

PELLISSIPPI STATE TECHNICAL COMMUNITY COLLEGE  
MASTER SYLLABUS

**STRENGTH OF MATERIALS  
MET 1051**

**Class Hours: 3.0**

**Credit Hours: 4.0**

**Laboratory Hours: 3.0**

**Revised: Fall 06**

**Catalog Course Description:**

A study of the internal reactions within a rigid body caused by external forces acting on the body. Included are stress, strain, torsion, and bending and deflection of beams.

**Entry Level Standards:**

Students entering this course must have a working knowledge of geometry, advanced algebra, and trigonometry.

**Prerequisites:**

MET 1040

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

Textbook: *Statics and Strength of Materials*: Cheng, Glenco/McGraw Hill, Latest Edition, 1997.

References: *Statics and Strengths of Materials*: Bassin, Brodsky, & Wolkoff, McGraw-Hill, 4th Edition, 1988.

*Statics and Strength of Materials*: Morrow, Prentice-Hall, 1981.

*Statics and Strength of Materials*: Wolf, Merrill Publishing Company, 1988.

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

<b>Week</b>	<b>Topic</b>
1	Moment of Inertia
2-4	Concept of stress Simple stress, shear stress, bearing stress. Geometric stress concentration. Stress on thin walled pressure vessels.
5-7	Introduction to Strain. Axial strain, thermal strain

8	Mechanical properties of materials
9-10	Torsion
11	Shear and bending moments in beams
12-13	Stresses in beams
14	Deflection in simple beams
15	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. Evaluate the stress and strains in structures and machines. (A, C, D)
- B. Understand the relationships between stress and strain and use these relationships to evaluate the mechanical properties of common engineering materials. (A, C, D)
- C. Determine the stress distribution and angle of twist in hollow or solid circular shafts. (A, C, D)
- D. Evaluate shear forces, bending moments, and deflection along the length of statically determinate beams. (A, C-E)
- E. Operate equipment used in the field of strength of materials and effectively communicate the results of an experiment. (B, D, E, G, H)

\*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 Strength of Materials. *Communication Outcome, Mathematics Outcome, Technological Literacy Outcome, Active Learning Strategies*
2. Use concepts derived in the text and critical thinking skills to solve strength of materials problems. This includes those presented in the book, on class exams and in the laboratory. *Communication Outcome, Mathematics Outcome, Technological Literacy Outcome, Active Learning Strategies*
3. Work 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, Natural Sciences Outcome, Mathematics Outcome, Technological Literacy Outcome, Active Learning Strategies*
4. Collect, analyze, and tabulate data in an orderly format to prepare a college level technical report using computer software packages including Microsoft Word or Word Perfect, Excel, and MD Solids. *Communication Outcome, Natural Sciences Outcome, Mathematics Outcome, Technological Literacy Outcome, Active Learning Strategies*
5. Participate in a capstone team project that will use the concepts from the text and laboratory experiments to design, build, and test a simple truss. A lab report and presentation to the class will be completed on the results. *Communication Outcome, Natural Sciences 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. Calculate moment of inertia for a specific cross section. A
2. Analyze various systems and solve for normal axial stress. A
3. Analyze various systems and solve for shear stress. A
4. Analyze various systems and solve for stresses due to abrupt changes in geometrical shape. A
5. Analyze various systems and solve for axial strain. A
6. Use stress-strain diagrams to evaluate material properties. A, B
7. Solve for thermal strain. A
8. Associate and apply the concepts of Hooke's Law, and Poisson's Ratio. A, B
9. Calculate torsion stress and angle of twist for structures subjected to twisting loads. C
10. Draw shear and bending moment diagrams for various types of beams. D
11. Calculate bending stresses or moments at various sections of a beam. D
12. Calculate the deflection of beams under varied loads. D
13. Complete experiments on strength of materials and prepare college level written reports. E
14. Work with team members to construct a truss, experimentally determine the maximum load the truss can hold, complete a laboratory report and give a presentation to the class on the results. A, B, E

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

#### **VI. Evaluation:**

##### A. Testing Procedures:

Total evaluation will be based on the following point distribution.

Unit Exams (50 Points)

There will be 4-6 unit exams administered during the course.

Final Exam (15 Points)

There will be one comprehensive final exam administered at the end of the course.

##### B. Laboratory Expectations:

Laboratory (30 Points)

Laboratory will include special projects and one oral presentation. Guidelines and requirements for special projects will be provided by the instructor.

C. Field Work:

N/A

D. Other Evaluation Methods:

Participation (5 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, response to verbal questions, and regular attendance.

E. Grading 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 instructors may have requirements that are more stringent.

B. Academic Dishonesty:

Refer to the Pellissippi State 2004-2006 Catalog & Handbook; Pages 62-67.

C. Accommodations for disabilities:

If you need accommodation 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. Privately after class or in the instructor's office.  
To request accommodations students must register with Services for Students with Disabilities: Goins 127 or 131, Phone: (865) 539-7153 or (865) 694-6751 Voice/TDD.

D. Other Policies:

Make-Up Exams: As a general rule, no make-up exams 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.