EEL 3744C: MICROPROCESSOR APPLICATIONS

http://mil.ufl.edu/3744/ @eel3744 *UF's Canvas*

INSTRUCTORS Dr. Eric M. Schwartz MAEC 106 392-2541 ems@ufl.edu Office Hours: Wed: 12:50pm, Fri 1:55pm
Assistant Lecturer: Chris Crary & Wesley Piard

LECTURES Tues 2nd-3rd (8:30-10:25am) & Thur 3rd (9:35am-10:25am) in NEB 202
Tues 8th-9th (3:00-4:55pm) & Thur 9th (4:05-4:55pm) in FAB 105

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

Mon			Tues			Wed			Thur			Fri		
Sec/Cl	Start	PI*	Sec/Cl	Start	PI	Sec/Cl	Start	PI	Sec/Cl	Start	PI	Sec/Cl	Start	PI
						183E/ 12383	11:45am	Wes	2284/ 12414	11:45am	Leslye	6957/ 12420	9:35am	Hadrien
			1826/ 12380	1:55pm	Jared	8705/ 12421	1:55pm	Nick Po	1539/ 12347	1:55pm	Nick Po	1825/ 12379	11:45am	Steph
228H/ 12416	4:05pm	Nick Po	1540/ 12348	4:05pm	Leslye	2283/ 12385	4:05pm	John	228G/ 12415	6:15pm	Nick Pa	1823/ 12378	4:05pm	Jared
			1829/ 12381	8:20pm	Kyle	1822/ 12350	6:15pm	Kyle						

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

COURSE OBJECTIVES (ABET Design Content 50%) [Lab fee: $127.21]
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—2nd 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.

OFFICE HOURS
You may go to any PI available (in NEB 281, if available; else NEB 222), 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 (also shown at the above office hours link).

PI Office Hours in NEB 281 (or NEB 222, when NEB 281 is not available)

Name	Wes Piard	Nick Poindexter	John Kearney	Leslye Castillo	Kyle Ditzig
e-mail	wespiard@ufl.edu	npoindexter@ufl.edu	jkearney@ufl.edu	leslye.castillo@ufl.edu	kyle.ditzig@ufl.edu

Name	Stephanie Mackenzie	Hadrien Roy	Jared Holley	Nickolas Pais
e-mail	mackenzie124124@ufl.edu	hadrienroy@ufl.edu	jaredrholley@ufl.edu	npais@ufl.edu

EXAM/PRACTICAL SCHEDULE
Our mid-term exams and practical quizzes are administered in the evenings.

EDIT THIS!!! Exam Schedule

EXAM	DATE	TIME	LOCATION
1	Thur, 26 Sept	8:20pm	
2	**Wed, 16 Oct**	8:20pm	
1**P**	**Thur, 17 Oct**	8:20pm	
3	Mon, 4 Nov	8:20pm	
2**P**	Mon, 25 Nov	8:20pm	
Final	Sat, 7 Dec	???	

HARDWARE PURCHASES

- The *National Instruments (NI) Analog Discovery 2* (**NAD**) *board* **or** *Digilent Analog Discovery 2* (**DAD**) *board* is required for this course (and many other ECE courses). Board ordering information for the NAD can be found at https://tinyurl.com/NAD-UF-f19 (for $189, all inclusive) and the DAD-2 (for $196.90, all inclusive) at https://tinyurl.com/DAD-UF-f19. If you are an EE student, I recommend that you buy the DAD-2 (from Digilent) and also buy the NI Multisim software (for analog circuit design and simulation, but **NOT** used in our course), available from for $39.99 as an add on. According to the UF bookstore's website, they have the NAD-2 available for $225; this is mostly relevant if you want to use financial aid or want it right away.
- You **MUST** have and use your own laptop for this course, since there are no computers available in the 3744 lab. You will be given your UF 3744 board kit in your first lab meeting (Lab 0). This kit contains most of the additional hardware that you will add to your boards over the course of the semester. (You may also need to purchase some additional ICs or other components as the semester progresses.)
- UF 3744 (AVR XMEGA) *µPAD* 2.0 board kit [required and given to you in Lab 0] 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 *µPAD* 2.0, *µPAD* Memory Base, *µPAD* Switch and LED Backpack, *µPAD* Robotics Backpack, *µPAD* Analog Backpack, and the *µPAD* EBI Base Board. **You probably cannot buy the kits separately, so please be careful as you design and construct your circuits this semester.**
- Optional purchases. Used only in Lab 0.
  - Soldering Iron. We will have soldering irons in our lab.
    Weller makes the recognized best soldering irons, e.g., WLC100 is a very good iron available for about $50. A better soldering iron is the *Weller* WES51 (for $90-$120). *Lowes* and *Home Depot* sell soldering irons, but I don't think that the ones in stock are very good. *Home Depot* will sell you a WES51 for about $90, the best price that I could find, by delivering it to the store for your pickup.

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. Selected pages should be printed and brought to class, lab, and exams. 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). I intend to have the relevant pages of the document available later in the semester at a local copy center.

CLASS AND EXAM BEHAVIOR

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 a noise-making device goes off during an exam, your will lose a significant number of points on this exam.

GRADING POLICY

Grades are periodically posted on the class web site. **It is your responsibility to check your grades regularly** since mistakes often happen when dealing with a large number of students and PIs. **All grades are final one week after posting.** After curving exams as needed, course grades are assigned using the 60 (D), 70 (C), 80 (B), and 90 (A) cuts. [$90 \rightarrow 100$ (A), $86.\overline{6} \rightarrow 89.\overline{9}$ (A-), $83.\overline{3} \rightarrow 86.\overline{6}$ (B+), $80 \rightarrow 83.\overline{3}$ (B), $76.\overline{6} \rightarrow 79.\overline{9}$ (B-), $73.\overline{3} \rightarrow 76.\overline{6}$ (C+), $70 \rightarrow 73.\overline{3}$ (C), $66.\overline{6} \rightarrow 69.\overline{9}$ (C-), $63.\overline{3} \rightarrow 66.\overline{6}$ (D+), $60 \rightarrow 63.\overline{3}$ (D), $56.\overline{6} \rightarrow 59.\overline{9}$ (D-), and $0 < 56.\overline{6}$ (E)].

Part of your grade on tests, quizzes, labs, 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 **randomly**) will result in a deduction of 1 point (out of 100) from your overall course total. There are no excuses for missed classes, but two classes can be missed without penalty. (Late arrival or early departure will count as an absence.)

Exam 1	11%
Practical (Quiz) 1	3%
Exam 2	11%
Exam 3	11%
Practical (Quiz) 2	7%
Final Exam	13%
Laboratory*	40%
Homework†/Quizzes	4%
Total$	100%
Hackathon	up to 5%

(Note: All labs are **not** worth the same amount. Some labs may have **extra credit**.)

(90+ on **weighted average** of **Final & Practical 2** results in 5% grade bonus, e.g., 86% ⇒ 91%)

(We **may** have a near end-of-semester hackathon worth up to 5% extra credit.)

All grades are **non**-negotiable **one week** after the grade is posted. 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 **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.

† 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 of one point (out of 100) from your overall course total. There are no excuses for missed classes, but two classes can be missed without penalty.

EXTRA CREDIT

Extra credit is sometimes offered during class (or on the web, by tweet, 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.

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

EXAM RE-GRADE POLICY

If you believe an error has been made on an exam score, you must make a written request to the instructor explaining where the misgrading or error occurred and why you think more credit is deserved. This request must be submitted **immediately at the end of the class in which the exam is returned**. If you do resubmit an exam, the instructor reserves the right to scrutinize and grade the **entire** exam more closely. This definitely places your current score at risk. Consequently, it is not advisable to resubmit an exam for re-grade unless a blatant grading error has been made. You **must** make it clear what writing you added to the exam (by clear indication, e.g., use a different color pen or pencil) after it was returned to you.

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. Current exam solutions will be discussed and shown in class on the day the graded exam is returned to class, but will **not** be posted.

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. Scans are acceptable, but must be compressed and in a single document. *Fast Scanner* (available for Android and iPhone) is a cell phone app that works well. Unclear scans **will not** be accepted. Homework solutions are sometimes posted on our class web-site **before** they are due. It is **not** appropriate to copy the supplied solutions verbatim; this constitutes cheating. Homework will only be 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). The final course grades will be assigned with strict cuts between grades, but HW **could** push you above a cut. Also, the (pop) quizzes will come from the class material, the labs, **and** the homework. In addition, the exams will be partly based on the assigned homework. **Late homework will not be accepted**.

All grades are **non**-negotiable **one week** after the grade is assigned. 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. 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 exam (or 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, lab section (4 characters), 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 (via email, with subject: ***3744: Conflict with Lab X***, where *X* is the lab number) 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. Each missed class when roll is taken will cost 1 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 two 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 a noise-making device goes off during an exam, your will lose a significant number of points on this exam.
   - If you miss the first two classes and do not notify me prior to your seconded 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 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 Exam X***, where *X* is the exam 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/) by providing appropriate documentation. 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.

Students requesting classroom, laboratory or exam accommodations must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the instructor when requesting accommodation. For optimal consideration, 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 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
- **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, 392-4357, 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://evaluations.ufl.edu/evals. Evaluations are typically open during the last two weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at https://evaluations.ufl.edu/results/.

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.

TECHNOLOGY

The use of cell phones and **every other** technology device is strictly prohibited during exams. All use of an electronic devices during an 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. Laptop computer and tablets are welcome in class as long as they are used for class-related work. Surfing the web, checking email, making posts, etc., is strictly prohibited (**if distracting to others**) and will result in course grade deductions.

STUDENT PRIVACY

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

COMMUNICAITION

Twitter is utilized for course announcements. You are also responsible for getting the tweets either with a Twitter account or with software that creates an email or text message from tweets. 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 with some space for note taking. 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 bring the **printed** class **notes and examples** to class to augment the printed material with your own notes. Notes are removed shortly after they are covered in class.

I recommend that you bring your laptop or tablet computer (or printed notes) to each class, so that you can easily augment these notes with your own notes. Historically, student that take good notes perform much better in this class then those who do not take notes (or take poor notes).

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."

*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 the 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 instructor (and, possibly, the UF honor court) 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/students/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 a 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 exams.

LABORATORY GRADING

You will not be admitted to the lab without a *Summary* document, as described in the *Lab Rules and Policies*. The *Summary* document and other files also **must** be submitted through Canvas **BEFORE** the start of your lab.

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**.

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 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.

HANDOUTS

Most handouts are supplied on-line and can be downloaded from the class web site: http://mil.ufl.edu/3744/. Old graded non-lab assignments not picked up in class can be picked up from Dr. Schwartz for a few days, then they will be recycled..

LABORATORY GUIDELINES

LABORATORY OBJECTIVES

The purpose of this laboratory is to teach students hardware and software development 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.

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.

LABORATORY ATTENDANCE

Laboratory attendance during scheduled times is mandatory. A **documented** personal or family emergency will be accepted as an excuse for absence for a **second** missed lab if documentation for a **first** missed lab is **also provided**. In such cases, consult your **Dr. Schwartz** (**not** your PI) about a makeup lab **as soon as possible**. See ***Course Requirements*** for more details. Students should make serious attempts on **all** labs. **Grades less than 50% may be interpreted as not a serious attempt and may be scaled to 0! Note: ALL** students **MUST** have everything working **BEFORE** coming to lab.

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

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.

LABORATORY RULES & POLICIES

See 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

An PI will let you in at the start of your lab period. Your PI has the right to kick you out of the lab if you are not prepared, i.e., you have not uploaded the required Canvas submissions and turned in the required hardcopy document 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 built, 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 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.
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.**

EEL 3744 LABORATORY SCHEDULE

Lab	Start Date	Tentative Lab Topics (Lab in NEB 281)
0		Introduction to lab rules and assembly of PCBs..
1		Use Atmel Studio (IDE) to write an assembly program, simulate the program, download the program to the *μPAD*, and emulate the program on the *μPAD*.
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. Convert Asynchronous Serial Communication to 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.

EEL 3744 SCHEDULE (Part 1 of 2)

WEEK/DAY	DATE	LAB #	Lecture	Tentative Weekly Topics / Comments
1 M	19-Aug	No lab	No class	Syllabus, web tour, Atmel Studio Installation
1 Tu	20-Aug		1	Intro to uP, XMEGA Architecture;
1 W	21-Aug			
1 Th	22-Aug		2-3	
1 F	23-Aug			~~**Drop/Add ends Friday at 11:59pm**~~
2 M	26-Aug	0		**Drop/Add ends Monday at 11:59pm**
2 Tu	27-Aug	0	4	GCPU review, Assembly examples
2 W	28-Aug	0		Demo: Assembly, Simulation, Emulation
2 Th	29-Aug	0	5-6	Addressing Modes, Instruction Set
2 F	30-Aug	0		
3 M	2-Sep	No lab	No class	**Holiday: Labor Day**
3 Tu	3-Sep		7	GPIO, Ports
3 W	4-Sep			Clock, Simplified Timer-Counter
3 Th	5-Sep	1	8-9	
3 F	6-Sep	1		
4 M	9-Sep	1		Program Structures, Data Structures, Stack
4 Tu	10-Sep	1	10	Simplified Timer-Counter
4 W	11-Sep	1		Hardware and Software Debugging; Include file (BM, BP, GC)
4 Th	12-Sep		11-12	
4 F	13-Sep			
5 M	16-Sep	2		Address and Data Bus Timing (EBI)
5 Tu	17-Sep	2	13	Interfacing, Interfacing Examples, Address Decoding
5 W	18-Sep	2		
5 Th	19-Sep	2	14-15	Resets & Interrupts
5 F	20-Sep	2		
6 M	23-Sep			**CISE Career Workshop: Sept 23rd, 1-6pm**
6 Tu	24-Sep		16	Parameter Passing; Keypad
6 W	25-Sep			**Career Showcase (Technical Day, Sept 25th)**
6 Th	26-Sep		17-18	**Exam 1: Thur, 26 Sept, 8:20pm**
6 F	27-Sep	3		SCI (Asynch Data Communications)
7 M	30-Sep	3		SCI (Asynch Data Communications)
7 Tu	1-Oct	3	19	Intro to C
7 W	2-Oct	3		
7 Th	3-Oct	3	20-21	
7 F	4-Oct	No lab	No class	**Holiday: Homecoming**
8 M	7-Oct	4		SPI Subsystem
8 Tu	8-Oct	4	22	
8 W	9-Oct	4		
8 Th	10-Oct	4	23-24	
8 F	11-Oct	4		

EEL 3744 SCHEDULE (Part 2 of 2)

WEEK/DAY	DATE	LAB #	Lecture	Tentative Weekly Topics / Comments
9 M	15-Oct			D/A and A/D Conversion, A/D Subsystem
9 Tu	15-Oct		25	
9 W	16-Oct			**Exam 2: Wed, 16 Oct, 8:20pm, in _____**
9 Th	17-Oct		26-27	**Realization Exam 1: Thur, 17 Oct, 8:20pm, in _____**
9 F	18-Oct			
10 M	21-Oct	5		System Clock
10 Tu	22-Oct	5	28	Topic: LCD, Lookup Table
10 W	23-Oct	5		Topic: DMA and DAC
10 Th	24-Oct	5	29-30	
10 F	25-Oct	5		Exam 1 Solutions / Regrade petitions submitted
11 M	28-Oct	6		Signal Generation
11 Tu	29-Oct	6	31	Output Compare System and PWM
11 W	30-Oct	6		
11 Th	31-Oct	6	32-33	
11 F	1-Nov	6		
12 M	4-Nov			**Exam 3: Mon, 4 Nov, 8:20pm**
12 Tu	5-Nov		34	Other microprocessors and microcontrollers
12 W	6-Nov	7		Multitasking
12 Th	7-Nov	7	35-36	
12 F	8-Nov	7		
13 M	11-Nov	No lab	No class	**Holiday: Veteran's Day**
13 Tu	12-Nov	7	37	Topic: uP 2 and Real-time DSP Applications
13 W	13-Nov	Mon Lab 7		
13 Th	14-Nov	8	38-39	
13 F	15-Nov	8		
14 M	18-Nov	8		
14 Tu	19-Nov	8	40	
14 W	20-Nov	8		
14 Th	21-Nov		41-42	
14 F	22-Nov			
15 M	25-Nov			**Realization Final Exam: Mon, 25 Nov, 8:20pm, in mult bldgs** **Drop Deadline**: Mon, 25 Nov @ 11:59pm
15 Tu	26-Nov		43	
15 W	27-Nov	No lab	No class	**Holiday: Thanksgiving**
15 Th	28-Nov	No lab	No class	**Holiday: Thanksgiving**
16 F	29-Nov	No lab	No class	**Holiday: Thanksgiving**
16 M	2-Dec			
16 Tu	3-Dec		44-45	
16 W	4-Dec			(*Classes End*)
16 Th	5-Dec	No lab	No Class	Reading Day
16 F	6-Dec	No lab	No Class	Reading Day
			Final	**Final Exam: Sat, 7 Dec, _____, in _____**