C. Field Work:

N/A

### D. Other Evaluation Methods:

Participation (10 Points): Based on instructor observation during the course, each student will be evaluated on participation activities. Evaluation parameters to include active participation in class discussions, being prepared, efficient use of lab time, striving to achieve more than minimum requirements, and regular attendance.

### E. Grading Scale:

Final grade for this course will be based on the following alphabetic/numerical scale.

A 93-100

B+ 88-92

- B 83-87
- C+ 79-82
- C 74-78
- D 65-73
- F Below 65

## VII. 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.

### B. Academic Dishonesty:

Plagiarism, cheating, and other forms of academic dishonesty are prohibited. Students guilty of academic misconduct, either directly or indirectly through participation or assistance, are immediately responsible to the instructor of the class. In addition to other possible disciplinary sanctions which may be imposed through the regular Pellissippi State procedures as a result of academic misconduct, the instructor has the authority to assign an F or a zero for the exercise or examination or to assign an F in 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. Other Policies:

Make-Up Quizzes: As a general rule, no make-up quizzes will be administered during the course.

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 will result in automatic failure of the course.

Your instructor is available during posted office hours or by appointment.