

ELab (EN-3212L)

Electronics Laboratory - SPRING 2025

This laboratory supports the Electronics course ECI (EN-3212). Participants learn to use electronic instruments by taking measurements on analog & digital circuits constructed during lab. The measurement data are then used to verify the analytical relationships developed in the classroom. Additional ELabs involve PLC programming and operation.

Text: **ELab Handouts are given out in each Lab session.**

ELabs use material from the ECI Course Text:

Process Control Instrumentation Technology

Curtis D. Johnson

8th Edition (copyright 2006), Pearson/Prentice Hall

Lab Instructor:

Dr. John J. Bausch

Email: jbausch@maritime.edu

Phone: (508) 830-5278

Room: HA 222A

ELABs: **TUESDAY & WEDNESDAY Afternoons:**

Section-x26 = TUESday @14:00-15:40 (7th&8th Period)

Report to Lab as scheduled.

There are **NO MAKE-UP Labs!!!**

ALL Lab Sections will **MEET EVERY WEEK.**

BR 222; the ECS Lab-Electronics & Control Systems

Grading: Grades are based on the Team Lab Report (using your data & results in your **LAB NOTEBOOK**), a Team Project, and on **INDIVIDUAL** lab participation. Lab participation is based on attendance and observed work. Assignments and updates are also made via email. **Late work will NOT be accepted without prior clearance. NO FOOD or DRINK in ELab!!**

Evaluation: Cadets are expected to participate in **each lab** as part of a team.

Lab NOTE Book (10 HW Labs; ONE Notebook per Team)	50%
Lab Report (only 1 Cumulative Report per Team)	20%
ECI Emerging Technology Project (Labs 1 & 6 Presentation)	30%
Total Grade	100%

ELab Syllabus & Outcomes

Lab1: Introduction to ECI, and the Applications & Trends in Marine & Power Systems

Introduce the ELab topics, and organize students into lab teams.

Learn and evaluate electronic information search methods and library resources.

Develop teamwork and communication skills.

Lab2 & Lab3: Electronics Measurement Hardware and Analog Signal Processing

Introduce and operate basic lab measurement and power supply equipment.

Build and test basic breadboard circuits.

Present the topic selected for the team application project.

Lab4, Lab5 & Lab7: Passive Electronic Circuits and Signal Converters

Read and understand circuit diagrams using passive, analog electronic components.

Build and test breadboard circuits including:

1) voltage dividers, 2) wheatstone bridges, and 3) a variety of passive filters.

Calibrate and plot fundamental, physical relationships between inputs and outputs (I/O).

Lab6: Emerging Applications & Trends in Marine & Power Systems: Student Presentations

Research the emerging technologies in the Marine and Power industries.

Understand relevant applications of Electronics and Computer-integration.

Develop technical writing, communication and presentation skills.

Evaluate performance in peer-to-peer comparisons.

Lab8 & Lab9: Active Electronic Circuits and Signal Converters

Understand the operation and wiring of a 741 operational amplifier (op-amp).

Read and understand circuit diagrams using active, analog & digital components.

Build and test breadboard circuits including:

1) amplifiers, 2) isolators, and 3) a variety of active filters.

Calibrate and plot fundamental, physical relationships between inputs and outputs (I/O).

Lab10, Lab11 & Lab12: Ladder Logic Circuits & Digital PLC's

Understand the operation and wiring of multi-contact, electro-magnetic relays

Read and understand ladder logic circuit diagrams for discrete-state control.

Build and test breadboard circuits including a variety of components including NC & NO pushbuttons, and LED's in an ON/OFF controller application.

Test and evaluate basic transistor switching circuits.

Learn and implement PLC Ladder programming on a personal computer.

Program and implement a Ladder Logic controller application with a TECO PLC unit.