ECE 395-001: Microprocessor Laboratory, (0-4-2)
Fall 2025

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Office hours: Thursday 1:00–3:30 PM (email for location). Available other days by appointment.

Class Meeting times: Friday 1:00-05:20 PM, FMH 204A

Description: In this laboratory the students are expected to learn to apply their theoretical knowledge of both the hardware and software aspects of microprocessors. To attain this objective the students are required to construct a microprocessor based single board computer (SBC), with adequate interfacing capabilities to be able to perform some useful control tasks. Programming of the device is done in assembly and C language. Some of the experiments that follow the construction project deal with software while others deal with the problems of interfacing of microprocessors.

Prerequisites or Corequisites: Electrical & Computer Engineering 252 (Undergraduate) and Electrical & Computer Engineering 291 (Undergraduate)

Educational objectives for the course:
Familiarizing the students with the microprocessor board Hifive1 Rev B. Students deal with C, C++, and assembly languages.

Tentative Course Schedule and Topics:

Week	Lab	Topic
1, 2	1	Microprocessor Operation
3,4	2	General Purpose Inputs and Outputs
5	3	Annunciator (GPIO Application)
6	4	UART Serial Port
7, 8	5	Simple Calculator (UART Application)
9	6	Extending the Calculator
10	6	Advanced Calculator Features
11	7	Software PWM and Servo Control
12	7	Delay in microseconds
13	8	Hardware PWM
14	9	Project demo
exam		exam

Lab 1 – Microprocessor Operation
Create a PlatformIO project, write, assemble, and debug code
Observe and document microprocessor core operation

Lab 2 – General Purpose Inputs and Outputs
Configure MCU internal peripherals
Operate GPIO pins

Lab 3 – Annunciator (GPIO Application)
Apply knowledge from Lab 2 in a real-world application

Lab 4 – UART Serial Port
Set up and operate MCU serial ports
Create serial port initialization and communication functions

Lab 5 – Simple Calculator (UART Application)
Use serial port

Lab 6 – Advanced Calculator Features
Extend Lab 5 by adding backspace handling, memory functions (M+, M-, MR, MC), modulus and factorial operations, chained expressions, and prime checks
Demonstrate all features over UART using Tera Term

Lab 7 – PWM and Servo Control
Generate PWM signals using software delays to control servo motor angles via GPIO
Fix or modify the delayMicroseconds() function for accurate pulse widths
Use the onboard red LED for timing diagnostics.

Lab 8 – UART Communication with Wi-Fi for Data Logging
Connect the HiFive to Wi-Fi via UART commands, and transmit digital sensor data to an external website.

Lab 9 – Servo Control with PWM Hardware
Use FE310's hardware PWM peripherals to control a servo motor with precise timing
Configure PWM registers, set frequency and duty cycle to match servo requirement.

Project demonstration
Final Exam

Grading Policy:

Labs:	40% (group)
Project:	30% (group)
Final Exam:	30% (individual)

Notes:

- All lab reports must be submitted on Canvas. Due dates are listed in the Canvas calendar.
- Individual effort will be considered in grading of all items. Teamwork is vital to success.
- Attendance and Group Grading Policy: Students within the same group may receive different grades if:
    - Effort contributions vary significantly
    - Absences or chronic tardiness are an issue (without valid justification)
- Each student starts with a 100% attendance grade, which will decrease with unexcused absences or repeated late arrivals. Lab attendance is essential for task explanations. Once lab tasks are completed, students may leave early.
- This syllabus is tentative and subject to change at the instructor's discretion. Any updates will be communicated via Canvas and in class

Academic Integrity:

Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at: http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf.

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. **Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university.** *If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at* dos@njit.edu.