

Massachusetts Maritime Academy
Auxiliary Machinery I (EN-1211)
Spring 2016

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Office Hours: Monday, Wednesday and Friday 0900-1000 and by appointment.

TEXTS: **Auxiliary Machinery**, US Dept. of Energy, Reprint for Massachusetts Maritime Academy

Engineering Training Manual (ETM), TS Kennedy

COURSE INFORMATION

DESCRIPTION: This is a 3.5 credit course that lays the foundation for future engineering courses. Students will learn the basic principles of construction, operation, maintenance and repair of piping systems. Topics include pipe and fittings; valves, pumps, and heat exchangers; pressure, temperature, level and flow measurement; piping and instrument diagrams (P&ID) and blueprint reading. Both shore side and marine applications are discussed.

This is a required course for all engineering students and contains STCW knowledge and practical elements. A grade of "C-" or better is required.

PREREQUISITES: Engineering Systems and Safety (EN-1112); Intermediate Algebra (SM-0112)

Course Goals: To prepare the student for the operation, maintenance and repair of fluid piping systems. Knowledge of the construction and purpose of system components is paramount. Emphasis is placed on safety and the specific engineering equipment and systems discussed.

Learning Outcomes - At the completion of the course, the student should be able to:

- Interpret machinery drawings and handbooks
- Interpret piping, hydraulic and pneumatic diagrams
- Safely operate pumps, valves and pumping systems
- Conduct routine pumping operations
- Discuss the construction and operational principles of pumps, valves and heat exchangers
- Discuss the methods of measurement of temperature, pressure, level and flow
- Perform basic calculations and unit conversions involving system parameters
- Demonstrate basic mechanical knowledge and skill in a workshop environment

Must be able to demonstrate knowledge and understanding of the following STCW elements:

AB-E-A5.1 Basic knowledge of the function of auxiliary machinery

AB-E-A5.1..... Basic knowledge of the operation of auxiliary machinery

- AB-E-A8.1 Safe operation of valves and pumps
- AB-E-B1.1 Ability to use lubrication materials and equipment
- OICEW-A4.1 Basic construction and operation principles of pumps
- OICEW-A4.1 Basic construction and operation principles of heat exchanges
- OICEW-A5.2 Operation of pumping systems
- OICEW-A5.2 Routine pumping operations
- OICEW-C1.7 Use of various types of sealants and packings
- OICEW-C2.2 Appropriate basic mechanical knowledge and skills
- OICEW-C2.5 Design characteristics and selection of materials in construction of equipment
- OICEW-C2.6 Interpretation of machinery drawings and handbooks

The Course supports the achievement of the following ABET objectives:

- An ability to apply knowledge of mathematics, science and engineering
- An ability to identify, formulate and solve engineering problems
- An ability to communicate effectively

GRADING:	Quizzes (4-5)	20%
	Tests (3)	45%
	Homework	35%
	Labs	See below

Attendance: It is expected students will come to class on time and not leave early. Late arrivals and early departures are distracting to the class. You must be present for all tests and labs. Unexcused absences will be assigned a grade of zero for the missed work. Let me know in advance by phone, email or in person if you must miss a test or lab. There will be **NO** quiz make-ups. Labs are mandatory. Each missed Lab will cause the final course average to be reduced by 4%. Everyone will take the final. **For each unexcused absence there will be a 2% deduction from the final course average. The student must let the instructor know about expected absences by email.**

Homework: Weekly homework will be assigned and will be based solely on material covered in class. Homework should be neat and the pages stapled together. A ruler or "straight edge" should be used for any sketches. *Unit labels must be carried out throughout the problem or no credit will be given for that problem.* Check all math and dimensions. Box and label answers. Every page should contain your name, the course number and the assigned due date. All homework will be due in class on the following class unless stated otherwise. Late homework will not be accepted.

Labs: Labs are a required part of this class. There will be a 4% final grade deduction for each missed lab. That includes lab attendance and any lab write up. Lab write ups must meet minimum passing grade in order to avoid a deduction

Study tips: Exams, quizzes and homework will focus exclusively on material covered in class. Attendance is mandatory for this reason! If you follow along in class and complete all homework, there will be no test surprises.

Disclaimer: This syllabus is intended to serve as a guide to the range of topics that will be addressed in EN1222 but the topics and sequence are subject to adjustment or change based on the needs of the class..

Electronics: Cell phones must be silenced and remain out of sight. Laptop note taking will not be necessary nor allowed. Therefore, Laptops or any Ipad type devices will not be allowed in class. Violations may be subject to grade deductions of up to 1% of the final grade per violation. Calculators: **Only non programmable calculators will be allowed for exams.**

MMA is committed to providing reasonable accommodations to students with documented disabilities. Students who believe they may need accommodations in this class are required to contact Fran Tishkevich, Director of Disability Compliance, within the first two weeks of class at ext. 2208 or by email ftishkevich@maritime.edu

TOPICS

READING ASSIGNMENTS

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| 1. Steam Cycle and Steam Thermodynamics Review | ETM: Ch 1 Pages-13-17, 21-30 |
| 2. Piping and Instrumentation Diagrams | Pages: # 121 - # 176 Quiz #1 |
| 3. Fasteners and Hardware | Handout |
| 4. Piping Identification | Handout |
| 5. Pipe Connection Methods | Handout Quiz #2 |
| 6. Valve Functions and Basic Parts | Pages: # 202 - # 243 |
| 7. Safety Valves and Relief Valves | Pages: # 224 - # 243 |
| 8. Pneumatically Operated Valves | Pages: # 244 - # 250 Test #1 |
| 9. Steam Traps | Pages: # 251 - # 255 |
| 10. Filters and Strainers | Pages: # 256 - # 263 Quiz #3 |
| 11. Temperature Measurements | Pages: # 43 - # 58 |
| 12. Pressure Measurements | Pages: # 59 - # 71 Test #2 |
| 13. Level Measurements | Pages: # 72 - # 88 |
| 14. Heat Exchangers | Pages: # 293 - # 310 Quiz #4 |
| 15. Non Positive Displacement Pump Overview | Pages: # 265 - # 280 |
| 16. Positive Displacement Pump Overview | Pages: # 282 - # 292 Quiz # 5 |
| 17. Process Control | Pages: # 346 - #400 Test #3 |