

EN-3213 REFRIGERATION SYLLABUS
MASSACHUSETTS MARITIME ACADEMY FALL 2022

INSTRUCTOR: LT. Tim DeMoranville

HARRINGTON OFFICE #216A

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TEL EXT. #5281

OFFICE HOURS:

Monday and Wednesday 1300-1400

Monday 1400-1500

Or by appointment.

DRESS CODE:

Dress code will be uniform of the day as announced by the Commandant of Cadets Department. If students are returning from lab they are expected to change before the beginning of class. No Boiler Suits allowed in class. No Exceptions.

REQUIRED TEXTBOOKS:

- *ENGINEERING TRAINING MANUAL TS KENNEDY (HAYNES)*
- *(OPTIONAL) – Whitman, Johnson, Tomczyk, Silberstein REFRIGERATION AND AIR CONDITIONING TECHNOLOGY 8th ED., Cengage 2017*

BLACKBOARD:

Digital media covered in the classroom will be posted on Blackboard. Students will be responsible for this information. This will include class presentations, homework assignments, and lab training videos to review before attending lab exercises.

CELL PHONE & SMART TECHNOLOGY POLICY:

Cell phones, laptops, and internet-capable technology are not to be used during class. These instruments are to be on silent and out of view at all times unless otherwise instructed. Usage during class will result in authorized confiscation to the dean's office. Programmable calculators are permitted in class, but may not be used during exams. Non-programmable calculators are welcome at all times.

FOOD, DRINKS, & LAVATORY USAGE DURING CLASS:

Please refrain from bringing any kind of food or drink into the classroom. They will not be allowed.

Please refrain from using the lavatory during class. It will not be allowed.

ATTENDANCE POLICY:

This course is governed by STCW rules and regulations.

STCW: International Convention on Standards of Training, Certification and Watch-keeping for Seafarers

Attendance is required for all labs and lectures in this course. For the lecture portion of the course a student may miss only 10% (up to a maximum of 2 lectures**) before they are ineligible to complete the course. For the Lab portion of the course a student may not miss a single lab class. If you miss a lab, **YOU MUST MAKE IT UP AS SOON AS POSSIBLE**. Please coordinate Lab make-ups with an instructor that is teaching that lab. Attendance will be taken at the beginning of each class for both lab and lecture.

- 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. Perfect attendance means perfect attendance, you physically were present during every lecture.

- **NO** Make-up quizzes will be offered **UNLESS** the student is unable to make the quiz due to an Academy authorized event (with documentation from the Dean's office) such as sports team travel, military service, or a documented illness. **Otherwise a Missed Quiz = 0**

Attendance includes being present at the beginning of class. Quizzes are typically given at the beginning of a class lecture and students will not be permitted to take the quiz or permitted into the classroom if they are tardy. Tardiness of more than 10 minutes will be considered an unexcused absence.

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.

LAB ATTIRE:

Uniform of the day will be permitted in the lab, although it is recommended to wear your boilersuit. All students must wear eye protection at all times when in the lab. Although safety shoes are not required, they are advisable.

NOTEBOOK:

Students are encouraged to take notes in lecture & lab and keep an organized three-ring binder. This notebook may be admissible for use as reference during some quizzes, so a better organized notebook can suffice as its own reward.

COURSE DESCRIPTION:

An in-depth study of refrigeration and the design, operation, maintenance, and repair of environmental control systems. The impact of refrigerants regarding ozone depletion and global warming is covered in detail. [Lab time required]

ENTRANCE REQUIREMENTS:

- Explain the concept of a closed cycle
- Explain the steam cycle and its use of superheat and sub-cooling within the cycle
- Explain and define sensible heat and latent heat
- Calculate formulae using simple algebra
- Display their knowledge of pumps and valves (as learned in Auxiliary machinery)

LEARNING OBJECTIVES:

- [OICEW-A4.1](#) Basic construction and operation principles of refrigeration, air-conditioning and ventilation systems
- [OICEW-A4.3](#) Preparation, operation, fault detection and measures to prevent damage for refrigeration, air-conditioning and ventilation systems

DEMONSTRATE PROFICIENCY IN THE FOLLOWING SKILLS:

- [OICEW-5-1B](#) Start refrigeration system
- [OICEW-5-1C](#) Shut down refrigeration system

PRACTICAL OBJECTIVES:

- Explain the purpose and interrelations of the components of a refrigeration system
- Explain the basic construction and operating principles of refrigeration, air-conditioning and ventilation systems.
- Properly prepare, start, operate, fault detect and determine through measurement the operating status of refrigeration systems system to ensure damage prevention.
- Determine the refrigerant used in a system
- Explain the process to perform leak detection, system maintenance and repair
- Safely recover, evacuate, recharge a system
- Calculate required refrigeration load

SUBJECT MATERIAL AND READING ASSIGNMENTS:

Course reading assignments and subject material covered will be assigned by the instructor on a class-by-class basis. Reading assignments may be posted on Blackboard, emailed to students by the instructor, or assigned during class. All reading assignments are pertinent material and subject to evaluation in quizzes, tests, and homework.

HOMEWORK AND CLASS PARTICIPATION:

Due diligence is essential for success in this course. The more participation and effort put forth the greater the successful result. Homework and class participation count for 10% of a student's grade. Homework may be collected and graded if assigned. Students are expected to participate in class discussions, and ask questions pertinent to the subject material.

LEARNING DISABILITIES:

The Academy offers, upon request, accommodations to students with documented learning disabilities. The ADA Coordinator, Asst. Dean Elaine Craghead, evaluates the documentation provided, determines appropriate services, and is available to discuss accommodations with students. The Disability Resources office is located in the Academic Resource Center, ABSIC 320. Students can drop in during normal business hours, M-F 0800-1600, or call x5120, or email ADAcompliance@maritime.edu.

A signed copy 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.

COURSE TOPICS:

1. Introduction / History / Safety
2. Basic Refrigeration Cycle
3. Ideal Gas Law / Pressure Temperature Charts
4. Vapor Compression Systems
5. Refrigeration System Characteristics and System Design Calculations
6. Properties of Refrigerants
7. Refrigerant System Lubrication
8. Refrigerant Recovery
9. Compressors
10. Flow Controls
11. Rules and Regulations
12. Condensers
13. Evaporators
14. System Troubleshooting
15. Low pressure systems & Chillers
16. Pressure switches & Thermostats
17. Heat Pumps
18. Psychrometrics
19. Air Conditioning
20. Containerized Refrigeration

***This schedule may be changed subject to class requirements**

Quizzes and Tests: Quizzes will be given weekly and will be given on the Wednesday of each week at the beginning of class. The Final Exam will be administered during Finals Week, not during the last lecture session of the semester.

GRADING: Your final grade will be comprised as follows.

Weekly Lecture Quizzes	30%
Final	20%
Midterm Exam*	20%
Homework & Class Participation	10%
Lab (STCW / Practical Assessment) **	10%
Lab Quizzes	10%

***IF no midterm is administered then the 20% will be distributed as follows:**
10% added to the Weekly lecture quiz average
10% added to the Final Exam grade.

**** STCW Assessment Grading will be as follows:**
Pass on first attempt – 100%
Pass on second attempt – 80%
Pass on third attempt – 60%
Don't pass after third attempt – Course Failure and you must repeat the course.

GRADING SCALE:

Please note that the minimum passing grade for this course is 70% due to the requirements of STCW. The course grading will be broken down as follows:

A: 95-100	C+: 77-79
A-: 90-94	C: 73-76
B+: 87-89	C-: 70-72
B: 83-86	F: < 70
B-: 80-82	

Optional: EPA 608 Certification:

Should you successfully pass the EPA 608 certification and submit a certificate of completion at the end of the course, the following points will be added to your final grade:

One type = +2
Two types = +5
Universal = +10

Note: You must have a Final Average passing grade of 70 or better in order to qualify for the EPA 608 bonus.