SYS 662 FUNDAMENTALS OF ELECTRONIC WARFARE
Course Syllabus: Fall 2024

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Office hours: By Appointment
Class Days/Hours: TBD

Description:
This course presents Electronic Warfare (EW) systems fundamentals in practical and in physical terms. This course provides insight into the whole electronic warfare field at the systems and operational level. It addresses important antenna, propagation and jamming equations from the EW perspective. New threats and EW techniques are covered including considerations for EW deployments in multiple domains and in a systems-of-systems distributed network environment.

Course Objectives:
Upon completion of the course, students will be able to:
- use fundamental EW equations for radio propagation, antenna, direction finding, jamming, and probability of intercept
- employ modelling and simulation for Communication, Counter-Communication EW, Radar and Counter-Radar EW
- analyze the design performance of EW Systems in a use case approach
- perform systems trades with the employment of various EW technologies and solutions
- develop skills that are highly valued in the defense and aerospace industries, including problem-solving, critical thinking, and teamwork.

Course Outcomes:
After successful completion of this course, students will be able to:
- articulate EW systems performance through modelling and simulation
- identify architectural limitations of EW system designs
- optimize EW system design performance for a given use case with constrains
- evaluate system design trade offs for new and existing systems
- relate the Voice of the Customer (VoC) to Operational View and System View

Grading Policy / Course Requirements:
Your final grade in the course is determined as follows:

Homework / Assignmnets	20%
Midterm	30%
Final	30%
Project / Paper	20%

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Textbook(s):

- David Adamy, EW 101: A First Course in Electronic Warfare, 1st Edition February 2001, Artech House Radar Library.
- Det 8, ACC TRSS United States Air Force, Electronic Warfare Fundamentals, November 2000, *https://falcon.blu3wolf.com/Docs/Electronic-Warfare-Fundamentals.pdf?force_isolation=true*, Accessed 10 April 2023.
- Avionics Department United States Navy, Electronic Warfare and Radar Systems Engineering Handbook, NAWCWD TP 8347 Fourth Edition, 2013, *https://apps.dtic.mil/sti/pdfs/ADA617071.pdf*; accessed 10 April 2023.

Schedule:

Week	Date			Topic(s)	Homework / Project
1	9/3	-	9/6	EW Overview and Threats	Homework: 1) Online Discussion Question; 2) Install MatLab.
2	9/9	-	9/13	Math for EW	HW - dB and Radio Propagation: Students will solve problems using basic antenna and propagation equations, Fresnel Zone, Knife Edge Diffraction, and the Radar Range Equation.
3	9/16	-	9/20	Antennas	HW – Antennas: Students will solve problems using more advanced antenna and propagation equations
4	9/23	-	9/27	Receivers	HW - Receivers
5	9/30	-	10/4	EW Processing	HW – EW Processing
6	10/7	-	10/11	Search & Probability of Intercept	HW – POI: Students will solve problems on probability of detect given a receiver design and a signal of interest.
7	10/14	-	10/18	Direction Finding	HW - DF
8	10/21	-	10/25	Midterm Exam	
9	10/28	-	11/1	Radar Characteristics	HW - Radar Range Equation & Pulse Compression: Students will solve problems on the Radar Range Equation and Pulse Compression.
10	11/4	-	11/8	Electronic Attack	HW - J/S & Jamming Students will solve problems for J/S to determine Jamming effectiveness, Burn through for multiple types of jamming.
11	11/11	-	11/15	Electronic Protect	Project - M&A Analysis of EW System, Assigned
12	11/18	-	11/22	EW against LPI Signals	HW - LPI & FFT: Students will solve problems for FFT receiver designs
	11/25	-	11/29	Thanksgiving - No Class	
13	12/2	-	12/6	Decoys & Chaff, IR/EO SYSTEMS & CM & Special Topics	HW - Decoy Effectiveness: Students will solve problems with the Decoy Link Equation
14	12/9	-	12/13	Final Exam	