

**ECE-395: Microprocessor Lab** (2 credits, 3.75 hours, required course)

**Instructor:** David Harrison; **email:** [djh7970@njit.edu](mailto:djh7970@njit.edu); **office hours:** by appointment

**Course Materials:**

ECE-395 Lab Manual: The course lab manual is available on the course web page. The manual describes the hardware used in the course, highlights the key features of the processor that are relevant to the course and outlines the required experiments.

Course Web Page: <http://web.njit.edu/~jhu/ece395/index.html>

**Course Description:** In this laboratory, students get the opportunity to apply the theoretical knowledge they acquired in their previous microprocessor courses to real hardware and software. The course uses a Coldfire (68k based) microcontroller demo board as a development platform and commercial development tools so students can experience modern design techniques. Some of the labs focus strictly on software while others deal with the problems of operating and interfacing microprocessor hardware. The students write code in assembly language to develop a strong understanding of microprocessor fundamental operations.

**Prerequisites:** ECE 291, ECE 252

**Specific Course Learning Outcomes (CLO):** The students are able to

1. understand and apply the fundamentals of assembly level programming of microprocessors;
2. work with standard microprocessor interfaces including GPIO, serial ports, digital-to-analog converters and analog-to-digital converters;
3. troubleshoot interactions between software and hardware;
4. analyze abstract problems and apply a combination of hardware and software to address the problem;
5. use standard test and measurement equipment to evaluate digital interfaces.

**Relevant Student Outcomes:**

- (1) an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics (1,2,3,4,5)
- (6) an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions (3, 4, 5)

**Experiments:**

**Exp. 1 – Get Acquainted with the Project Kit (No lab report)**

- Learn to operate board used in the class
- Learn to assemble and execute code

**Exp. 2 – Developing Software for the SBC (No lab report)**

- Part 1: Find 'X' program
- Part 2: Move a string in RAM program
- Part 3: Adding numbers entered from the keyboard

**Exp. 3 – An Event Driven Annunciator System (Lab report required for 3-person group)**

- Demonstrate annunciator state machine program specified by lab manual

**Exp. 4 – Testing and Simulating Some IC’s (No lab report)**

Part 1: Quad logic gate (NAND, AND, OR) chip tester

Part 2: Simulation of D and JK flip-flop in software

**Exp. 5 – Testing the Serial Port (Lab report required)**

- Clock Tolerance for the UART
- Observation of the Serial Waveform

**Exp. 6 – DAC (Digital to Analog Converter) Interface with the Microprocessor (Lab report required)**

**Exp. 7 – ADC (Analog to Digital Converter) with Accelerometer (Replaces lab 7 in manual)**

**Lab Reports:**

Lab reports are required for certain labs as indicated. Each lab report should have a primary author that is responsible for writing the report for the entire group. Each group partner is responsible for one report in the semester. The grade given for the report will count toward the primary author’s grade.

**Grading Policy:**

Exp. 1 – 0 points

Exp. 2 – 10 points

Exp. 3 – 10 points

Exp. 4 – 15 points

Exp. 5 – 10 points

Exp. 6 – 15 points

Exp. 7 – 10 points

Lab reports – 20 points (individual component based on reports primary author)

Attendance – 10 points

Total – 100 points

**Honor Code:** The NJIT Honor Code will be upheld, and any violations will be brought to the immediate attention of the Dean of Students.

As this is a group lab, collaborating (sharing code, results, etc.) within your own group is expected. Using the work of others (e.g.. another group or person in or out of this class) is not acceptable and is a direct violation of the honor code.