

PELLISSIPPI STATE TECHNICAL COMMUNITY COLLEGE
MASTER SYLLABUS

THERMODYNAMICS AND HEAT TRANSFER
MET 2040

Class Hours: 2.0

Credit Hours: 3.0

Laboratory Hours: 3.0

Revised: Fall 06

Catalog Course Description:

A study of the basic laws of thermodynamics and heat transfer and their application to practical problems. Topics include the first and second laws of thermodynamics, properties of steam, and power cycles.

Entry Level Standards:

Students entering this course must have a basic understanding of fluid mechanics and a thorough knowledge of how to apply mathematical principles to problem-solving.

Prerequisites:

MATH 1730 & MET 2020

Textbook(s) and Other Course Materials:

Textbook: *Thermodynamics and Heat Power*: Granet & Bluestein, Prentice-Hall, Latest Edition, 2004.

References: *Thermodynamics and Heat Power*: Granet, Prentice-Hall, 4th Edition, 1990.
Thermodynamics and Heat Power: Rolle, Merrill Publishing Company, 3rd Edition, 1989.

I. Week/Unit/Topic Basis:

Week	Topic
1-2	Review of Fluids & Fundamental Concepts
3-7	Heat Transfer
8-10	First Law of Thermodynamics
11-12	Second Law of Thermodynamics
13-14	Properties of Steam & Power Cycles
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. Demonstrate their understanding of basis thermodynamic concepts. (A, C, D, G)
- B. Demonstrate their understanding of basic heat transfer concepts. (A, C, D, G)
- C. Demonstrate their understanding of the first and second laws of thermodynamics. (A, C, D, G)
- D. Demonstrate their understanding of steam power generation and power cycles. (A, C, D, 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 thermodynamics. *Communication Outcome, Mathematics Outcome, Technological Literacy Outcome, Active Learning Strategies*
2. Use concepts derived in the text and critical thinking skills to solve problems presented in the book, on class exams, and in the laboratory. *Communication Outcome, Natural Sciences Outcome, Mathematics Outcome, Technological Literacy Outcome, Active Learning Strategies*
3. 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, 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 such as Microsoft Word, Word Perfect, and Excel. *Communication Outcome, Natural Sciences Outcome, Mathematics Outcome, Technological Literacy Outcome, Active Learning Strategies*
5. Use research and oral presentation skills to present findings to a subject matter expert, peer group or an evaluation team from industry. *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. Solve problems using both the English and SI system. A
2. Differentiate potential and kinetic energy. A
3. Differentiate liquids and vapors. A
4. Explain and apply the concept of specific heat. A
5. Associate and apply the concepts of conduction, convection, and radiation heat transfer. B
6. Identify various types of heat exchangers, explain their function, and solve for sizing based on specific applications. B
7. Identify and analyze an isometric process, an adiabatic process, an isobaric process, an isothermal process, and a throttling process. C

8. Analyze and solve problems dealing with heat flow in pipes, turbines, boilers, nozzles, and heat exchangers. C
9. Identify and explain the details of the following power cycles: D
 - A. Carnot Cycle
 - B. Rankine Cycle
 - C. Reheat Cycle
 - D. Regenerative Cycle
 - E. Otto Cycle
10. Apply the principles of various power cycles to common mechanical systems. D

*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 (60 Points)
There will be 5-6 unit exams administered during the course.

Comprehensive Final Exam (10 Points)

B. Laboratory Expectations:

Laboratory (25 Points)

Laboratory will include problem-solving sessions and a special project. Guidelines and requirements for special project 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:

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 instructors may have requirements that are more stringent.

B. Academic Dishonesty:

Refer to the Pellissippi State Catalog & Handbook.

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 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.