Steam Generators EN-3131

Fall 2015

Instructor: LT K. McClellan

Office: Room 215A Harrington

E-Mail: kmcclellan@maritime.edu

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

Prerequisites: Calculus I

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 design, construction, and operation of steam generators (boilers). It also considers fuels and their combustion, combustion equipment, combustion control, feedwater regulators, air heaters, economizers, superheaters, reheaters, boiler water treatment, and auxiliary boilers. A laboratory aboard the Academy's training ship is included, emphasizing boiler external fittings, safety valves, fuel oil systems, and main and auxiliary steam systems. [Lab time required]

Attendance:

- Attendance is mandatory for all class lectures and lab instruction. Special liberties DO NOT COUNT as excused
- 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

Grading:

- Quizzes 60%
- Final 30%
- Lab 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-.

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!!!!

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. Introduction to Course: Basic concepts: BTU's, pressure, temperature, etc.
2. Properties of Steam: Superheated and saturated steam, latent heat, quality of steam, etc.
3. Boiler Capacity Limitations: Circulation, carryover, combustion rate, heat transfer
4. Boiler Classification: Firetube boilers, watertube boilers, electric boilers
5. Design and Construction of Boilers
6. Boiler Refractories
7. Internal Boiler Fittings
8. Superheaters and Desuperheaters
9. Heat Recovery Devices
10. Boiler Water Chemistry
11. External Boiler Fittings
12. Feedwater Regulators
13. Combustion: Atomizers, registers, fuel oil, fuel oil systems
14. Combustion: Chemistry of combustion, stack gas analysis
15. Auxiliary Boilers
16. Boiler Operation and Controls

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:

- Understand the design, construction, and operation of marine boilers
- Comprehend basic thermodynamics and steam tables
- Demonstrate proficiency in solving fundamental engineering calculations
- Understand both firetube and watertube boiler fundamentals and operation
- Explain boiler refractories
- Comprehend internal boiler fittings
- Describe properties of superheaters and desuperheaters
- Compare/Contrast heat recovery devices

- Classify and Examine external boiler fittings
- Explain combustion theory
- Demonstrate knowledge of boiler water chemistry and treatment
- Show proficiency in boiler operation

STCW Learning Objectives:

Demonstrate knowledge and understanding of the following STCW elements:

- OICEW-A4.1 Basic construction and operation principles of marine boilers
- OICEW-A4.3 Preparation, operation, fault detection and measures to prevent damage for steam boiler and associated auxiliaries
- OICEW-A4.3 Preparation, operation, fault detection and measures to prevent damage for steam systems
- OICEW-B1.2 Steam boiler automatic controls
- RFPEW-A2.1 Safe operation of boilers

Demonstrate proficiency in the following skills:

- OICEW-5-2D Boiler water test