

Massachusetts Maritime Academy – Department of Marine Engineering
Strengths of Materials Lab EN-3112L
Spring 2025

Instructor: Joe Riordan

Office: Room 215A Harrington

E-Mail: jriordan@maritime.edu

Office Hours: Monday, 0800-1000, Wednesday, 1200-1400, Thursday 0800-1000, or by appointment

Requisites:

Strength of Materials - Must be taken either prior to or at the same time as this course.

Entrance Requirements

- Demonstrate safe practices in laboratory environments.

Texts:

NA

Caution:

- No food or drink is allowed in the classroom except bottled water.

Course Description:

This is the lab for Strength of Materials. This lab reinforces the basic concepts of normal stress, shear stress, torsion, beam bending and deflection, and beam design as taught in the Strength of Materials course. Formal engineering reports are required with emphasis on writing and spreadsheet skills.

Attendance:

- Attendance is mandatory for all labs

Dress Code:

All regimental cadets are required to be in the uniform of the day. Boiler suits are permitted; however, they must be clean and with no holes. If you are not in the proper uniform, you will be asked to leave, which will count as an absence.

Food & Drink:

No food and drink except water are allowed in the classroom.

Honesty:

Students are expected to be honest and forthright in their academic endeavors. Academic dishonesty includes cheating, inventing false information or citations, plagiarism, computer tampering, destroying other people's studio property, or academic misconduct. Plagiarism and cheating are not permitted. Students caught cheating will receive a zero for the assignment and may receive a failing grade for the entire course.

Use of AI Tools:

This course requires you to complete various assignments that assess your understanding and application of the course content. You are expected to do your own work and cite any sources you use correctly. You cannot use any artificial intelligence (AI) tools, such as chatbots, text generators, paraphrasers, summarizers, or solvers, to complete any part of your assignments. Using AI tools is considered academic dishonesty and will result in a zero grade for the assignment and possible disciplinary action. If you have any questions about the acceptable use of AI tools, please consult the instructor before submitting your work.

Class Policy:

Respect for your classmates and the instructor is paramount. You may be dismissed from class for any behaviors considered as distractions, including, but not limited to:

- Arriving late to class or leaving the classroom without permission from the instructor
- Performing a repetitive act that is annoying or loud or having prolonged side conversations
- Providing inappropriate comments to the instructor or classmates
- Not turning off or muting your cellphone may cause phone rings, beeps, vibrations, etc.
- Sleeping, reading a newspaper, browsing social media, or using your phone for anything (including text messaging) at any time during class

The instructor initially, either generally or individually, as part of the instructor's classroom management efforts will address any distracting behavior. Cases in which such annoying behavior becomes excessive and the student refuses to respond to the faculty member's efforts will be referred to the registrar, academic advisor, Department Chair, and maybe to the Academic Dean, and you may be dismissed from class – even if it is during an exam.

Blackboard:

Blackboard will enhance the overall course content. It will be used to upload Lab content. You are responsible for checking your Blackboard for material and ensuring you can log in.

Homework:

Homework is only assigned if lab reports are not completed during the Lab. In that case lab reports are due by midnight the day of the lab.

Quizzes:

NA

Disability Accommodation:

Massachusetts Maritime Academy is committed to providing academic accommodations to students who qualify. Students with an IEP or 504 Plan in high school or others who believe they may need and qualify for accommodations in this class are encouraged to contact Dr. S. Elaine Craghead, Assistant Dean and Academic Accessibility Services Coordinator, ideally within the first two weeks of class. Please remember that academic accommodations are not retroactive. Dr. Craghead can be contacted at ADAcompliance@maritime.edu or x5350.

Mental Health:

If you feel overwhelmed or worried about a friend, don't hesitate to contact me or your academic advisor. We can try to help or put you in touch with someone who can. Mass Maritime Academy has trained counselors who are available to listen and help.

Academic Integrity, Academic Freedom, and Building Trust in the Classroom:

This commitment to building respect and trust in the classroom means members of this class will not record, photograph, or share any interactions involving classmates or any teaching team member online. Students will also respect the instructor's intellectual property rights. They will not share or otherwise make accessible any course materials to anyone not enrolled in the course without the instructor's written permission.

This policy is not meant to restrict students' ability to use classroom recordings in ways that are beneficial to their learning. Students who may benefit from recorded lectures and lecture playback, including those who use English as an additional language or who have accommodations from SDS, should speak to the instructor to maintain transparency and trust in the classroom. Students approved to record lectures are expected to respect and preserve the privacy of the learning environment, as stated above. Students will also not enable anyone not enrolled in the course to participate in any activity that is associated with the course.

Exceptions to this require the instructor's written permission.

Circulating Class Materials:

All course materials are copyrighted, and it is prohibited to circulate or sell to commercial vendors the course materials, including syllabus, exams, lecture notes, images, presentations, and student papers. Such unauthorized behavior constitutes academic misconduct. Video and/or audio recording of class lectures and review sessions without my permission in advance is prohibited. If you have an accommodation letter from Student Disability Services, please make an appointment to meet during office hours before you record anything.

Lab Report Assignments:

Lab Report assignments will be posted on Blackboard at the beginning of each week.

Labs:

Week 1: MICROSOFT EXCEL Review:

Week 2: Ultimate Shear Stress -Excel

Week 3: Ultimate Tensile Stress by Extensometer

Week 4: Izod and Charpy Impact-Excel

Week 5: Poisson's Ratio Only-MEMO

Week 6: Torsion-Tinius Olsen

Week 7: Bending Stress on a prismatic beam -ANY LOAD- Excel

Week 8: Stress Concentration-MEMO

Week 9: Principal Stresses - Excel

Week 10: Equation of the Elastic Curve-2 loads Excel-BB Student Learning Outcomes:

Success in this course will be measured by examining and applying your understanding of the installation, operation, and maintenance of Auxiliary equipment and systems in the Marine Engineering field. Weekly quizzes will be used to measure the learning objectives. Homework will also be given to ensure students meet all learning objectives within this course.

STCW Learning Objectives:

Demonstrate knowledge and understanding of the following STCW elements:

- **AB-E-A5.1** Basic knowledge of the function of auxiliary machinery
- **AB-E-A5.1** Basic knowledge of the operation of auxiliary machinery
- **AB-E-A6.1** Knowledge of oil transfer operations
- **AB-E-A6.1** Preparations for fuelling and transfer operations
- **AB-E-A6.1** Procedures for connecting and disconnecting fuelling and transfer hoses
- **AB-E-A6.1** Procedures relating to incidents that may arise during fuelling or transferring operation
- **AB-E-A6.1** Procedures for securing from fuelling and transfer operations
- **AB-E-A8.1** Safe operation of valves and pumps
- **AB-E-B1.1** Ability to use lubrication materials and equipment
- **OICEW-A4.1** Basic construction and operation principles of pumps
- **OICEW-A4.1** Basic construction and operation principles of heat exchanges
- **OICEW-A5.2** Operation of pumping systems
- **OICEW-A5.2** Routine pumping operations
- **OICEW-C1.7** Use of various types of sealants and packing
- **OICEW-C2.2** Appropriate basic mechanical knowledge and skills
- **OICEW-C2.5** Design characteristics and selection of materials in the construction of equipment
- **OICEW-C2.6** Interpretation of machinery drawings and handbooks

Learning Objectives:

After this course, the student should be able to:

- Interpret machinery drawings and handbooks
- Interpret piping, hydraulic, and pneumatic diagrams
- Safely operate pumps, valves, and pumping systems

- Conduct routine pumping operations
- Discuss the construction and operational principles of pumps, valves, and heat exchangers
- Discuss the methods of measurement of temperature, pressure, level, and flow
- Perform basic calculations and unit conversions involving system parameters
- Demonstrate basic mechanical knowledge and skill in a workshop environment

The course supports the achievement of the following ABET objectives:

- An ability to apply knowledge of mathematics, science, and engineering
- An ability to identify, formulate, and solve engineering problems
- An ability to communicate effectively

Demonstrate proficiency in the following skills:

ABE-1-6A Assist with fuel oil transfer
 OICEW-8E2A Make emergency repairs
 RFPEW-1H2C Shift and clean a basket-type duplex strainer

Other Objectives:

- Calculate the dimensions of a section of pipe or tubing
- Explain the construction techniques and materials used in a section of pipe or tube
- Identify all pipe fittings used in a fluid piping system
- Describe the types and purpose of various flange connections used in a high-pressure fluid piping system
- Identify the different types of expansion joints used in a liquid piping system
- Discuss the various operational problems associated with fluid piping systems
- Identify the multiple materials used in packing and gasket sealing systems
- Calculate the size of moving shaft packing sizes
- Discuss the importance of the "Lock out-Tag out" safety procedure
- Explain the various methods of renewing fixed gasket joints and the safety concerns involved
- Calculate pressure readings in both the gage and absolute scales
- Calculate pressure readings based on the height of various liquids
- Identify the different pressure-measuring devices
- Calculate temperature readings in both Fahrenheit and Celsius scales
- Discuss the difference between thermometers and pyrometers
- Describe the methods of liquid level measurements. Deep or Ullage soundings
- Identify the various types of valves used in a fluid piping system.
- Demonstrate the use of piping symbols on the system drawings to identify these valve
- Discuss the construction differences in valves used in low- and high-pressure piping systems
- Discuss the troubleshooting of problems associated with valves
- Describe the operation of a spring-loaded pressure-regulating valve
- Demonstrate knowledge of the purpose of the essential parts of a spring-loaded pressure-reducing valve
- Discuss operational problems associated with the failure of various parts of a spring-loaded pressure-reducing valve
- Describe the use of diaphragm control valves in a pneumatic piping system
- Describe the operation of a pneumatically operated pressure-regulating valve
- Discuss the features of a diaphragm control valve regarding whether it is "Fails-Open or Fails Closed."

Student/Instructor Responsibilities:

Instructor will:

- Arrive on time, prepared for class
- Maintain student hours
- Treat students with respect
- Grade all quizzes promptly
- Inform students of any changes to the syllabus

Students will:

- Check email and Blackboard daily
- Arrive on time for class, prepared
- Treat all classmates with respect
- Reach out to the instructor with concerns or questions

Note:

This syllabus is subject to change. Students will be notified if anything changes in the syllabus throughout the course.