

PELLISSIPPI STATE TECHNICAL COMMUNITY COLLEGE
MASTER SYLLABUS

**FLUID MECHANICS & POWER APPLICATIONS
MET 2020**

Class Hours: 3.0

Credit Hours: 4.0

Laboratory Hours: 3.0

Revised: Fall 06

Catalog Course Description:

A study of fluid mechanics with hydraulic and pneumatic applications. Topics include pressure, fluid flow, fluid energy, system losses, pumps, control valves, system analysis, and maintenance. Other topics include Total Quality Maintenance (TQM), along with preventive and predictive maintenance methods.

Entry Level Standards:

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

Prerequisites:

MATH 1730

Textbook(s) and Other Course Materials:

Textbook: *Applied Fluid Mechanics*: Latest Edition. Mott, Merrill Publishing Company, 2000.

Industrial Hydraulic Technology: Bulletin 0221-B1, Parker Hannifin Corporation, Current Printing, 2002. [Lab Text]

References: *Fluid Power with Applications*: 6th Edition. Esposito, Prentice Hall, 2003.

Hydraulics for Engineering Technology: Johnson, Prentice Hall, 1996.

Power Handbook: McGraw-Hill, 1983.

I. Week/Unit/Topic Basis:

Week	Topic
1	Basic Fluid Properties Lab: Introduction to Hydraulics
2	Fluid Pressure and Measurement Lab: Hyd. Actuators & Control Devices
3	Pneumatics Basics Lab: Check & Flow Control Valves
4-5	Fluid Flow

	Lab: Directional Control Valves
6	Fluid Energy and System Losses Lab: Pressure Control Valves
7-8	Viscosity, Laminar, and Turbulent Flow Friction Losses and Minor Losses Lab: Hydraulic Pumps & Motors
9-10	Hydraulic Systems Analysis and Maint. Lab: Hydraulic System Components
11-12	Compressible Fluids Lab: Introduction to Pneumatics Pneumatic System Analysis and Maint. Lab: Pneumatic Logic Circuits
13	Total Quality Maintenance (TQM)
14	Preventive and Predictive Maintenance
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 an understanding of basic fluid concepts. (A-G)
- B. Demonstrate an understanding of incompressible fluids and hydraulic concepts. (A-G)
- C. Demonstrate an understanding of compressible fluids and pneumatics. (A-G)
- D. Identify, describe, and explain the function of commonly used hydraulic and pneumatic components. (A-C, G)
- E. Demonstrate an understanding of Total Quality Maintenance (TQM). (A-C, I-K)
- F. Demonstrate an understanding of preventive and predictive maintenance methods and applications. (A-C, I-K)

*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, and principles of fluid mechanics, hydraulics and pneumatics. *Communication Outcome, Mathematics Outcome, Technological Literacy Outcome, Active Learning Strategies*
2. Work in teams to complete laboratory experiments related to the theories, concepts and principles covered in the lecture section of the course. *Communication Outcome, Natural Sciences Outcome, Mathematics Outcome, Technological Literacy Outcome, Active Learning Strategies*
3. Analyze, tabulate, and present collected data in an orderly format to prepare a college level technical report using computer software packages including Microsoft Word, Word Perfect, and Microsoft Excel. *Communication Outcome, Natural Sciences Outcome, Mathematics Outcome, Technological Literacy Outcome, Active Learning Strategies*

4. Use research, computer, and oral presentation skills to research a topic and present findings to a subject matter expert, a peer group or an evaluation team from industry. *Communication Outcome, Natural Sciences Outcome, Mathematics Outcome, Technological Literacy Outcome, Active Learning Strategies*
5. View instructional video tapes on topics related to course subject matter, complete workbook assignments and apply concepts by replicating circuits on test stand to increase problem solving skills along with identification and recognition of components. *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. Solve problems using both the English and SI system. A
2. Identify and apply the basic properties of mass, specific weight, specific gravity, and density. A
3. Differentiate force and pressure. A
4. Differentiate absolute, gage, and atmospheric pressure. A
5. Associate the concepts of pressure and elevation. A
6. Associate and apply the concepts of energy and losses to various types of fluid flow. A
7. Classify and analyze various types of fluid systems. A
8. Identify the symbols and explain the function of various hydraulic and pneumatic system components. B
9. Classify and analyze various types of piping systems. A
10. Troubleshoot and maintain basic hydraulic and pneumatic systems. B
11. Calculate flow rates and pressures for compressible fluids. C
12. Identify the basic differences between a hydraulic and pneumatic system. C
13. Identify and explain the concepts of TQM. E
14. Identify and explain the methods for preventative and predictive maintenance. F

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

VI. Evaluation:

A. Testing Procedures:

Evaluation of both classroom and laboratory work is required in this course. Total

evaluation will be based on the following point distribution.

Unit Exams (50 Points)

There will be 5-7 unit exams administered during the course.

Final Exam (15 Points)

The final exam will be a comprehensive examination of the topics covered in the course.

B. Laboratory Expectations:

Laboratory (30 Points)

Experiments and demonstrations will be performed in the laboratory on many of the topics covered in class. Guidelines and requirements for each project will be provided by the instructor. Laboratory reports will count towards 15 points of the total.

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 and exercises, quizzes, 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:

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. (*Pellissippi State Catalog*)

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 quizzes or 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.