

Steam & Gas Turbine EN-3233

Spring 2016

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Office Hours: Monday, Wednesday, Friday: 1000-1100, or by appointment

Prerequisites: Calculus I and Steam Generators

Text:

Modern Marine Engineer's Manual, Vol. 1 (Osbourne or Hunt)

Engineering Training Manual TS Kennedy (Haynes)

Marine Engineering Workbooks, Vol. 1, 2, and 3 (Haynes)

Handouts will be distributed during class lectures and lab instruction

Caution:

- Cell phones will be taken and given to the Dean. Students are expected to bring notebooks and writing utensils
- Programmable calculators are not allowed during quizzes and exams
- Cell phones may not be used as a calculator

Course Description:

EN -3131 covers the principles, design, operation, maintenance, and repair of marine steam turbines and gas turbines, including their reduction gears, thrust bearings, couplings, governors, and lubrication systems. Line shaft bearings, and propellers are other topics included. [Lab time required]

Entrance Requirements:

- Locate and identify all the components relating to the training ship's main propulsion plant
- Understand and utilize Mollier chart and steam tables
- Thoroughly understand the operation of the training ship's boilers

Attendance:

- Attendance is mandatory for all class lectures and lab instruction. Special liberties DO NOT COUNT as excused
- The only excused absences are for mandatory academy activities
- Students with perfect attendance will have their lowest quiz grade dropped. There will be NO make-up quizzes offered even with an excused absence and **NO QUIZZES WILL BE DROPPED without perfect attendance**. Missing a quiz equals a **ZERO**
- For each unexcused lecture absence, the final grade will be reduced by 2 percent
- Students will be allowed two excused absences from class lectures provided they provide notification twenty-four hours before the scheduled class
- **Students who miss four (4) or more classes will automatically fail the course**

Grading:

- Quizzes 60%
- Final 30%
- Lab/Homework 10%

Note:

This is a STCW required course; the only grades earned in this class will be "A, B, C, or F." The lowest passing grade is a C-.

Homework:

Homework is a key part in your learning. You are expected to do all homework/reading assignments. Please keep a notebook with all work.

Dress Code:

You are expected to be in the proper uniform of the day as announced by the Commandant of Cadets.

Cheating:

Cheating will not be tolerated!!!!

Blackboard:

Blackboard will be used to enhance the overall course content. It will be used to upload lectures, handouts, and videos.

Disability Accommodation:

Massachusetts Maritime Academy 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 the Director of Disability Compliance.

Reading Assignments: Will be given out and amended as the course moves along

1. Fundamentals of steam turbines, thermodynamics, Rankine cycle
2. Turbine design – impulse, reaction, Curtis, Rateau, etc.
3. Steam turbine main engine construction, gland sealing steam, turbine losses
4. Auxiliary plant steam turbines, turbogenerators
5. Lube oil – lube oil systems, lube oil purification
6. Reduction gears, gears, couplings
7. Governors, control systems, turbine control
8. Principles of gas turbine, thermodynamics, Brayton cycle
9. Gas turbine design and performance
10. Gas turbine systems auxiliary equipment: starting systems, fuel systems, lube oil systems
11. Main engine propulsion and gas turbine auxiliaries
12. Gas turbine inspection, maintenance, and repair
13. Propellers
14. Steam turbine and Gas turbine plant operation and Casualty control

Student Learning Outcomes:

Success in this course will be measured through examination and application of your understanding of the design, construction, and operation of marine boilers

### Learning Objectives:

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

- Demonstrate basic construction and operation principles of marine steam turbines
- Demonstrate basic construction and operation principles of marine gas turbines
- Communicate basic construction and operation principles of shafting installations, including propellers
- Indicate basic construction and operation principles of purifiers
- Develop an understanding of the major components of a turbine and what their specific functions are
- Understand the theories of the basic principles of impulse and reaction design
- Provide a detailed explanation of the theory and construction of gas turbines
- Develop an understanding of how a steam turbine differs from a gas turbine

### STCW Learning Objectives:

#### **Learning Objectives**

**Demonstrate knowledge and understanding of the following STCW elements:**

- OICEW-A4.1 Basic construction and operation principles of marine steam turbines
- OICEW-A4.1 Basic construction and operation principles of marine gas turbines
- OICEW-A4.1 Basic construction and operation principles of shafting installations, including propellers
- OICEW-A4.1 Basic construction and operation principles of purifiers

**Demonstrate proficiency in the following skills:**

- OICEW-4-2A Respond to engine room alarms
- OICEW-5-1H Start fuel oil or lube oil purifier
- OICEW-5-1I Shut down fuel oil or lube oil purifier
- OICEW-5-2A Light off main boiler
- OICEW-5-2B Secure main boiler
- OICEW-5-2C Bottom blow boiler
- OICEW-5-3B Respond to boiler high water alarm
- OICEW-5-3C Respond to boiler low water alarm
- OICEW-6-1A Transfer fuel
- OICEW-7-1C Pre-start inspection of steam turbo-generator
- OICEW-7-1D Connect ship service diesel generator to main switchboard