OBJECTIVES

- Understand what is expected of you in this course.
- Become introduced to your (Undergraduate) Peer Instructor (UPI or PI).
- Construct the relevant lab kit.

INTRODUCTION

Welcome to EEL3744C (otherwise known as 3744)! In this course, a vast amount of fundamental microprocessor and microcontroller application concepts will be explored. Just as in any other course, the amount of knowledge received will be very positively correlated with the amount of effort put into learning the material. However, unlike most other courses, it is likely that 3744 shall prove to be challenging for all that are enrolled.

In general, this course is lab-driven. Primarily, course lectures will aim to provide a broad understanding of general concepts pertaining to a wide variety of microprocessors and microcontrollers, rather than provide specific details related to the lab material. It is therefore the intention that labs will require students to explore material beyond what is discussed in lecture, just as you will be expected to accomplish when you are a practicing engineer/computer scientist. With an appropriate understanding of the above, along with motivation and consistent effort, most any individual can succeed in this course, as well as gain superpowers in the realm of microprocessor applications during the process.

LAB STRUCTURE

In this first lab, you will become familiar with what is expected of you, as well as begin to construct your lab kit. Before attending your assigned lab session, you will explore, understand, and agree to all lab rules and policies. Then, within the lab, you will become formally introduced to your Undergraduate Peer Instructor(s), the individual(s) responsible for hosting your lab session. Beyond introductions, your Peer Instructor will identify if anything additional is expected of you throughout the semester, as well as administer your first lab quiz. Finally, you will begin to construct your lab kit for the semester by soldering and assembling several printed circuit boards (PCBs).

REQUIRED MATERIALS

- Lab Rules & Policies
- Out of the Box (OOTB) µPAD 2.X Assembly Guide
- Hardware Assembly Video Tutorial
- µPAD v2.0 Parts List (Excel or PDF)
- Electronic Assembly Technique Handout
- Pre-lab Report Submission Template (Word or PDF)

SUPPLEMENTAL MATERIALS

- Toolbox, multimeter, Digital Analog Discovery (DAD) kit with WaveForms software (all from 3701)

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1 During rare semesters, more than one Undergraduate Peer Instructor may be assigned to a single lab section.
2 You may see or hear the term Peer Instructor, PI, or UPI (an abbreviation for Undergraduate Peer Instructor).
3 In general, although Dr. Schwartz gives the parameters, the PIs have discretion on the contents of a quiz.
PRE-LAB PROCEDURE

First and foremost, you must become fully aware of, as well as agree to, the lab rules and policies for this course.

1. Read and understand all items presented within the Lab Rules & Policies document. Additionally, agree to the document by electronically signing and dating it. Submit this document (through Canvas) and attach a screenshot of your completed signature page within your pre-lab report.

PRE-LAB EXERCISES

i. How late can you arrive to lab and still be allowed to take the lab quiz?
ii. In general, when are your pre-lab submissions due on Canvas?
iii. How late can you arrive to lab and still be admitted?
iv. What is the minimum weighted lab average required for you to be eligible to pass the course?
v. Can you drop this lab if you overslept? How about if a project for another class is due?
vi. Describe the lab makeup policy.

vii. In which section of your pre-lab report should the screenshot required above be pasted?
viii. In your pre-lab report, what should be included with every measurement, screenshot, etc.?
ix. Describe the process of taking measurements with a system such as an oscilloscope or logic analyzer. Additionally, include details regarding when precise frequency measurements are of interest.

As mentioned above, during the first lab session, you will begin to solder and assemble a lab kit containing several printed circuit boards. Overall, this lab kit will contain a breakout board, referred to by the term \( \mu \text{PAD} \) (pronounced micro-pad), for an Atmel ATxmega128A1U microcontroller, as well as several accompanying PCBs used to extend the functionality of the microcontroller, called either backpacks or baseboards depending on where they are located with respect to the \( \mu \text{PAD} \). (Backpacks are accompanying PCBs mounted on top of the \( \mu \text{PAD} \) and baseboards are PCBs mounted beneath the \( \mu \text{PAD} \).)

Before constructing the kit in lab, it is first necessary to review how to properly solder an electrical component, as well as understand how the lab kit should be assembled.

NOTE: Prior to the summer semester of 2017, wire wrapping was performed in 3744. Wire wrapping is an alternative to soldering and is used to make an electrical and mechanical connection between two parts by wrapping wires around pins. Wire wrapping is no longer performed in this course as to save students countless hours and frustration. However, later in this course, electrical connections will also be made with a breadboard, as in EEL3701C.

2. Read and understand the Electronic Assembly Handout given on the course website. Prepare to assemble the lab kit by watching the Hardware Assembly Video Tutorial.

PRE-LAB EXERCISES

x. In general, when soldering a wire to a pin, what should the soldering iron touch? What should the soldering iron not touch?

PRE-LAB PROCEDURE SUMMARY

1) Read and understand the Lab Rules & Policies document. Complete the signature page within the document, submit this document to Canvas, and paste a screenshot of the completed signature page within your pre-lab report.
2) Answer all pre-lab exercises.
3) Further prepare for your first lab session by reviewing how to properly solder an electrical component, as well how to assemble the relevant lab kit.
**IN-LAB PROCEDURE**

In your first lab session, you will do several things in preparation for the remainder of the semester. Initially, you will meet your Undergraduate Peer Instructor, the individual in charge of hosting your lab session.

Following this, your UPI will administer your first lab quiz, where, as in general, this quiz will test your understanding of what was explored within the pre-lab procedure (or in subsequent labs, your understanding of material from prior labs).

Then, as an additional resource, your UPI will provide a short demonstration of how to properly solder. For the purposes of this course, when soldering any component with more than two pins, it is required that two pins on opposite corners of the component be connected first before soldering the remainder of the pins. Then, before proceeding with the soldering, verify that the component is appropriately placed. When placing components or when unsure about anything, consult your UPI! Failure to follow any of the above procedure may result in unnecessary errors that cost significant time, money, and lab points.

After this, your UPI will provide you with your lab kit. Upon receiving this kit, you will be required to verify that it contains all the parts listed on the μPAD v2.0 Parts List (Excel or PDF), immediately notifying the UPI if any components are missing.

**NOTE:** Following this lab, you will be responsible for any missing components.

Next, after verifying that you have received all of the required components, you must ask your UPI to either practice soldering on some component available in the lab or ask to begin assembling your kit.

When assembling the kit, regularly refer to the *Out of the Box (OOTB) μPAD 2.0 Assembly Guide*, the *Hardware Assembly Video Tutorial*, or to your PI. You must remain in lab until either you finish the construction of the lab kit or until the lab period ends. If you do not finish the assembly, **you must finish it before your next lab session** (either during lab office hours or at home). Additionally, if you plan to solder any remainder of the kit at home, first verify with either a PI or Dr. Schwartz that your soldering iron and solder are appropriate.

**IN-LAB PROCEDURE SUMMARY**

1) Meet your PI and become familiar with their style of teaching.
2) Take and submit your first lab quiz.
3) Watch your PI perform a demonstration of how to properly solder.
4) Receive your lab kit and verify that all components are accounted for. If any parts are missing, immediately notify your PI.
5) Ask your PI to allow you to either practice soldering on a component available in lab or to begin assembling your lab kit.
6) Continue constructing your lab kit until either it is complete or until the lab period ends.