EN-3213 REFRIGERATION *SYLLABUS*
MASSACHUSETTS MARITIME ACADEMY SPRING 2025

INSTRUCTOR: LCDR. WILLIAM HIBBARD

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OFFICE HOURS:
MONDAY 0900-0950 ; WEDNESDAY 0900-0950 ; FRIDAY 0900-0950 or By Appointment.

CREDITS: 2.5 TOTAL INCLUDING LAB

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*

PRE REQUISITE: ENGINEERING PHYSICS III (SM-3125)

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 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 allowed 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 period. Attendance will be taken at the beginning of each class for both lab and lecture.

Students will be *rewarded* for perfect attendance. For a perfect attendance record, the lowest quiz grade will be dropped.
Students will be *penalized* for an unexcused absence. Please inform me before the start of class (either by voicemail, email, or in-person) that you will be unable to attend class and the reason. If no prior notice is given by that student, the absence will be considered "unexcused" and there will be a 2 point deduction from his or her final grade for each unexcused absence.

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.

Absences that are given prior notice will not be penalized, but the student will not be allowed to drop his or her lowest quiz grade at the end of the semester. If the absent student is on a MMA sanctioned activity that includes an athletics event, MMA school-sponsored event, or USCG / MSL license exam, AND has discussed this prior to the absence with the instructor, he or she may still be eligible for perfect attendance.

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 POLICY:
A separate lab policy is included for this course. You may obtain and review this policy in the "Syllabus" section of your Refrigeration Lab Blackboard (EN-3213L). Please note that refrigeration lab is integral with this course, and a portion of your overall course score is comprised of your performance in refrigeration lab.

LAB ATTIRE:
Uniform of the day will be permitted in the lab, although it is recommended to wear your issued boiler suit. 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 refrigeration 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. Students are expected to participate in class discussions, and ask questions pertinent to the subject material. All homework assignments are to be submitted via the Blackboard LMS (Learning Management System). Emailed homework submissions will not be accepted. Late homework submissions will be given partial (50%) credit up to one week late. Homework assignments more than one week tardy will not be accepted.

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 ADA Coordinator Dr. Elaine Craghead ecraghead@maritime.edu ; Office: ABSIC 320 Tel: x5120 (Karen Nahigian) or email ADAcompliance@maritime.edu

*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	15. Evaporators
2. Refrigeration Fundamentals	16. Pressure Switches and Thermostats
3. Gas Laws, P-T Charts, & Vapor Compression Systems	17. Regulations
4. Refrigeration System Design Calculations	18. System Troubleshooting
5. Refrigeration System Design Calculations	19. Low pressure systems & Chillers
6. Commercial Refrigeration Components	20. Heat Pumps
7. Properties of Refrigerants Part 1	21. Introduction to Psychrometrics
8. Properties of Refrigerants Part 2	22. Psychrometrics and Air Conditioning (HVAC)
9. Refrigerant System Lubrication	23. Introduction to Air Conditioning
10. Refrigerant Recovery	24. HVAC Configurations
11. Compressors	25. Containerized Refrigeration
12. Capacity Control	26. Final Review
13. Flow Control Devices	
14. Condensers	

EPA 608 CERTIFICATION:

This test for certification for the handling and disposal of refrigerants is made available to all students enrolled in the course. The test is not mandatory, although incentive is given to attempt and successfully pass this exam. This exam currently consists of 4 modules: Core, TYPE I, TYPE II, and TYPE III. The "Core" module must be passed to receive any certification. Passing all four modules and obtaining a "Universal" certification earns a student 10 additional points to his or her final grade. Passing 3 of 4 modules earns a student 5 additional points to his or her final grade. Passing 2 of 4 modules earns a student 2 additional points to his or her final grade. The exam must be administered by a certified EPA 608 proctor, and can be taken in various formats (paper exam, online, smartphone app, etc.). Proof of certification must be presented to the instructor no later than the beginning of the final exam in order to receive additional points for the final grade. Additional points are applied to a student's grade at the end of the semester and are only applied if the student is receiving a grade of 70 or above for the course. Points awarded for passing the EPA 608 exam cannot raise a students grade from below a 70.

FINAL EXAM:

A final exam is given during finals week at the end of the semester. Students must take the final exam at the scheduled time provided by the registrar. This scheduled exam time is not negotiable and will not be offered at an alternate time in order to facilitate the convenience of the student. However, if the final exam is missed for any reason, the student will be allowed to make up the final exam in the first week of the following semester. The student will be given an "I" for incomplete in the course until the exam is made up and the final grade recorded. This will replace the "I" for incomplete. If the exam is not made up in the first week of the following semester, a 1 point deduction will be assessed for each day following until the exam is completed. After a period of 6 months past the initial end of semester, any incomplete grade will automatically revert to an "F".

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%**

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+:** 77-79.9
A-: 90-94.9	**C:** 73-76.9
B+: 87-89.9	**C-:** 70-72.9
B: 83-86.9	**F:** < 70
B-: 80-82.9	

IN THE EVENT OF A TRANSITION TO ONLINE LEARNING DUE TO COVID-19 OR OTHER SCENARIO:

In the event of a transition to online learning, the following format shall be utilized in place of in-person learning:

- Students should be prepared for a transition to online learning. This means that the cadet should have access to a computer with internet capability and have access to the internet. If the student does not feel that they are prepared at the beginning of the semester for the online semester, they should contact the instructor immediately.
- Pre-Recorded video lectures will accompany PowerPoint Class slides posted to Blackboard. The format of the video lecture will be Panopto, which shall be embedded in Blackboard course content. These interactive video lectures shall be tracked for course completion and credit complete attendance for the course. There will be multiple short quizzes inserted in the Panopto video lectures to encourage retention. Full 100% completion of the Panopto video lectures is required for credit.

- Scheduled classes will be held virtually in a synchronous format, during scheduled class time, using the ZOOM video platform. These Zoom forums will not be mandatory, but will give the students an opportunity to interact with the instructor, ask questions, practice problems, and support the posted course content. All ZOOM videos will be recorded and posted in Blackboard content for review by all students
- All quizzes and tests will be administered via Blackboard. Students will be able to review test and quiz questions on Blackboard after the quiz has been completed. There will only be one (1) attempt offered to student to take a particular quiz or test, and the quiz must be taken within the specified time frame in order to avoid at 10% reduction in grade for every calendar day the test remains incomplete past the due date.
- Homework assignments will be administered and uploaded to Blackboard. Submissions should be in the following formats only: .mp4, .jpeg, .pdf, or .doc files. Other formats, including MAC OS formats, must be resubmitted in the aforementioned formats.
- Grading format will not change in a transition to online learning. Grading format can be traced in the Blackboard Grade Center.
- Office hours will remain the same, performed virtually, by appointment only for up to 3 hours per week.

ACADEMIC DISHONESTY – PLAGIARISM:

Plagiarism: According to the *Oxford English Dictionary* means, "to take and use as one's own." In academia this means taking and using the writing, ideas or work of another person and passing it in as your own work.

Some of the most common forms of plagiarism are:

- Buying a paper from a research service or paper mill
- Turning in a paper or excerpts from a "free term paper" web site
- Cutting and pasting sentences and/or paragraphs from web sites
- Turning in another student's work as your own with or without the student's knowledge
- Turning in work that another student, friend, family member, etc. has written for you
- Copying directly from a source (book, magazine, Internet, etc.) without using quotations marks and giving credit to the author
- Copying directly from a source without using quotation marks and changing a few words. This does not make the work your own. Example: Changing the original word "asked" to "questioned"
- Paraphrasing or summarizing (putting someone else's words, ideas or work into your own words) without giving credit to the source
- Using any parts or all of a PONY (pass on to next year) file (including graphs, tables, etc.)

Avoiding Plagiarism: The main way to avoid plagiarism is to give credit to the sources you have used. You can do so by quoting directly, summarizing or paraphrasing. **In ALL cases, you must give credit to the author and/or source.** Depending on the assignment you are given, this may include a bibliography or works cited page. Always check with your instructor or professor to find out how this should be done in the particular discipline.

If you are not sure if you are plagiarizing from an outside source, you can always check with one of the Humanities professors regardless of the course in which the assignment is due. We are always willing to help students with any and all writing problems or concerns for any course, not just those in the Humanities Department. You may also go to the Writing Resource Center or the Academic Resource Center for help.

REMEMBER: ANY STUDENT COMMITTING AN ACT OF PLAGIARISM WILL FACE CONSEQUENCES SUCH AS FAILING THE PROJECT OR THE COURSE. IN ADDITION, YOU MAY BE REPORTED TO THE ACADEMIC DEAN FOR FURTHER ACTION AND POSSIBLE SUSPENSION OR EXPULSION FROM THE SCHOOL.