

## Microprocessor Applications

EEL 3744C All Class Numbers

**Class Periods:** Tuesdays: 7th (1:55-2:4pm); Thursdays: 7th-8th (1:55-3:50pm)

**Location:** FLG 270

**Academic Term:** Spring 2020

### **Instructor:**

Dr. Eric M. Schwartz

[ems@ufl.edu](mailto:ems@ufl.edu)

352-392-2541

MAEC 106 (Campus map: <https://campusmap.ufl.edu/>)

Office Hours: Wed: 12:50-1:40pm, Fri 1:55-2:45pm

### **Undergraduate Peer Instructors (UPIs):**

Please contact through the Canvas website (Office hours TBD in NEB 281 [or, if unavailable, in NEB 222])

- Leslye Castillo, [leslye.castillo@ufl.edu](mailto:leslye.castillo@ufl.edu)
- Kyle Ditzig, [kyle.ditzig@ufl.edu](mailto:kyle.ditzig@ufl.edu)
- Jared Holley, [jaredrholley@ufl.edu](mailto:jaredrholley@ufl.edu)
- Nickolas Pais, , [npais@ufl.edu](mailto:npais@ufl.edu)
- Alex Shuping, [alexandershuping@ufl.edu](mailto:alexandershuping@ufl.edu)
- Camilo Chen, [camilo.chen@ufl.edu](mailto:camilo.chen@ufl.edu)
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- Khaled Pakizeh Hesari, [kpakizehhesari@ufl.edu](mailto:kpakizehhesari@ufl.edu)
- Sobhi (Sam) Hosni, [shosni@ufl.edu](mailto:shosni@ufl.edu)

### **Course Description**

Experience in the elements of microprocessor-based systems, hardware interfacing and software design for their application. Laboratory. 4 credits

### **Course Pre-Requisites / Co-Requisites**

EEL 3701C

### **Course Objectives**

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.

### **Materials and Supply Fees**

Lab fee: \$123.04

Also need National Instruments (NI) Analog Discovery 2 (NAD) board or Digilent Analog Discovery 2 (DAD) board, lab kit from EEL 3701C, and laptop computer with the capability of running the Windows OS.

### **Professional Component (ABET):**

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### **Relation to Program Outcomes (ABET):**

Outcome	Coverage*
1. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	High

Outcome	Coverage*
2. An ability to apply both analysis and synthesis in the engineering design process, resulting in designs that meet desired needs.	
3. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.	
4. An ability to communicate effectively with a range of audiences	
5. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	
6. An ability to recognize the ongoing need for additional knowledge and locate, evaluate, integrate, and apply this knowledge appropriately.	
7. An ability to function effectively on teams that establish goals, plan tasks, meet deadlines, and analyze risk and uncertainty	

### Required Textbooks and Software

- Title: *Microcontrollers and Microcomputers Principles of Software and Hardware Engineering*
- Author: Frederick M. Cady
- Publication date and edition: Second Edition, Oxford University Press, New York, NY, 2009
- ISBN numbers: ISBN13: 9780195371611, ISBN10: 0195371615
- Required (free) Software: *Atmel Studio*

### Course Schedule

- Week 1: Course introduction, History of microprocessors, IDE (Integrated Development Environment), review of microprocessor architectures, course's microprocessor architecture
- Week 2: Course's assembly language instruction set, simulation, emulation
- Week 3: Assembly and simulations demos, addressing modes
- Week 4: Program structures, data structures, GPIO (general purpose inputs/outputs), ports
- Week 5: Simplified timer-counter, hardware/software debugging
- Week 6: External bus interface (address, data, and control busses), interfacing examples, address decoding, **Exam 1**
- Week 7: Reset and interrupts, parameter passing
- Week 8: Asynchronous data communications (SCI/UART), synchronous data communications (SPI/USART)
- Week 9: More serial communications, keypad, LCD, **Exam 2, Practical 1\***
- Week 10: Introduction to embedded C for course's processor
- Week 11: Analog-to-digital, digital-to-analog
- Week 12: DMA (Direct Memory Access), **Exam 3**
- Week 13: System clock, other microprocessors and microcontrollers
- Week 14: *Intro to Microprocessors 2* and *Real-time DSP Applications*, **Practical 2\***
- Week 15: Multitasking, advanced microprocessor applications

\* Practical is an exam where students design, build and demonstrate their solution to a small laboratory-like problem.

Final Exam during finals week

### Attendance Policy, Class Expectations, and Make-Up Policy

Attendance is required. 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. Two classes can be missed without penalty. (Late arrival or early departure will count as an absence.) Excused absences follow the university policy available at <https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>; prior notification of at least one week must be given. Appropriate documentation is needed for approved absences.

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**. Do not visit websites, play games, or use other programs or apps during class that might distract nearby students. If a noise-making device goes off during an exam, you will lose a significant number of points on this exam.

Late homework is not accepted.

Your lowest lab grade will be dropped. (You should do this lab on your own. If necessary, you may visit a UPI 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. You must notify Dr. Schwartz at least 8 days prior to your exam (or other event) so that an alternate lab time can be arranged.

### ***Evaluation of Grades***

<b>Assignment</b>	<b>Percentage</b>
Homework Sets (3-7)	4%
Labs* (9)	40%
Midterm Exams (3)	33%
Practical 1	3%
Practical 2	7%
Final Exam	13%

\* All labs are not worth the same amount. Some labs may have extra credit.

### ***Grading Policy***

<b>Percent</b>	<b>Grade</b>	<b>Grade Points</b>
90.0 - 100	A	4.00
86.7 - 89.9	A-	3.67
83.3 - 86.6	B+	3.33
80.0 - 83.3	B	3.00
76.7 - 79.9	B-	2.67
73.3 - 76.6	C+	2.33
70.0 - 73.3	C	2.00
66.7 - 69.9	C-	1.67
63.3 - 66.6	D+	1.33
60.0 - 63.3	D	1.00
56.7 - 59.9	D-	0.67
0 - 56.6	E	0.00

More information on UF grading policy may be found at:

<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

### ***Students Requiring Accommodations***

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, <https://www.dso.ufl.edu/drc>) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

### ***Course Evaluation***

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.

### ***University Honesty Policy***

UF students are bound 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. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: “On my honor, I have neither given nor received unauthorized aid in doing this assignment.” The Honor Code (<https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

### ***Commitment to a Safe and Inclusive Learning Environment***

The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:

- Your academic advisor or Graduate Program Coordinator
- Robin Bielling, Director of Human Resources, 352-392-0903, [rbielling@eng.ufl.edu](mailto:rbielling@eng.ufl.edu)
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, [taylor@eng.ufl.edu](mailto:taylor@eng.ufl.edu)
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, [nishida@eng.ufl.edu](mailto:nishida@eng.ufl.edu)

### ***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.

### ***Student Privacy***

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: <https://registrar.ufl.edu/ferpa.html>

### ***Campus Resources:***

#### ***Health and Wellness***

##### **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; and the 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 Recovery Services (SARS)**

Student Health Care Center, 392-1161.

**University Police Department** at 392-1111 (or 9-1-1 for emergencies), or <http://www.police.ufl.edu/>.

*Academic Resources*

**E-learning technical support**, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu. <https://lss.at.ufl.edu/help.shtml>.

**Career Resource Center**, Reitz Union, 392-1601. Career assistance and counseling. <https://www.crc.ufl.edu/>.

**Library Support**, <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with respect to using the libraries or finding resources.

**Teaching Center**, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring. <https://teachingcenter.ufl.edu/>.

**Writing Studio, 302 Tigert Hall**, 846-1138. Help brainstorming, formatting, and writing papers. <https://writing.ufl.edu/writing-studio/>.

**Student Complaints Campus:** <https://care.dso.ufl.edu>

**On-Line Students Complaints:** <http://www.distance.ufl.edu/student-complaint-process>.