Special Topics in Freshman Engineering: Adventures in ECE Design
EGN 1935
Class Periods: Tuesdays and Thursdays, period 9, 4:05 PM- 4:55 PM
Location: MAEA 0327
Academic Term: Fall 2023

Instructor:
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Office Hours: Mondays 10:00 am to noon or by appointment

Teaching Assistant/Peer Mentor/Supervised Teaching Student:
None

Course Description
(2 credits) This course provides a hands-on, game-based learning introduction to electronic hardware and the key principles of system operation. Students will experiment with hardware platforms to understand the underlying physics (e.g., signal propagation, switching of transistors, sensors) and mathematics (e.g., bits, Boolean algebra, logic gates) of computing. Also, students will experiment with hardware applications in novel topics such as the IoT (Internet of Things) and AI (Artificial Intelligence).

Course Pre-Requisites / Co-Requisites
- None

Course Objectives
This lab course consists of a set of hands-on experiments that intend to help students:
- Design combinational and sequential circuits by applying knowledge about the mathematical models used in digital electronics.
  - Illustrate binary and decimal numbers and apply their conversion techniques using push buttons and switches in hardware
  - Apply knowledge about Boolean logic to design combinational circuits using logic gates
  - Design sequential circuits (Finite State Machines) and implement them on a programmable chip in the hardware platform
- Design and implement circuits to perform basic computer operations, sense data, and store information
  - Implement circuits to read and write from memory by differentiating between memory devices
  - Create a basic model of a computer capable of doing arithmetic and logical operations
  - Evaluate the uses of sensors by analyzing and modifying software codes that operate them to acquire sensed data
- Experiment with hardware sensors in IoT applications for monitoring and controlling devices in real-time
  - Create a webserver to provide an interface through which a user can send control commands to interact remotely with microcontrollers.
  - Extract motion telemetry from an Inertial Measurement Unit (IMU) and relay the information to a visualization panel.
  - Measure the temperature and humidity parameters of the environment and visualize the data

captured on a dashboard hosted on a server
  - Measure the temperature and humidity parameters in an environment and control connected devices using a smart voice assistant
- Make predictions using data from sensor hardware modules using AI algorithms
  - Utilize RGB sensor modules to create logic tables that allow making predictions about object characteristics
  - Utilize different methods to measure distances and apply those methods to appropriate situations

Materials and Supply Fees

Students are expected to bring a portable computer (e.g., laptop) to class meetings

Relation to Program Outcomes (ABET)

Outcome	Coverage*
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	Medium
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	
3. An ability to communicate effectively with a range of audiences	Medium
4. 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	Low
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	High
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	Medium
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	Medium

*Coverage is given as high, medium, or low. An empty box indicates that this outcome is not covered or assessed in the course.

Required Textbooks and Software

- Software:
  - Vivado Design Suite (Free download)
- There is no required textbook for the course

Course Structure

Students will be provided with the hardware modules at the beginning of the course, a manual, and classroom instructions on how to use them. Students will keep the boards throughout the semester and return them at the end. Students will receive written instructions for each of the experiments in this course. In addition, at the beginning of each new experiment, the instructor will briefly introduce the topic, the steps of the experiments, advanced options, if any, and expected learning outcomes.

Course Schedule
Tentative schedule

Date	Topic	Important Dates
(08-24)	Course introduction	
(08-29)	Binary arithmetic	HW1 due
(08-31)	Boolean logic	
(09-05)	Boolean logic	HW2 due, Quiz 1
(09-07)	Sequential circuits	HW3 due
(09-12)	Memory read and write processes	
(09-14)	Memory read and write processes	HW4 due, Quiz 2
(09-19)	Computer design	
(09-21)	Computer design	HW5 due
(09-26)	Sensors and impacts of noise	
(09-28)	Sensors and impacts of noise	HW6 due, Quiz 3
(10-03)	Project work	Project draft due
(10-05)	**Midterm**	
(10-10)	Remote interaction with microcontrollers	
(10-12)	Remote interaction with microcontrollers	HW7 due
(10-17)	Motion telemetry and visualization	HW8 due
(10-19)	Project work	Quiz 4
(10-24)	Measures of temperature and humidity	
(10-26)	Measures of temperature and humidity	HW9 due
(10-31)	Control devices through smart voice assistants	
(11-02)	Control devices through smart voice assistants	HW10 due, Quiz 5
(11-07)	RGB sensor modules and predictions	
(11-09)	RGB sensor modules and predictions	HW11 due
(11-14)	Methods to measure distances	
(11-16)	Methods to measure distances	HW12 due, Quiz 6
(11-21)	Project work	
(11-23)	THANKSGIVING	
(11-28)	Project work	
(11-30)	Project presentations	Final project report
(12-05)	**Final exam**	

Attendance Policy, Class Expectations, and Make-Up Policy
Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies. Click here to read the university attendance policies: https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/

Please carefully read the following 8 topics pertaining to class expectations and make-up policies:

1. *Course Communications*
General information:
(a) The primary means to get help with a problem, other than office hours, will be the Canvas discussion boards. The board will be checked daily, to answer inquiries. Other students should feel free to post responses to these

questions as well within the guidelines discussed in the sections on collaboration and course etiquette.

(b) Questions about grades or personal issues may be emailed to the instructors or within Canvas.

(c) The course will have a Slack page: TBD. This is an optional resource for students to discuss the course amongst each other and with the instructor. This resource is intended to supplement office hours and student interactions. No official communication/submission happens over Slack. No assignments submissions will be accepted over Slack.

2. Attendance Policy

Excused absences must be in compliance with university policies in the Graduate Catalog and require appropriate documentation (https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies).

3. Grading Policy

General information:
(a) all assignments will have a grading rubric and submissions will be graded based on the assignment's rubric. For maximum credit, students must submit correct and elaborated answers that follow instructions.

Expectations: Students are expected to complete all assignments with care, ensure that submissions are complete and illustrate the understanding of the concepts being assessed.

4. Late Work

Students are to follow all deadlines. In case of conflict, students should communicate with the course instructor well in advance about any conflicting issues in order to avoid losing the "on-time" points.

5. Make-Up Policy

General information:
(a) if a student feel that any graded assignment needs to be re-graded, they must discuss this with the instructor within one week of grades being posted for that assignment. If approved, the entire assignment will be subject to complete evaluation.
(b) if students have an academic conflict with any assignment or exam date/time, please inform the instructor well in advance to make the necessary changes and make the appropriate accommodations available.

Expectations: Students are expected to communicate with the instructor well in advance about any conflicts or time/date change requests.
Excused absences must be consistent with university policies in the undergraduate catalog (https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx) and require appropriate documentation.

6. Collaboration

In solving any individual assignments, healthy discussion and collaboration amongst classmates is encouraged. Healthy collaboration includes: (a) discussing and explaining general course material, and (b) discussing assignments for better understanding.

7. Cheating and Plagiarism

General information: while collaboration is encouraged, students are expected to submit their own work and follow the student honor code. Submitting work completed by another student is considered plagiarism and will be dealt according to university policy.
Examples of plagiarism include: (a) copying (or allowing someone to copy), even partially, an assignment solution or program from the course; (b) submitting material taken from another source without proper citation; (c) obtaining solutions to assignments or exams through inappropriate means.
Note that the instructor may elect to use a plagiarism detection service in this course, in which case students

will be required to submit their work to such a service as part of course assignments.

Expectations: All students are bound to the honor pledge as indicated in the [student honor code](#).

8. *Course Etiquette*

- Be present. This will allow you to get the most out of class time as well as for your classmates to get the most out of their collaborations with you.
- Put your cell phone away unless you are actively using it to further the class activities.
- Be prepared. The readings and videos are carefully chosen to support the in-class activities.
- Listen carefully and do not interrupt others.
- Give quality feedback. What constitutes "quality" will be discussed in class.
- Respect the opinions of others, even when you do not agree.
- Keep an open mind, embrace the opportunity to learn something new.
- Avoid monopolizing the discussion. Give others a chance to contribute and be heard.
- Do not be afraid to revise your ideas as you gather more information.
- Try to look at issues from more than one perspective.
- Respect others by learning and using the name and pronoun they prefer.
- Do not use offensive language.

Evaluation of Grades

Assignment	Total Points	Percentage of Final Grade
Homework Sets (12)	100 each	30%
Quizzes (6)	100	15%
Final Project	100	15%
Midterm Exam (1)	100	20%
Final Exam (1)	100	20%
		100%

Grading Policy

Percent	Grade	Grade Points
93.4 - 100	A	4.00
90.0 - 93.3	A-	3.67
86.7 - 89.9	B+	3.33
83.4 - 86.6	B	3.00
80.0 - 83.3	B-	2.67
76.7 - 79.9	C+	2.33
73.4 - 76.6	C	2.00
70.0 - 73.3	C-	1.67
66.7 - 69.9	D+	1.33
63.4 - 66.6	D	1.00
60.0 - 63.3	D-	0.67
0 - 59.9	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 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 Honor 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. 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
• Jennifer Nappo, Director of Human Resources, 352-392-0904, jpennacc@ufl.edu
• Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, taylor@eng.ufl.edu
• Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, 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 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

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

Career Connections 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*: https://distance.ufl.edu/state-authorization-status/#student-complaint*.