

Course: Steam and Gas Turbines

Department of Engineering  
Steam and Gas Turbines / EN-3233  
Spring 2016

Instructor: LCDR Jonathan McDonnell  
Phone: Ext. 2015

Office: Room 208A Harrington  
Email: [jmcdonnell@maritime.edu](mailto:jmcdonnell@maritime.edu)

Office Hours: Third Period on Monday, Wednesday, and Friday or by appointment

Prerequisite: Steam Generators and Calculus I

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

Required Text:

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

Recommended Texts:

Engineering Training Manual TS Kennedy (Haynes)

Marine Engineering Workbooks, Vol. 1, 2, 3 (Haynes) 7<sup>th</sup> Ed.

Handouts will be distributed during class lectures and lab instruction

Caution: Cell phones will be taken and given to the Dean. No video or audio recording devices allowing in class or lab. Students are expected to bring notebooks, writing utensils, etc.

Course: Steam and Gas Turbines

Uniform: No boiler suits allowed in class, only uniform of the day. Only long sleeve boiler suits allowed in lab (no short sleeves)

Course Description: To prepare the student in understanding the design, construction, and operation of marine steam and gas turbines.

Attendance Policy:

- Attendance is mandatory for all class lectures and lab instruction. Five (5) unexcused absences from class lectures will result in a failing (F) grade.
- Students with perfect attendance will have their lowest quiz grade dropped. Missing a quiz equals zero.
- Students will be allowed two excused absences from class lectures only provided they provide notification twenty-four hours before the scheduled class. Students will have to make-up all required work. For each unexcused lecture absence, the final grade will be reduced by 2 percent.
- Lab instruction classes are **mandatory**. Disciplinary action will be taken if needed. An “Incomplete” grade will be issued if all labs are not completed.

Grading:

- Quizzes (Weekly) 60%
- Final Examination 20%
- Lab (See Attendance Policy) 10%
- Homework 5%
- Class Participation 5%

Note: *This is a STCW required course, the only grades earned in this class will be “A, B, C or F”, there will be no “D”.*

Reading Assignments: Will be given out and amended as needed.

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. Bearings- turbine bearings, line shaft bearings, stern tube bearings
8. Governors, control systems, turbine control
9. Principles of gas turbine, thermodynamics, Brayton cycle
10. Gas turbine design and performance
11. Gas turbine system auxiliary equipment: starting systems, fuel systems, lube oil systems
12. Main engine propulsion and gas turbine auxiliary gas turbines
13. Gas turbine inspection, maintenance, and repair
14. Propellers
15. Steam turbine and Gas turbine plant operation and casualty control

Reading Assignments:

- Chapter 1 – Thermal Sciences and Engineering 1-1 thru 1-47
- Chapter 3 – Steam Power Plants 3-1 thru 3-42
- Chapter 6 – Marine Steam Turbines 6-1 thru 6-58
- Chapter 4 – Bearing Application and Lubrication 4-1 thru 4-86
- Chapter 7 – Gas Turbines 7-1 thru 7-104
- Chapter 8 – Gas Turbine Fuels 8-36 thru 8-39
- Chapter 9 – Mechanical Transmission Systems 9-1 thru 9-63

All of the above material may be amended or rearranged depending on subject emphasis and/or student needs.

Course: Steam and Gas Turbines

Student Learning Outcomes: The main objective of the course is to give the student an understanding of the design, construction, and operation of marine steam and gas turbines.

Learning Objectives:

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

- Understand the design, construction, and operation of marine steam and gas turbines.
- Understand fundamental thermodynamics, steam tables, and air tables
- Understand how to perform fundamental engineering calculations
- Understand bearings
- Understand reduction gears
- Understand oil purifiers
- Understand major gas turbine components: gas generators, power turbine, etc.
- Understand gas turbine performance
- Understand gas turbine inspection, maintenance, and repair
- Understand steam plant operation and gas turbine plant operation
- Satisfy the USCG requirement of Standards of Training, Certification, and Watchkeeping (STCW) for the skill sets developed during the lab and lecture portions of this course.

The laboratory consists of locating and identifying all components relating to the training ship's steam turbine propulsion systems as well as steam and gas turbine laboratory equipment.

*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 Mr. Fran Tishkevich, Director of Disability Compliance, within the first two weeks of class at ext. 2208 or by email at [ftishkevich@maritime.edu](mailto:ftishkevich@maritime.edu).*