

# Syllabus for EEL 3923C Design I

## Summer 2022

### 1. Catalog Description

Preparatory skills are developed for Design II. The main focus in this class is on basic hardware design, software implementation, microprocessor and microcontroller development tool usage, and PCB design. Students design, produce and report on a hardware prototype, meeting defined specifications and using a structured design methodology. Project management, hardware prototyping, project reporting. Laboratory. Credits 3.

### 2. Pre-requisites

EEE 3308C and EEL 3112 and EEL 3701C with minimum grades of C and 2 courses from breadth elective list.

### 3. Course Objectives

Students will reinforce basic circuit and digital systems analysis and techniques to implement electrical engineering projects. PCB design software will also be taught such that small PCBs can be populated and tested in the lab. Each of the previously mentioned tool sets form a basic design module where they are introduced and then tested via short projects in the lab. At the end of the semester, a design project is assigned that uses the modules taught earlier in the semester.

### 4. Relationship of course to ABET program outcomes

- In this course you will gain ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
- In this course you will gain an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics

### 5. Instructors/coordinators:

	Dr. Erin Patrick	Mike Stapleton
Office	NEB 229	NEB 239
Office Hours	4th period (10-11 am) M,W,F	By appointment
email	erin.patrick@ece.ufl.edu	mstap@ece.ufl.edu
phone	392-0305	392-2727

### 6. Teaching assistants

Marc Martorell  
mmartorell@ufl.edu

The TA will be available to assist students in the Design I lab during their office hours, evaluation of student modules and final projects, and with operating the labs. They will also assist with grading.

### 7. Technical Support:

Mr. Eric Liebner, Engineer (ericl@ece.ufl.edu)

## 8. Course Content

We will have 8 lecture-based classes during the semester to introduce the course and every module and the final project. The class will meet at 5pm in a lecture hall in NEB (date and place TBA). The class will be broadcast via Zoom and a recording will be made available after the class.

There are 8 modules plus a final project listed below (not necessary in order of occurrence in class):

1. Test and Measurement – learn how to use lab equipment (power supply, oscilloscope, multimeter, DAD network analyzer)
2. PCB Design – use Altium (an industry-standard software) to design and layout a printed circuit board
3. Amplifier Design – review op-amp configurations for amplification purposes and learn about IC-specific specifications for use in real-world electronic circuit applications
4. Analog Filter Design – learn three common filter types and topologies and the issues with component tolerances when building them
5. Power Supply Design – build an AC to DC converter and learn about voltage regulation schemes (Zener diode, LDO)
6. Microcontroller Basics – review/learn general purpose digital input/output on a microcontroller
7. Microcontroller A/D with LCD – use the internal analog to digital converter on the microcontroller and learn how to interface with an LCD screen using parallel communication
8. Microcontroller SPI to DAC – use serial communication peripheral hardware on microcontroller (SPI) to communicate to a digital-to-analog converter IC (DAC).
9. Final Project - implement a system on a PCB using analog and digital inputs and outputs (microcontroller, LCD, DAC, amplification, power regulation, PCB)

Schedule:

Lecture (5 pm, NEB 202 & Zoom)	Module Demo Due	Module Report Due			
Week	M	T	W	R	F
<b>9-May</b>	L01 / Test & Meas. Module and PCB Design Module				
<b>16-May</b>	L02 / Amplifier Design Module	Test & Meas. and PCB Design Demos Due		PCB Design Report Due	
<b>23-May</b>	L03 / Power Supply Module	Amplifier Module Demo		Amplifier Module Report Due	
<b>30-May</b>			L04/ Microcontroller Basics Module	Power Supply Module Demo	
<b>6-Jun</b>	Power Supply Module Report Due	L05/ Microcontroller A/D LCD Module	Microcontroller Basics Module Demo		Microcontroller Basics Module Report Due
<b>13-Jun</b>					

<b>20-Jun</b>	Summer Break				
<b>27-Jun</b>	L06/ Microcontroller DAC SPI Module	Microcontroller D/A LCD Module Demo		Microcontroller D/A LCD Module Report Due	
<b>4-Jul</b>			L07/ Final Project	Microcontroller DAC SPI Module Demo	
<b>11-Jul</b>	Microcontroller DAC SPI Module Report Due	L08/ Filter Module			Order PCB for Final Project
<b>18-Jul</b>				Filter Module Demo	
<b>25-Jul</b>	Filter Module Report Due				
<b>1-Aug</b>			Final Project Demo		Final Project Report

Each module will have a demo and lab report associated with it. The demos will occur in the Design 1 lab with the TA or the instructor during their office hours. The report will always be due two weekdays after your module demo due date. You may demo any module or the Final Project before the final due date.

Marc Martorell (MM) will hold office hours in NEB 246 during the times shown below. Dr. Patrick (EP) will hold office hours in her office NEB 229 during the times shown below.

	M	T	W	R	F
9:00 AM					
10:00 AM	EP	EP	EP	EP	EP
11:00 AM		MM		MM	
12:00 PM	MM		MM		MM
1:00 PM					
2:00 PM					
3:00 PM					
4:00 PM					
5:00 PM					

## 9. Meeting Location

Design I Lab: NEB 246

## 10. Material and Supply Fees

Lab kit: \$145

Order from: <https://apacoelectronics.com/shop/ols/products/eel-3923-junior-design-lab-kit-university-of-florida>

Printed Circuit Board (for final project): ~\$30



## 12. Textbooks and Software Required

- a. No textbook
- b. LTSPICE IV: Available for free at <http://www.linear.com/designtools/software/>
- c. Pic microprocessor development tool software and Altium PCB design software are also downloadable for free.

## 15. Attendance and Expectations

- a. Format: The course is comprised of 8 modules and a final project. All module presentations for each group are due on the last day listed. Module lab reports are due at 11:59 PM two weekdays after the group presentation deadline for that module. The assignments and supporting material will be available on canvas.

Students must submit **individual** work **individually** on each module/final project. You are encouraged to work together and share ideas on assignments. However, you are not allowed to copy or duplicate anything, from anyone or any source. This work will be considered cheating and will be dealt with in a severe manner. See Section 19 on Honesty Policy.

- c. Class and Laboratory etiquettes: It is understood that attendees at lectures and labs will be focused on the particular lecture or lab and will take every possible measure to minimize distractions for everyone.

It is the student's responsibility to return all equipment and clean her/his work area before leaving the Lab unless the equipment is specifically checked out. In the latter case the equipment must be checked in before the end of the semester.

## 16. Grading-methods of evaluation

The overall grade for the course will be based on 8 Modules and a Final Project.

- a. Modules:  
The modules are pass/fail.
  1. Each student will be allowed to use up to two tardy passes during the term.
    1. The use of a tardy extends the due date for that module by one week.
    2. Students may use excess tardies beyond the two tardy passes.
  2. Each excess tardy will result in a reduction in the final grade for the course to the next lower grade. i.e. two excess tardies would reduce an 'A' first to an 'A-' and then to a 'B+'.
  3. Students are encouraged to NOT USE THE TARDY PASSES so that they will be available if they need them later.
  4. There will be a full letter grade deduction for the final grade for each module that was not fully completed. Full completion requires a pass on the demonstration AND a pass on the associated write-up.

b. Final project:

The final project will be graded on a 100 point scale. To pass the course the final project must be implemented on a PCB designed by each student, AND, the PCB must have been designed, and intended, to fully implement the entire functionality of the system. A final project that works properly, but meets only the minimum, will receive a score no higher than 90. The final project report also accounts for 25% of the points and will be judged based on presentation and level of understanding of the technical components of the design.

## 17. Grading Scale

Grading scale for final project: ≥93 A, ≥90 A-, ≥89 B+, ≥83 B, ≥80 B-, ≥ 73 C, ≥ 70 C-, ≥ 63 D, ≥ 60 D-, <60 E

The final grade for the course will be determined by reducing the final project grade by any letter grade reductions due to failing to fully complete any of the modules and/or for the use of excess tardies.

## 18. Make-up Exam Policy

a. For the pass/fail evaluation of each module, students are allowed two tardy passes where a tardy is any module checked-off after the initial scheduled time. The tardy extension can be up to one week only and if a student falls too far behind they will be strongly encouraged to drop the class. After the first two free tardy extensions are used, additional tardy extensions result in a partial grade penalty. i.e. A=>A-...C=>D+, one grade lower automatically per unsanctioned tardy.

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

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center by visiting <https://disability.ufl.edu/students/get-started/>. It is important for students to share their accommodation letter with their instructor and discuss their access needs, 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/>.

### ***In-Class Recording***

Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A “class lecture” is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To “publish” means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including

but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

### ***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 Conduct Code (<https://sccr.dso.ufl.edu/process/student-conduct-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. 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:

- Jennifer Nappo, Director of Human Resources, 352-392-0904, [jpennacc@ufl.edu](mailto:jpennacc@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***

##### **Covid-19 Protocols:**

- You are expected to wear approved face coverings at all times during class and within buildings even if you are vaccinated. Please continue to follow healthy habits, including best practices like frequent hand washing. Following these practices is our responsibility as Gators.
- If you are sick, stay home and self-quarantine. Please visit the UF Health Screen, Test & Protect website about next steps, retake the questionnaire and schedule your test for no sooner than 24 hours after your symptoms began. Please call your primary care provider if you are ill and need immediate care or the UF Student Health Care Center at 352-392-1161 (or email [covid@shcc.ufl.edu](mailto:covid@shcc.ufl.edu)) to be evaluated for testing and to receive further instructions about returning to campus. UF Health Screen, Test & Protect offers guidance when you are sick, have been exposed to

someone who has tested positive or have tested positive yourself. Visit the [UF Health Screen, Test & Protect website](#) for more information.

**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:** <https://counseling.ufl.edu>, 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](mailto:Learning-support@ufl.edu).  
<https://lss.at.ufl.edu/help.shtml>.

**Career Resource Center**, Reitz Union, 392-1601. Career assistance and counseling; <https://career.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://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/>; <https://care.dso.ufl.edu>.

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