Syllabus
ECE 4863 – Software Defined Radios

Lecture Location: Van Leer C341
Lectures Hours: M/W 5:00PM – 5:50PM
Studio Location: Van Leer C341
Studio Hours: R 5:00PM – 6:55PM

Instructor: James 'Trip' Humphries, Ph.D.
Office: TBD
Office Hours: M/W 4:00 – 5:00 PM
E-Mail: james.humphries@gtri.gatech.edu

Course Outcomes

- Program and test software defined radio (SDR) transceivers
- Process baseband signals in GNU Radio, Matlab, Python, or C++
- Implement timing, frequency, and frame synchronization
- Implement SDR applications using GNU Radio and the Pluto SDR

Student Outcomes

- An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
- An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Prerequisites

- Coding: (ECE 2036 [min C] or ECE 3090 [min C] or CS 1331 [min C]) and
- DSP: (ECE 2026 [min C]) and
- Probability and Statistics (CEE/ISYE/MATH 3770 [min C] or ISYE 2027 [min C] or ECE 3077 [min C])

Grading Criteria

Your final grade will be assigned as a letter grade according to the following scale:

- A: 90-100%
- B: 80-89%
- C: 70-79%
- D: 60-69%
- F: 0-59%

Homeworks and projects will be equally weighted and will count 70% toward your final grade. The final exam/project will count 25% to your final grade. Attendance will count towards 5% of your final grade.

Attendance Policy

Attendance is class and studio is required. Excessive absences may be counted against your final grade. Please get in touch with the instructor if you have a reason to miss class.

Required Textbook and Resources

Books:

- Travis F. Collins, Robin Getz, Di Pu, and Alexander M. Wyglinski, “Software-Defined Radio for Engineers,” Artech House, 2018 (https://www.analog.com/en/education/education-library/software-defined-radio-for-engineers.html)
- This is a FREE download and is also uploaded on Canvas.

SDR:

- ADALM-PLUTO Active Learning Module
- These are provided by the ECE Lab. They will be distributed during the first week of class.
- If you want to purchase your own, they are available on Digikey / Mouser / Arrow and Others (Roughly $150)

Computer and Software:

- You will need to setup your own computer for this class. The first laboratory will cover computer setup and configuration needed for this course.
- Python will be used for programming the SDR.

Academic Integrity

Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. For information on Georgia Tech's Academic Honor Code, please visit http://www.catalog.gatech.edu/policies/honor-code/ or http://www.catalog.gatech.edu/rules/18/ .

Any student suspected of cheating or plagiarizing on a quiz, exam, or assignment will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations.

Accommodations for Students with Disabilities

If you are a student with learning needs that require special accommodation, contact the Office of Disability Services at (404) 894-2563 or http://disabilityservices.gatech.edu/ , as soon as possible, to make an appointment to discuss your special needs and to obtain an accommodations letter. Please also e-mail me as soon as possible in order to set up a time to discuss your learning needs.

Student Use of Mobile Devices in the Classroom

I may issue grading penalties to student(s) whose use of any mobile device in the classroom becomes disruptive for any reason.

Schedule

Course schedule may change during the semester due to instructor's professional obligations, guest lecture scheduling conflicts, or for other reasons. The instructor will provide updates on the schedule as needed.

	Date	Class Type	Topic	Homework	Chapter Readings
1	22 Aug 2022	Lecture	Welcome, Syllabus, Intro to SDR	Start HW1: Computer / SDR Setup	1.1, 1.2, 1.3, 1.4, 1.5, 1.6
2	24 Aug 2022	Lecture	SDR Architecture		
3	25 Aug 2022	Studio	Computer / SDR Setup		
4	29 Aug 2022	Lecture	Intro to GNU Radio	Start HW2: GNU Radio Block Programming	2.1, 2.2
5	31 Aug 2022	Lecture	Intro to GNU Radio		
6	01 Sep 2022	Studio	GNU Radio Programming		
7	05 Sep 2022	Lecture	NO CLASS (HOLIDAY)	Start HW2: Digital Filters	2.6
8	07 Sep 2022	Lecture	DSP Techniques / FIR Filters		
9	08 Sep 2022	Studio	GNU Radio FIR Block		
10	12 Sep 2022	Lecture	Sampling Review / Complex Signals	Start HW3: GNU Radio Decimator Block	
11	14 Sep 2022	Lecture	Decimation / Interpolation		
12	15 Sep 2022	Studio	GNU Radio Decimator		
13	19 Sep 2022	Lecture	Digital Up/Down Converters	Start HW4: GNU Radio DDC	
14	21 Sep 2022	Lecture	Digital Up/Down Converters		
15	22 Sep 2022	Studio	GNU Radio DDC		
16	26 Sep 2022	Lecture	NO CLASS		5.1
17	28 Sep 2022	Lecture	NO CLASS		
18	29 Sep 2022	Studio	NO STUDIO		
19	03 Oct 2022	Lecture	Digital Modulation	Start HW6: Digital Modulation	
20	05 Oct 2022	Lecture	Digital Modulation		
21	06 Oct 2022	Studio	Digital Modulation		
22	10 Oct 2022	Lecture	Synchronization	Start HW7: Synchronization Part 1	
23	12 Oct 2022	Lecture	Synchronization		
24	13 Oct 2022	Studio	Synchronization Part 1		
25	17 Oct 2022	Lecture	NO CLASS (FALL BREAK)		4.1, 4.2

26	19 Oct 2022	Lecture	Class Project Discussion		
27	20 Oct 2022	Studio	Class Project Discussion		
28	24 Oct 2022	Lecture	Synchronization	Start HW8: Synchronization Part 2	
29	26 Oct 2022	Lecture	Synchronization		
30	27 Oct 2022	Studio	Synchronization Part 2		
31	31 Oct 2022	Lecture	Transceiver	Start HW9: Transceiver Part 1	
32	02 Nov 2022	Lecture	Transceiver		
33	03 Nov 2022	Studio	Transceiver Part 1		
34	07 Nov 2022	Lecture	Transceiver	Start HW10: Transceiver Part 2	
35	09 Nov 2022	Lecture	Transceiver		
36	10 Nov 2022	Studio	Transceiver Part 2		
37	14 Nov 2022	Lecture	SDR Systems	Start HW11: SDR Systems	
38	16 Nov 2022	Lecture	SDR Systems		
39	17 Nov 2022	Studio	SDR Systems		
40	21 Nov 2022	Lecture	Guest Lecture		
41	23 Nov 2022	None	NO CLASS (Thanksgiving Break)		
42	24 Nov 2022	None	NO CLASS (Thanksgiving Break)		
43	28 Nov 2022	Lecture	SDR Group/Class Project		
44	30 Nov 2022	Lecture	SDR Group/Class Project		
45	01 Dec 2022	Studio	SDR Group/Class Project		
46	05 Dec 2021	Review	Review Day		