

# EEL 3744C: MICROPROCESSOR APPLICATIONS

<http://mil.ufl.edu/3744/> [eel3744.slack.com](http://eel3744.slack.com) [UF's Canvas](#)

**INSTRUCTORS** Dr. Eric M. Schwartz MAEC 106 352-392-2541 [ems@ufl.edu](mailto:ems@ufl.edu) Office Hours: Wed: 12:50pm, Fri 1:55pm

**LECTURES** Tues 2<sup>nd</sup> – 3<sup>rd</sup> (8:30am-10:25pm) & Thur 3<sup>rd</sup> (9:35-10:25am) in Zoom  
 Tues 8<sup>th</sup> – 9<sup>th</sup> (3:00pm-4:55pm) & Thur 9<sup>th</sup> (4:05-4:55pm) in Zoom

**LAB CLASSES**  
 (NEB 281)  
 \*PI = Peer  
 Instructor  
 (PI=UPI=Undergrad PI)

Mon			Tues			Wed			Thur			Fri		
Class	Start	PI*	Class	Start	PI	Class	Start	PI	Class	Start	PI	Class	Start	PI
									12120	11:45am		12122	9:35am	
			12088	1:55pm		12090	11:45am		12060	1:55pm		12087	11:45am	
12121	4:05pm		12061	4:05pm		12091	4:05pm		12119	6:15pm		12086	4:05pm	
12062	6:15pm		12123	8:20pm		23350	6:15pm		12089	8:20pm				

## CATALOG DESCRIPTION

Elements of microprocessor-based systems; hardware interfacing and software design for their application. Laboratory.

**COURSE OBJECTIVES** (ABET Design Content 50%) [Lab fee: TBD, was \$165.56]

**Official:** Experience in the elements of microprocessor-based systems, hardware interfacing and software design for their application. Laboratory.

**Actual:** Students learn the functional and technological characteristics of microprocessor structures, memory components, peripheral support devices, and interface logic. Through laboratory experiments and examples, students learn how to integrate and apply microcomputer subsystems and components to common interfacing problems. Although the Atmel ATxmega128A1U microcontroller will serve as the vehicle for exploring these topics, students gain the experience to generalize the concepts to other microprocessors.

## TEXTBOOKS

F. Cady, *Microcontrollers and Microcomputers Principles of Software and Hardware Engineering*, Second Edition, Oxford University Press, New York, NY, 2009, ISBN13: 9780195371611, ISBN10: 0195371615. See <http://tinyurl.com/3744-ufl>.

## REFERENCES

- H. Lam & A. Arroyo, *Fundamentals of Computer Engineering*, Univ. Copy Center, Gainesville, FL 1995.
- Gene H. Miller, *Microcomputer Engineering—2<sup>nd</sup> edition*, Prentice-Hall, New Jersey, 1999.
- J. Peatman, *Design with Microcontrollers*, McGraw Hill, New York, 1988.
- K. Doty, *Fundamental Principles of Microcomputer Architecture*, Matrix Publishers, Inc., Oregon, 1979.

## INSTRUCTOR/PI OFFICE HOURS

You may go to any PI available, not just the one teaching your lab section, as necessary, for help during their [office hours](#). You are encouraged to use e-mail to communicate with the instructors and PIs. PIs will also hold a few help sessions, which will be announced by tweet.

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## LECTURE FORMAT

During this special semester, the course will be entirely synchronous. This means that your lectures and labs will occur at the times specified when you registered. We will utilize [Zoom](#) for our lectures and labs.

## QUIZ/PRACTICAL SCHEDULE

Our quizzes and practicals are administered **in the evenings**. All of our Quizzes, Practicals, and our Final Exam will utilize Honorlock with Zoom.

## Quiz/ Practical/Final Exam Schedule

ITEM	DATE	TIME
Lab 1 Quiz	Mon, 21 Sept	9:20pm
Lab 2 Quiz	Mon, 5 Oct	9:20pm
Lab 3 Quiz	Mon, 12 Oct	9:20pm
Lab 4 Quiz	Mon, 26 Oct	9:20pm
Practical 1	Wed, 28 Oct	8:20pm
Lab 5 Quiz	Mon, 2 Nov	9:20pm
Lab 6 Quiz	Mon, 16 Nov	9:20pm
Lab 7 Quiz	Mon, 23, Nov	9:20pm
Lab 8 Quiz	Wed, 2 Dec	9:20pm
Practical 2	Wed, 9 Dec	8:20pm
Final Exam	Sat, 12 Dec	5:30pm

## HARDWARE PURCHASES

- The *Digilent Analog Discovery 2 (DAD) board* or *National Instruments (NI) Analog Discovery 2 (NAD) board* is required for this course (and many other ECE courses). These boards **may be** available from *Digilent* or *National Instruments* for a reduced price with a student discount; they are also available from [DigiKey](#), [Adafruit](#), and other companies, but without the student discounts. If you are registered for 3744, I can give you info to obtain the device from *Digilent* at the student price while supplies last. According to the UF bookstore's website, they have (or will soon have) the NAD-2 available for \$225; this is mostly relevant if you want to use financial aid.
- You **MUST** have and use your own laptop for this course. If your laptop does not have two USB ports (one for power from your laptop and one for your DAD), then you will need to buy a USB Port Expander (generally, \$7 to \$15). Your UF 3744 lab kit will be (snail)mailed to you prior to your second lab meeting (Lab 1). This kit contains the additional hardware that you will utilize over the course of the semester.
- Because our quizzes, practicals, and final exam will all use Honorlock, you must have a speaker or set of speakers for the computer that you will use for these assignments. Headphones will not be allowed.
- UF 3744 (AVR XMEGA)  $\mu$ PAD 2.0 board kit [required and mailed to you prior to your Lab 1] was designed by *Out of the Box: Electronics and Robotics*, <http://ootbrobotics.com/>. The 3744-board kit is now included in your lab fees. Your parts kit comes with multiple printed circuit boards (PCBs) – the  $\mu$ PAD 2.0,  $\mu$ PAD Memory Base,  $\mu$ PAD Switch and LED Backpack,  $\mu$ PAD Robotics Backpack,  $\mu$ PAD Analog Backpack, and the  $\mu$ PAD EBI Base Board. **You probably cannot buy the kits separately, so please be careful as you design and construct your circuits this semester.**

## SOFTWARE REQUIREMENTS

*Atmel Studio*, an integrated development environment (IDE) for developing and debugging Atmel ARM® Cortex™-M processor-based and Atmel AVR® microcontroller applications (including our XMEGA), will be utilized in our course.

*Quartus* (from Altera) has been now required for *EEL 3701C* and *EEL 4712C*, so many of you already have copies. Quartus is available to download, free of charge, from Altera's website and our website. Whatever version you have from 3701 should be sufficient. Some *EEL 3744C* homework and laboratory assignments will require the drawing or simulation of logic circuits. This program greatly simplifies such assignments. Since Quartus programs will be useful in other *ECE* courses (and *CpE* courses) (*EEL 4712*, *EEL 4713*, *EEL/CEN 3923 - Design 1*, and *EEL 4924/CEN 4914 - Design 2*), we recommended that you obtain a copy if you have not already done so.

## REFERENCE MANUALS (available on our class website)

- [XMEGA AU Manual](#) (Atmel doc8331)
- [XMEGA128A1U Manual](#) (Atmel doc8385)
- [Instruction Set](#) (Atmel doc0856)
- and others

Do **NOT** printout these entire documents. Other documents are available on the class website (<http://mil.ufl.edu/3744/software.html>) and on the Atmel website (<http://www.microchip.com/wwwproducts/en/ATXMEGA128A1U>). During our live testing assignments, the relevant documents will be made available to you.

## CLASS AND EXAM BEHAVIOR

Turn off all cell phones, beepers, laptop sound effects, and other noise making devices before entering our class Zoom. If a noise-making device goes off during class, I reserve the right to lower your course grade. In general, you should mute yourself on Zoom. .

## GRADING POLICY

Grades are periodically posted on the class web site. **It is your responsibility to check your grades regularly** (on both Canvas and our course website) since mistakes often happen when dealing with a large number of students and PIs. **All grades are final one week after posting** (on either Canvas or our course website). After curving quizzes and our final exam as needed, course grades are assigned using the 60 (D), 70 (C), 80 (B), and 90 (A) cuts. [90  $\rightarrow$  100 (A), 86.6  $\rightarrow$  89.9 (A-), 83.3  $\rightarrow$  86.6 (B+), 80  $\rightarrow$  83.3 (B), 76.6  $\rightarrow$  79.9 (B-), 73.3  $\rightarrow$  76.6 (C+), 70  $\rightarrow$  73.3 (C), 66.6  $\rightarrow$  69.9 (C-), 63.3  $\rightarrow$  66.6 (D+), 60  $\rightarrow$  63.3 (D), 56.6  $\rightarrow$  59.9 (D-), and 0 < 56.6 (E)].

Part of your grade on labs, quizzes, exams, etc. is based not only on solving the problem you are presented with, but the manner in which you solve it. For example, there is a difference between two programs that meet the given specifications, but one is an elegant, extensible 20-line solution, while the other is an obfuscated 100-line program that also meets the specifications but would be difficult to extend later. Just as your future employer would value the latter program less than the first, so will I in grading your assignments.

The UF grading policies for assigning grade points can be found on the following undergraduate catalog web page: <https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>.

## COURSE GRADE DETERMINATION

I have found that attendance is directly correlated to grades. I assumed previously that students in 3744 had learned this already, but this is apparently not the case. Therefore, attendance is required, but it will **NOT** be worth positive points. Each missed class for which I take role (which will be done regularly, but sometimes randomly) will result in a deduction of 0.5 point (out of 100) from your overall course total. There are no excuses for missed classes, but three classes can be missed without penalty. (Late arrival or early departure will count as an absence.)

Laboratory*	25%	(Note: All labs are <b>not</b> worth the same amount. Some labs may have <b>extra credit</b> .)
Laboratory Quizzes <sup>#</sup>	45%	
Practical (Quiz) 1	3%	
Practical (Quiz) 2	7%	
Lecture Quizzes <sup>@</sup>	3%	
Homework <sup>†</sup>	2%	
Final Exam	15%	
Total <sup>§</sup>	100%	(90+ on <b>weighted average</b> of Final Exam and Practical 2 results in 5% grade bonus, e.g., 86% ⇒ 91%)

All grades are **non-negotiable one week** after the grade is posted on either Canvas or our website. Please don't come to me after the final grades have been posted with a hard-luck story.

\* A grade of **65%** or better for your weighted lab weighted average is **required** in order to be eligible to obtain a passing grade in the course (i.e., to earn a grade better than E). Your lowest lab grade will be dropped. But use this drop wisely, i.e., do **not** just skip a lab since all labs are important and your next missed lab may be unavoidable. If you need to miss a single lab, it's ok; but you **cannot** make up the missed lab. (You should do this lab on your own. If necessary, you may visit a PI during an office hour for help.) **If you have a valid reason for missing this lab, get documentation for your first missed lab and hold on to it.** If you miss a **second** lab, you must show **Dr. Schwartz** (not a PI) **written documentation for BOTH your first and your second missed labs.** This documentation should be official, i.e., from a doctor, judge, etc., so that a make-up can be arranged. You must notify Dr. Schwartz at least eight days **prior** to your scheduled second missed lab or **as soon as possible after** your second missed lab. **There is no excuse that will allow you to reschedule your first missed lab other than an exam in another course or an officially sanctioned academic event.** You must notify **Dr. Schwartz** at least **8 days** prior to your exam (or other event) so that an alternate lab time might be arranged.

# Your lowest lab quiz will be dropped. Generally, this will occur when you miss the corresponding lab, but this not necessary.

@ During the second half of the semester, we will have a lecture quiz once a week. The intention of this quiz is to verify that you watched the required videos.

† 4 to 10 Homework. Although HW does not count much toward your grade, **not** doing it will likely have an effect on your quiz and exam scores.

§ Attendance is required, but is **NOT** worth positive points. Each missed class results in a deduction from your overall course total. There are no excuses for missed classes, but three classes can be missed without penalty.

## EXTRA CREDIT

Extra credit is sometimes offered during class (or on the web, by slack, or by email). The amount of extra credit given is at the discretion of the faculty member unless specifically stated with the extra credit opportunity.

## EXAM SOLUTIONS, HW SOLUTIONS AND LAB SHELLS

We will post homework, lab, lab program shells and other class material on our class web site at: <http://mil.ufl.edu/3744/>, along with periodic postings of your grades and the class grade book statistics. Previous exams on the course material are also posted on our web site.

## SCANNING SOFTWARE

Some parts of homework, labs, quizzes, exams may require you to scan some of your handwritten work. Both *CamScanner* (<http://www.camscanner.com/user/download>) and *Fast Scanner* (<https://www.coolmobilesolution.com/>) are available for Android Phone and iPhone. Install one, & email a scan to yourself to verify that it works. Unclear scans **will not** be accepted. Unless other specified, when scans are request for a particular assignment, a **single pdf** document should be created and submitted. You also are expected to have access to a digital camera or cell phone camera for taking pictures of various hardware designs that you may construct during the semester. **HOMEWORK GRADING**

You must submit homework is through Canvas by the assigned deadline. Unless other specified (sometimes additional files are requested), a **single pdf** document should be submitted for each homework. You must use the homework template provided on our website. Scans of various parts of the homework are acceptable, but the scans must be incorporated into the single submission document. Homework are generally graded in a cursory fashion, i.e., Zen grading is used. The grades will be entered into the grade book as 0 (no significant effort or not submitted), 1 (half-hearted attempt) or 2 (significant attempt). Some homework assignments are graded more strictly. The final course grades will be assigned with strict cuts between grades, but HW **could** push you above a cut. **Late homework will not be accepted.**

All grades are **non-negotiable one week** after the grade is posted on either Canvas or our website. Please don't come to me after the final grades have been posted with a hard-luck story.

## COURSE REQUIREMENTS

1. Perform all laboratory experiments. A grade of 65% or better for your weighted lab average is **required** in order to be eligible to obtain a passing grade in the course (i.e., to earn a grade better than E). Your lowest lab grade will be dropped; these can be from different labs. But **use this drop wisely**, i.e., do **not** just skip a lab since all labs are important and your next missed lab may be unavoidable. Since there is a quiz on every lab, skipping it will likely cause you to do poorly on the associated quiz. If you need to miss a single lab, it's ok; you **cannot** make up the missed lab. (You should do this lab on your own. If necessary, you may visit a PI during an office hour for help.) **If you have a valid reason for missing this lab, get**

**documentation for your first missed lab and hold on to it.** If you miss a **second** lab, you must show **Dr. Schwartz** (not a PI) **written documentation for BOTH your first and your second missed labs.** This documentation should be official and from a doctor, judge, etc., so that a make-up can be arranged. You must notify the professor **prior** to your scheduled second missed lab or **as soon as possible after** your second missed lab. **There is rarely an excuse that will allow you to reschedule your first missed lab other than an exam in another course or an officially sanctioned academic event.** You must notify **Dr. Schwartz** at least **8 days** prior to your other event so that an alternate lab time might be arranged.

- If you believe that you have valid university-related reason for missing a particular lab (e.g., Lab X), send an email to Dr. Schwartz with the following information (with subject: **3744: Conflict with Lab X**, where X is the lab number).
    - State the cause for missing your Lab X and provide associated documentation for this event.
    - Info about your normally scheduled Lab X: PI's name, Lab X date (day and date) and time, and lab class number (5 digits)
    - Lab X dates (day and date) that you will be **unavailable** for your Lab X.
    - **ALL** of the Lab X dates, periods, and times (day, date, periods, and times) of the lab you will miss for which you **are** available (in order of your preference). Note that I will try to accommodate your preference **AFTER** I try to find a lab with available space.
    - If this is for an exam in another course, **first** verify that there are no alternate exam times available. If none, then provide Dr. Schwartz the course number and name, and also your teacher's name, email, and phone number. Also provide a link or screen shot of the cause of the conflict.
  - Labs **must** be done at scheduled times (except as described above).
  - Students **must** be prepared to demo their lab when they enter. Students will be randomly selected for their demonstration times during their lab period.
  - An average weighted lab grade of **65% or higher** is required to be **eligible** to **pass** the class!
2. Class attendance is mandatory. Roll will be taken by means of a short Canvas quiz. (The quiz is normally very simple material from the prior class or presented previously in the class in which the quiz is administered.) Each missed class when roll is taken will cost 0.5 points (out of 100) from your overall course total. Roll may be taken more than once in class; if you leave and a second roll is taken, this will be interpreted as an honor code violation.
- **No excuses accepted, but three free drops.**
  - **Missed classes and quizzes cannot be made up.**
  - Turn off all cell phones, beepers, laptop sound effects, and other noise making devices **before entering** our classroom. If a noise-making device goes off during class, I reserve the right to **lower your course grade**
  - If you miss the first two classes and do not notify me prior to your second missed class, you will be dropped from the course.
3. Do all homework assignments and turn them in **through Canvas before** the time that they are due.
- **Late homework will not be accepted.**
4. Take all exams as scheduled.
- **No makeup exams will be given except in cases of a medically documented incapacity, family emergency, or course conflict.**
  - If you believe that you have a valid practical, quiz, or exam conflict, please send me the info specified above for a lab conflict (again, at least **8 days** in advance), but with the subject: **3744: Conflict with TYPE X**, where TYPE is the type of assignment (Practical, Quiz, or Exam) and X is the assignment number. Please specify the times of your conflict, the cause of your conflict, and then times immediately before or after the scheduled exam time when you **are available**.

### STUDENTS REQUIRING ACCOMMODATIONS

The University of Florida is committed to providing academic accommodations for students with disabilities. Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, [www.dso.ufl.edu/drc/](http://www.dso.ufl.edu/drc/)) by providing appropriate documentation. See <https://disability.ufl.edu/students/get-started/> to start the process to request academic accommodations. Once registered, a student should present his/her accommodation letter to me supporting a request for accommodations. The University encourages students with disabilities to follow these procedures as early as possible within the semester. For your optimal benefit, you must see the professor **during the first week of classes**.

### UF COUNSELING SERVICES (HEALTH AND WELLNESS)

Resources are available on-campus for students having personal problems or lacking clear career and academic goals. The resources include:

- University Counseling & Wellness Center, <http://www.counseling.ufl.edu>, 3190 Radio Road, (352) 392-1575.
- SHCC mental Health, Student Health Care Center, <http://shcc.ufl.edu/>, Infirmary Building, 1 Fletcher Drive, 392-1161.
- U Matter, We Care, <http://www.umatter.ufl.edu/>, umbrella organization for UF's caring culture and provides students in distress with support.

### U Matter, We Care

- Your well-being is important to the University of Florida. The *U Matter, We Care* initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need.

- If you or a friend is in distress, please contact [umatter@ufl.edu](mailto:umatter@ufl.edu) so that the *U Matter, We Care* Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The *U Matter, We Care* Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center.
- Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.
- **Counseling and Wellness Center:** <http://www.counseling.ufl.edu/cwc> and 392-1575
- **University Police Department:** 392-1111 or 9-1-1 for emergencies.
- **Sexual Discrimination, Harassment, Assault, or Violence:** If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the Office of Title IX Compliance, located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, [title-ix@ufl.edu](mailto:title-ix@ufl.edu)
- **Sexual Assault Recover Services (SARS):** Student Health Care Center, 392-1161
  - Resources for Sexual Violence, <https://umatter.ufl.edu/helping-students/sexual-violence-response/>, Immediate Response/Advocacy 392-5648 or 392-1111; Medical Care from Student Health Care Center, 392-1161
- **University Police Department:** 392-1111 or <http://www.police.ufl.edu> 9-1-1 for emergencies.
- **Career Connections Center:** <https://career.ufl.edu/>, Reitz Union, 392-1601, career development assistance and counseling.
- **University Police Department:** 392-1111 or <http://www.police.ufl.edu> 9-1-1 for emergencies.

#### ACADEMIC RESOURCES

- E-learning technical support, [https://lss.at.ufl.edu/help\\_shtml](https://lss.at.ufl.edu/help_shtml), 392-4357, [Learning-support@ufl.edu](mailto:Learning-support@ufl.edu).
- Career Resource Center, <http://www.crc.ufl.edu/>, 392-1601. Reitz Union. Career development assistance and counseling.
- Library Support, <http://cms.uflib.ufl.edu/ask>.
- Teaching Center, <https://teachingcenter.ufl.edu/>, 392-2010. Broward Hall. General study skills and tutoring.
- Writing Studio, <https://writing.ufl.edu/writing-studio/>, 846-1138, 302 Tigert Hall.
- Ombuds office, <http://www.ombuds.ufl.edu/>. Ombuds office exists to assist students in resolving problems and conflicts

#### COURSE EVALUATION

Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at <https://ufl.bluera.com/ufl/>. Evaluations are typically open during the last two weeks of the semester, but students will be given specific times when they are open. A link to the evaluation will be available on Canvas. Summary results of these assessments are available to students at <https://ufl.bluera.com/ufl/>.

#### SOFTWARE USE

All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

#### REMOTE LECTURES AND EXAMS (ZOOM AND HONORLOCK)

During this special semester, the course will be entirely synchronous. This means that your lectures and labs will occur at the times specified when you registered.

We will utilize [Zoom](#) for our lectures and labs. Your assignments will specified on Canvas, but more information will be available on our website ([www.mil.ufl.edu/3744/](http://www.mil.ufl.edu/3744/)). All homework and lab submissions will be through Canvas. Quizzes, Practicals, and Exams will be administered through Honorlock (and Canvas Quizzes) with Zoom.

Just prior to connecting to [Zoom](#) for our lectures, open Canvas. Sometime during most classes, there will be a Canvas Quiz. This quiz will only be available for 1 minute!

Our lectures will be given live, using [Zoom](#) for interactive communication. UF students can use [Zoom](#) by utilizing their UF login. Honorlock will be used to proctor your Quizzes, Practicals, and Exams this semester. Honorlock is an online proctoring service. Both [Zoom](#) and Honorlock allow students to participate in the course from almost any location, as long as you have a computer a working webcam, and a stable Internet connection. Minimum upload and download bandwidths of 2 Mbps are required for this course. If you don't have this, you must upgrade your internet.

For Honorlock, you do not need to create an account, but will need Google Chrome (available from [www.google.com/chrome/](http://www.google.com/chrome/)). You will also need to download the Honorlock Chrome Extension (from [www.honorlock.com/extension/install](http://www.honorlock.com/extension/install)).

When you are ready to start your quiz, practical, or exam, log into Canvas, go to your course, and click on your appropriate assignment. Click "Launch Proctoring" to begin the Honorlock authentication process, where you will take a picture of yourself, show your ID, and

complete a scan of your room. Honorlock will record your exam session by webcam as well as recording your screen. Honorlock also has an integrity algorithm that can detect search-engine use, so please do not attempt to search for answers, even if it's on a secondary device. There are many more Honorlock rules; these should be investigated BEFORE your relevant Honorlock-monitored assignments.

Honorlock support is available 24/7/365. If you encounter any issues during an quiz or exam, contact them by live chat, which should be available inside Honorlock. If you are kicked out of an Honorlock, you can go to <https://honorlock.com/support/> and select begin live chat. At other times, i.e., not during a monitored assignment, you can send Honorlock an email ([support@honorlock.com](mailto:support@honorlock.com)) or try to reach them by phone (844-243-2500). Zoom chat and/or email Dr. Schwartz if this problem occurs during an Honorlock-monitored assignment.

As part of your Honorlock-monitored assignment, at the end of the timed session, you may be asked to scan some of your exam work. See § SCANNING SOFTWARE for more information.

### TECHNOLOGY

The use of cell phones and **every other** technology device is strictly prohibited during live assignments (labs, quizzes, practicals, or exams). All use of an electronic devices during a live assignment exam will be considered a violation of the student honor code (i.e., cheating). See the *Honesty Policy* section below for the minimum penalties that are incurred for all cases of cheating in our course.

### TWO-STEP AUTHENTICATION BACKUP

You should get a backup for the two-step authentication. See <https://it.ufl.edu/2fa/using2fa/>. There have been students who had cell phone issues just before starting an exam and were unable to participate. You can set up a friend's phone as your backup or find out how to get text's from you cell phone carrier's website. (This second option is very easy to do, and I recommend it strongly!)

### STUDENT PRIVACY

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments.

### COMMUNICAITION

Slack is utilized for course announcements. You are also responsible for getting the slack messages. You are also responsible for regularly checking announcements and course-related postings on the class website, Canvas, and your UF email.

### MULTIMEDIA CLASS/AUDIENCE NOTES

Audience notes are normally posted on the class web site every week or so for the subsequent week or more of classes. The notes consist of pdf versions of the class PowerPoint slides. These notes are not required but are **highly** recommended. Check the class web site for information on exactly when the notes are available. **For optimal performance**, read the notes and examples for a class **before** that class and augment the material with your own notes. My notes are removed shortly after they are covered in class.

Historically, student that take good notes perform much better in this course then those who do not take notes (or take poor notes). Augmenting my notes with your own is strongly encouraged.

### HONESTY POLICY

All students admitted to the University of Florida have signed a statement of academic honesty committing them to be honest in all academic work and understanding that failure to comply with this commitment will result in disciplinary action. The following pledge is required for all work submitted for credit by University of Florida students: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." This statement is a reminder to uphold your obligation as a student at the University of Florida and to be honest in all work submitted and exams taken in this class and all others. UF students are bound also by the **Honor Pledge** which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code." Each quiz, practical, and exam will contain a specific pledge; opening and starting the assignment commits you to honoring that pledge.

**CHEATING WILL NOT BE TOLERATED.** We will actively search for cheaters; we have and will use excellent software to help us in the search. If you are caught, there will be no negotiations. You will earn a course grade penalty (often failure for the course) and get reported to UF's honor court. There are **no excuses and no exceptions**. You may talk to other students about assignments, but the final work **must** be your own. You must also report others (anonymously, if desired) that you suspect are cheating. If you are caught cheating on **any** assignment (homework, lab, or exam, etc.), you **will** be prosecuted. A meeting with the UF honor court, along with the instructor, will determine penalties, none of which are desirable or pleasant (*i.e.*, cheating in this course always results in notification to the honor court, often results in a failing grade in the course, and can possibly result in suspension or expulsion from the university). If you know someone is cheating, **it is your responsibility to report it**. For more information about cheating, the UF Honor code, and the consequences of academic dishonesty, please refer to <https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/>. If you have any questions or concerns, please consult with Dr. Schwartz. The flow chart for an honor code violation is available [here](#). A link to report an academic honesty incident is available [here](#).

## WORKING TOGETHER

You are encouraged to work with other students on assignments in a professional manner. Each person in the group should attempt to solve all problems **independently** and **only** then discuss the results with one's partner(s) to correct errors. Copying your partner's work constitutes cheating and should not be permitted. All solutions should reflect your style of problem solving. You may **not** copy and submit old or new posted solutions as if they were your own.

Although you may **consult** with other students, PIs, or instructors for your assignments, you **must** do independent work. Consulting means **"seeking opinions or advice," not** getting working solutions, programs, or designs, understanding them, and then modifying them to make them your own. The latter constitutes cheating (see above section). Working side-by-side to find solutions, construct a program, or design in a group constitutes cheating. (Solving homework are good practice for solving quizzes and exams, which are also **not** group activities.) **You should note that we have used and will continue to use software that can detect similar submissions.**

Failure to do your own work in lab will likely result in failure in these associated quizzes, practicals, and exams.

## HANDOUTS

Handouts are supplied on-line and can be downloaded from the class web site: <http://mil.ufl.edu/3744/>.

# LABORATORY GUIDELINES

## LABORATORY OBJECTIVES

The purpose of this laboratory is that through the design, development, and demonstration process, you develop skills in both the hardware and software design of microprocessor based applications. The laboratory complements the lectures by providing hands-on experience with microprocessors, peripheral devices, and the required hardware and software development tools.

## LABORATORY RULES & POLICIES

See [www.mil.ufl.edu/3744/admin/Lab\\_Rules\\_&\\_Policies.pdf](http://www.mil.ufl.edu/3744/admin/Lab_Rules_&_Policies.pdf) for important information that you should re-read prior to each lab submission.

## LABORATORY ENTRY

Your PI has the right to either not admit you or kick you out of the lab if you are not prepared, i.e., you have not uploaded the required Canvas submissions (by the specified date and time) and/or have not built the required circuits. You may also be removed from lab if you are uncooperative or disruptive. You must be able to **demonstrate your understanding** of the design that you have created, the code that you submitted, and the lab topics in general. If you are not properly prepared, you will get a zero for the lab and will be asked to leave. You may **not** make-up this lab later. Therefore, **it is imperative that you come to lab prepared!**

## LABORATORY STRUCTURE (NEW THIS SEMESTER)

This semester, we will **NOT** have quizzes during our lab periods. Our lab quizzes will occur in the evening a few days following your lab submission and before most students perform their lab demonstrations.

Also new this semester, lab times will be scheduled by your PI; you will be assigned a 10 minute window for you to perform the required lab demonstrations to your PI during your regularly scheduled lab period. Failure to be ready and on the Zoom at your schedule lab time will result in a grade of zero on that lab. We encourage you to connect to your Zoom at least 5 minutes prior to your scheduled time slot.

## LABORATORY PREPARATION LIST

1. **Structure your program into functional modules and comment the modules as part of the coding.**
  - Each subroutine/function should accomplish just one function. If a subroutine extends beyond 40 instructions, it is probably doing more than one function and should be split into two or more smaller subroutines/functions.
2. **Devise means for testing each subroutine/function separately so that problem isolation (debugging) is easily accomplished.**
  - Simulate your program with the *simulator* or debug it on your board (i.e., *emulate*) **before** coming to Lab. Bring to your lab your **working** assembly code and circuit diagram file (if any) on your laptop. You will **not** be allowed in the Lab without the required submitted documentation.
3. **Arrive at the lab on time to give yourself adequate time.**

## LABORATORY GRADING

**You will not be admitted to the lab without a previously submitted Pre-Lab Report,** as described in the *Lab Rules and Policies*. The *Pre-Lab Report* and other files also **must** be submitted through before the scheduled deadline. Lab files will be accepted up to 24 hours late with a 20% penalty and up to 48 hours late with a 40% penalty.

Each circuit diagram, VHDL file, and assembly language program, and list file must have your name included at the top. **ALL** Quartus simulations should be clearly annotated. Quartus files should be sent in a **Quartus archive file**. Demonstration videos of up to three minutes must also be submitted prior to your lab.

Some labs will count more than other labs. Grading emphasis will be placed upon your producing well documented, well-structured programs and hardware designs that realize the functional requirements specified by the lab handout and the lab instructor. The

## SYLLABUS

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remaining portion of your grade will result from observations by your lab instructor on such matters as your understanding of the lab, your lab techniques, your pre-lab preparation, your lab reports and your cooperation and compliance with the rules. Having your design perform properly does **not** guarantee a grade of 100, but makes a 100 grade **possible**. Lab designs and/or software that are similar and/or identical to other student's work constitute cheating (see above) and result in you failing the course, honor court charges, and possibly expulsion from UF. We have software that will be used to look for plagiarized software. There may be a quiz at the beginning of some labs. If you are late for a lab, you will get a zero for the quiz.

### REMOTE LABS AND ZOOM

Our labs will be done remotely, i.e., you will not be in the same room as your fellow lab students or PI. To administer the labs, we will use Zoom. You must follow rules for all labs:

- You **MUST** have a working web cam and microphone for your labs.
- During lab, you must keep you web cam on as well as show us your work, i.e., Share Screen | Screen.
- No email, messaging, or chats are allowed during your lab (except with your PI).

We may also utilize Zoom during Practical Exams.

### LABORATORY ATTENDANCE

You will **not** officially makeup your dropped lab. You should do this missed lab at home (or, if necessary, during a PI office hour) to be sure you understand the required material.

See the **COURSE REQUIREMENTS** section of this document for information.

### EQUIPMENT REQUIRED

1. UF 3701 toolbox including NAD/DAD and multimeter.
2. In your first lab (lab 0) you will also be given a “bag of goodies,” i.e., parts that you will use during the semester, including the UF 3744 board kit. [Note: During this special semester, you will receive your “bag of goodies” through the mail.]

All grades are **non-negotiable one week** after the grade is posted on either Canvas or our website. Please don't come to me after the final grades have been posted with a hard-luck story.



## EEL 3744 LABORATORY SCHEDULE

Lab	Tentative Lab Topics (Lab on Zoom)
0	Introduction to lab rules, your PI, and course hardware
1	Use Atmel Studio (IDE) to write an assembly program, simulate the program, download the program to the $\mu PAD$ , and emulate the program on the $\mu PAD$ .
2	Delay loops, built-in GPIO Port utilization with LED and switch circuits, XMEGA timer/counter. Use DAD/NAD for timer testing.
3	Timers and external interrupts (w/ timers for debouncing).
4	External Bus Interface (EBI) I/O Port Expansion (for SRAM, input port, and output port w/ expansion PCB). Bus Timing using DAD/NAD as LSA. .
5	UART Asynchronous Serial Communication (SCI) in Assembly w/ interrupts.
6	C programming. Asynchronous Serial Communication in C, Synchronous Serial Communication (SPI) - connected IMU.
7	ADC to sample CdS cell and DAD/NAD waveform. Use ADC and Events to create scope-like device.
8	Utilize DMA with DAC. Output waveforms using DAC. Create music.

**SYLLABUS**

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**EEL 3744 SCHEDULE (Part 1 of 2)**

WEEK/DAY	DATE	Lecture #	Lab due	Lab quiz	Lab demo	Comments
1 M	31-Aug					<b>Classes Begin</b>
1 Tu	1-Sep	1-2				Syllabus, Web tour, Atmel Studio Installation
1 W	2-Sep					
1 Th	3-Sep	3				Intro to uP, XMEGA Architecture;
1 F	4-Sep					<b>Drop/Add Deadline: Fri, 11:59pm</b>
2 M	7-Sep	No class				<b>Holiday: Labor Day</b>
2 Tu	8-Sep	4-5		0 (in class) Honorlock /Zoom For 1 <sup>st</sup> time	0	GCPU review, Assembly examples Demo: Assembly, Simulation, Emulation
2 W	9-Sep				0	Addressing Modes, Instruction Set Demo: Assembly, Simulation, Emulation
2 Th	10-Sep	6			0	GPIO, Ports
2 F	11-Sep				0	
3 M	14-Sep				0	
3 Tu	15-Sep	7-8				Clock, Simplified Timer-Counter
3 W	16-Sep					Program Structures, Data Structures, Stack
3 Th	17-Sep	9				
3 F	18-Sep		1			
4 M	21-Sep			1	1	Hardware and Software Debugging; Include file (BM, BP, GC)
4 Tu	22-Sep	10-11			1	
4 W	23-Sep				1	
4 Th	24-Sep	12			1	
4 F	25-Sep				1	
5 M	28-Sep					Resets & Interrupts; Interrupts for Timer-Counter
5 Tu	29-Sep	13-14				External Interrupts; Timer Interrupts
5 W	30-Sep					
5 Th	1-Oct	15				
5 F	2-Oct		2			
6 M	5-Oct			2	2	Address and Data Bus Timing (EBI)
6 Tu	6-Oct	16-17			2	Interfacing, Interfacing Examples, Address Decoding
6 W	7-Oct				2	Parameter Passing; Keypad
6 Th	8-Oct	18			2	LCD,
6 F	9-Oct		3		2	
7 M	12-Oct			3	3	SCI (Asynch Data Communications)
7 Tu	13-Oct	19-20			3	SPI Subsystem
7 W	14-Oct				3 Fri labs	
7 Th	15-Oct	21			3	Intro to embedded C
7 F	16-Oct	No class			No class	<b>Holiday: Homecoming</b>

## EEL 3744 SCHEDULE (Part 2 of 2)

WEEK/DAY	DATE	Lecture #	Lab due	Lab quiz	Lab demo	Tentative Weekly Topics / Comments
8 M	19-Oct					
8 Tu	20-Oct	22-23				Intro to embedded C
8 W	21-Oct					
8 Th	22-Oct	24				
8 F	23-Oct		4			
9 M	26-Oct			4	4	LCD
9 Tu	27-Oct	25-26			4	D/A and A/D Conversion, A/D Subsystem
9 W	28-Oct				4	<b>PRACTICAL 1:</b> Wed, 28 Oct, ??pm (through Honorlock w/ Zoom)
9 Th	29-Oct	27			4	Lookup Table
9 F	30-Oct		5		4	
10 M	2-Nov			5	5	Events and Direct Memory Access (DMA)
10 Tu	3-Nov	28-29			5	Signal Generation & Output Compare System
10 W	4-Nov				5	Output Compare System and PWM
10 Th	5-Nov	30			5	System Clock
10 F	6-Nov				5	
11 M	9-Nov					Other microprocessors and microcontrollers
11 Tu	10-Nov	31-32				<b>Holiday: Veteran's Day</b>
11 W	11-Nov	No class				
11 Th	12-Nov	33				
11 F	13-Nov		6			
12 M	16-Nov			6	6	Multitasking
12 Tu	17-Nov	34-35			6	Topic: uP 2 and Real-time DSP Applications
12 W	18-Nov				6	
12 Th	19-Nov	36			6	
12 F	20-Nov		7		6	
13 M	23-Nov			7	7	<b>DROP DEADLINE (11:59pm)</b>
13 Tu	24-Nov	37-38			7	TBD
13 W	25-Nov	No class				<b>Holiday: Thanksgiving</b>
13 Th	26-Nov	No class				<b>Holiday: Thanksgiving</b>
13 F	27-Nov	No class				<b>Holiday: Thanksgiving</b>
14 M	30-Nov		8		7	TBD
14 Tu	1-Dec	39-40			7	
14 W	2-Dec			8	7	
14 Th	3-Dec	41			8	
14 F	4-Dec				8	
15 M	7-Dec				8	Advanced microprocessor applications
15 Tu	8-Dec	42-43			8	<b>PRACTICAL 2:</b> Wed, 9 Dec, ??pm (through Honorlock w/ Zoom)
15 W	9-Dec	Classes End			8	
15 Th	10-Dec					
15 F	11-Dec					Reading Day
	12-Dec					<b>Final Exam</b> (through Honorlock w/ Zoom): <b>Sat, 12 Dec, time TBD</b>