

Massachusetts Maritime Academy
Auxiliary Machinery II (EN-2111)
Fall 2015 (4 Credits)

Instructor: Lt. Roger Gill, Assistant Professor (MMA)
Office: Harrington Building, Room 217A
Telephone and e-mail: (Ext. 1707) rgill@maritime.edu
Office Hours: Mon. 1200-1300, Weds. 1200-1300, Fri. 1200-1300

NO CELL phones in Sight! NO TEXTING IN CLASS!!! They must be silenced in every class or I have the right to take your phone and send you to the Dean's Office.

PREREQUISITE: Auxiliaries 1 (EN-1222)

Entrance Requirements:

- Demonstrate a basic understanding of piping systems
- Understand the construction and function of valves
- Understand the operation and design of pressure and temperature regulating devices
- Understand the construction, operation, and function of pressures and temperature measuring devices

Uniform and Dress Code: Cadets are expected to be in the proper uniform of the day as announced by the Commandant of Cadets Department. **NO BOILER SUITS!**

Textbooks:

- 1) Engineering Training Manual by William E. Haynes
- 2) Marine Engineering Workbooks, Vol. 1, 2 and 3, (Most Recent Edition)
- 4) Auxiliary Machinery, U.S. Department of Energy
- 5) Handouts

Website: weh.maritime.edu

Course Description:

Auxiliary Machinery (II) is a (4) Credit course and is a continuation of EN-1211. This course covers the design and operation of Marine Engineering equipment and systems. Topics include: thermodynamic properties, steam traps, centrifugal pumps, positive displacement pumps, heat exchangers/cooling towers, air compressors and compressed air systems, hydraulics and hydraulic systems, air removal equipment, evaporators, marine sanitation devices, oily water separators., as well as combined cycle operation.

Course Objective: To give the student an understanding of the design, operation and functions of shipboard auxiliary equipment and their associated systems as well as the operation and function of combined cycle power plants.

Homework: Homework assignments will be given during class. The Homework assignment topic matter, along with "Safety" topic matter, will be on exams. Homework must be passed in by 1600 hrs of the due date given in class to be eligible for a 100% grade. Any homework delivered after 1600 hrs of the due date will be eligible for a maximum of 70% grade. Homework will not be accepted (2) calendar days after due date and a grade of zero for that homework will be entered. Some homework assignments will be individual, others may be group assignments. All group members must be confirmed PRIOR to assignment or no-credit will be given to all members. As per Aux. Machinery I, all P&ID's must be per the DOE handbook.

GRADING: There will be five (5) tests given through the semester and will be announced beforehand. The tests will be given during class in both multiple choice and essay format.

- If you have an "A" average for all five (5) tests you will be exempt from the final and I will use your tests average as your final exam grade, (If all LABS are Completed to the satisfaction of your lab Instructor)
- The test average will constitute 50% of your final grade.
- A laboratory grade will be generated by the laboratory Instructors and will constitute 10% of your final grade.
- An "Incomplete "grade will be issued if all labs are not completed, which eventually turns into an "F" course grade
- Assigned Homework will constitute 10% of your final grade.
- The final examination grade will constitute the remaining 30% of your final grade.
- NO electronic devices may be used during exams EXCEPT a non-data-transmitting calculator.
- Calculators MAY NOT be shared during an exam. Any infringement from this policy will constitute cheating and will be treated as such in accordance with regimental manual/academic policies

CLASS EXAMS.....50%

HOMEWORK.....10%

LABS.....10%

FINAL.....30%

Deduct (2) points from Final Course Grade for each unexcused class missed.

Standard in Training, Certification, and Watch keeping (STCW)

Auxiliary Machinery II is an STCW Course. STCW policy requires a passing grade of 70 or higher for any STCW course. The STCW course grading will be A, B, C, C- or F. No "D" grading policy. You will Pass or Fail. Failing will require making up the course.

ATTENDANCE: Attendance is mandatory for class lectures and lab instruction. Daily Attendance will be taken. TWO (2) Points will be deducted from your Final grade for each class missed. If you miss a class, for any reason, you are responsible for all lessons and assignments. All medical/illness absences must be accompanied by a signed Medical document upon return to class OR TWO POINTS will be deducted from your Final Grade. You must attend your assigned class, no "switching" to an earlier class. If, due to a MMA sporting event/activity, in which the Dean acknowledges your absence, you must immediately schedule with me the appropriate time to make-up this exam, after which taken, the class exams will be returned.

Sleeping in class: Any student sleeping during any part of my class will be dismissed from class. This will be considered an absence from class with (2) points deducted from the Final Grade Point average

Special Liberty Policy: Please do not ask the Instructor to sign a special liberty request. The only special liberties recognized by the engineering department are those of an emergency nature which are granted directly by the Commandant of Cadets office. A copy of this document must be given to me following your return to class.

Notebooks: Students are expected to maintain a three-ring notebook for the course materials.

LEARNING OUTCOMES: the main objective of the course is to give the student an understanding of the installation, operation and maintenance of auxiliary equipment and systems in marine and industrial applications. Also, an understanding of Combined Cycle power plants and their function.

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

Learning Objectives

Demonstrate knowledge and understanding of the following STCW elements:

- OICEW-A1.2 Change-over of remote/automatic to local control of all systems
- OICEW-A4.1 Basic construction and operation principles of air compressors
- OICEW-A4.1 Basic construction and operation principles of fresh water generators
- OICEW-A4.1 Basic construction and operation principles of steering gear
- OICEW-A4.1 Basic construction and operation principles of deck machinery
- OICEW-A4.3 Preparation, operation, fault detection and measures to prevent damage for auxiliary prime movers and associated systems
- OICEW-A4.3 Preparation, operation, fault detection and measures to prevent damage for auxiliary machinery
- OICEW-C2.3 Dismantling, adjustment and reassembling of machinery and equipment
- OICEW-C2.4 The use of appropriate specialized tools
- OICEW-C2.7 The interpretation of piping, hydraulic and pneumatic diagrams

Demonstrate proficiency in the following skills:

- OICEW-5-1D Start air compressor
- OICEW-5-1E Shut down air compressor
- OICEW-8-2A Centrifugal pump maintenance
- OICEW-8-2B Reciprocating pump maintenance

Other Objectives

- Read and follow written instructions.
- Read and understand a blueprint.
- Properly handle basic hand tools.
- Gain an appreciation of the dependence of the auxiliary systems serving a power plant.
- Understand the principles of operation and the construction details of Auxiliary Machinery.
- Disassemble and reassemble centrifugal pumps.
- Operate a pump, monitoring suction, discharge pressures and power requirements.
- Disassemble and reassemble a duplex, double acting reciprocating pump, set the steam admission valves properly, prove the correct settings by actual operation in a closed circuit system.
- Disassemble and reassemble a two stage reciprocating air compressor. Run the air compressor to demonstrate correct operation.
- Perform a complete pump alignment. Prove alignment within 0.002".
- Identify hydraulic components.

- Disassemble, inspect and reassemble hydraulic pumps and control devices.
- Construct hydraulic systems on hydraulic simulator.
- Operate hydraulic systems and demonstrate proper operation
- Understand the installation, operation, maintenance and repair of auxiliary machinery equipment.
- Understand the operation and types of steam traps commonly used.
- Understand the types of strainers commonly used and their operation.
- Understand both Positive and Non-positive pump fundamentals and operations.
- Understand compressed air systems and air compressor design and operation.
- Understand heat Exchanger concepts and Operations.
- Understand vacuum generating equipment and air removal systems.
- Understand hydraulic equipment and operating systems.
- Understand pneumatic controls and operating systems.
- Understand how auxiliary equipment and their systems are used in shipboard applications.
- Understand the thermodynamic cycle of gas turbines and how they are incorporated into Combined Cycle Power Plants.

TOPICS

REQUIRED READING ASSIGNMENTS

1. Thermodynamic Properties/Steam Traps.....	Aux. Mach. DOE pp. 1-42; pp. 251-264; 425-426. Handout(s) Pages given in class. TS Kennedy Training Manual, Ch(s) 1 and 2.
2. Centrifugal Pumps	Aux. Mach. DOE pp. 265 – 281. Handout(s) Pages given in class. TS Kennedy Training Manual, Ch. 3
3. Positive Displacement Pumps.....	Aux. Mach. DOE pp. 282-292. Handout(s) Pages given in class. TS Kennedy Training Manual, Ch. 3
4. Heat Exchangers/Cooling Towers	Aux. Mach. DOE pp. 293- 310; pp. 328-333. Handout(s) Pages given in class. TS Kennedy training Manual, Ch 3, 7.
5. Air Compressors and Compressed Air Systems.....	Aux. Mach. DOE pp. 311-319. Handout(s) Pages given in class. TS Kennedy Training Manual, Ch 7
6. Hydraulics and Hydraulic Systems.....	Aux. Mach. DOE pp. 164-175; pp. 320-323. Handout(s) Pages given in class. TS Kennedy Training Manual, Ch 7
7. Air Removal Equipment.....	Handout(s) Pages given in class. TS Kennedy Training Manual, Ch3

8. Evaporators, MSD units and.....Handout(s) Pages given in class.
Oily/Water Separators TS Kennedy Training Manual, Ch 7
9. Combined Cycle Operation.....Handout(s) Pages given in class.
Class Notes

LABS:

Labs will meet in Breshnahan Rm 126 or where the Lab Instructor designates. Bring lab handouts, given in class, with you.

- Labs are mandatory. This is a STCW lab. If you miss a lab, this will result in an Incomplete grade for the semester which turns into an "F" for the course grade 2 weeks into the following semester.
- The laboratory consists of mandatory disassembly/ reassembly of working machinery and full functional testing of each piece of equipment. Students will work on: Positive displacement pumps, non-positive displacement pumps, reciprocating pumps, air compressors, hydraulic / pneumatic systems, Instrumentation and Control as well as Combined Cycle Operating systems. Each student must demonstrate proficiency in using small tools, diagnostic equipment and measuring clearances.
- Students will also understand the importance of "Lock out-Tag out"
- (LOTO) safe working practices and procedures. Will conduct proper LOTO during all lab work.

Lab Attire: Wear PPE; Long-sleeve Boiler Suit, Hard Hat, Steel-Toed Boots, Hearing Protection, Flashlight, gloves.. Bring (3) Ring Binder and Pen/Pencil and calculator.

Learning Disabilities: MMA is committed to providing reasonable accommodations to students with documented disabilities. Students who believe they need accommodations in this class are required to contact Associate Professor Fran Tishkevich, Acting director of Disability Compliance, the first day of class at ext 2208 or by e-mail at ftishkevich@maritime.edu. A signed copy of disability form must be given to me the following class.

*MMA Health Services realizes that students may encounter situations which could impede their academic, personal and social development and success. Counseling services are designed to help students address these concerns, increase their self-awareness and empower them to manage challenging areas in their lives. To schedule a confidential appointment please email Jlevesque@maritime.edu or call ext 1480.

