Systems Design
ESI 6553   Section CAMP, OVER, 2FED, 1FE2
Class Periods: M,W,F | Period 7 (1:55 PM - 2:45 PM)
Location: CSE E118
Academic Term: Fall 2023

Instructor:
Dr. Mengyu Li
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(352)-294-6391
Office location: 379 Weil Hall
Office Hours: Fridays 3:00 -4:00 pm (online option available)

Teaching Assistant/Peer Mentor/Supervised Teaching Student:
N/A

Course Description (3 credits)
This course serves as an introduction to systems engineering. It consists of the structured approaches needed to design complex systems. This course introduces basic mathematical techniques for dealing with systems design, and it emphasizes the formulation of systems problems and approaches to their solutions.

Course Pre-Requisites / Co-Requisites
Calculus, linear algebra, basics of statistics, ESI 6314 (waived with instructor consent)

Course Objectives
This course will acquaint students with concepts of systems and the role systems engineering plays in their development. Students will obtain introductory knowledge of the system design process, including conceptual, preliminary, and detailed design requirements, and test and evaluation methods. Students will also develop knowledge of engineering methods for systems design and analysis, and systems safety engineering. The course will also provide introductory knowledge of data mining, sampling, classification, and cluster analysis for systems design decision-making. As this is a project-oriented course, a final project is required.

Materials and Supply Fees
Not applicable

<u>Recommended</u> Textbooks and Software
- Systems Engineering and Analysis, 5th Edition
- Benjamin S. Blanchard, Wolter J. Fabrycky
- Pearson, 2010, 5th Edition
- ISBN-13: 978-0132217354

- How To Do Systems Analysis: Primer and Casebook
- John E. Gibson, William T. Scherer, William F. Gibson, Michael C. Smith
- John Wiley & Sons, 2017, 1st Edition
- ISBN-13: 978-1119179573

Recommended Materials
- Lecture slides will be prepared and distributed by the instructor in advance of discussion sessions
- Supplemental reading materials will be provided by the instructor according to the course schedule.
- An analytical software of your choice: Excel, MatLab, R Studio, etc.

Course Schedule*

This is a <u>tentative</u> outline. The instructor reserves the right to make changes as she sees necessary.

Week	Date	Topic	Activity
1	8/23/2023	Introduction – syllabus, schedule, assignments, exam, etc.	Self-Introduction
	8/25/2023	Module 1 Part 1 – System definition, elements, classification, etc.	
2	8/28/2023	Module 1 Part 2 – System engineering terminology, life cycle, engineering process.	
	8/30/2023	Module 1 Part 3 – System models, evaluation, implementation, outcomes.	
	9/1/2023	Module 1 discussion	
3	9/4/2023	Holiday - Labor Day	HW1
	9/6/2023	Module 2 Part 1 Conceptual design, requirements planning, performance measures, function allocation and analysis, system specs.	
	9/8/2023	Personal introductions	
4	9/11/2023	Module 2 Part 2 – Preliminary design, subsystem function allocation and analysis.	
	9/13/2023	Module 2 Part 3 – Detailed design and development, systems integration.	
	9/15/2023	Module 2 discussion	
5	9/18/2023	Module 3 Part 1 – Test and evaluation: Categories and planning.	Quiz 1
	9/20/2023	Module 3 Part 2 – Goal development: generalizing questions, descriptive vs. normative scenarios, objective trees.	
	9/22/2023	Module 3 discussion & HW1 discussion - Systems design and analysis application.	
6	9/25/2023	Module 4 Part 1 – System design analysis methods.	
	9/27/2023	Module 4 Part 2 – System complexity: Measures, management and decision making.	
	9/29/2023	Module 4 discussion & Quiz 1 discussion	
7	10/2/2023	Midterm Exam review discussion	Midterm
	10/4/2023	Midterm Exam	
	10/6/2023	Holiday - Homecoming	
8	10/9/2023	Module 5 Part 1 – Intro to systems safety: Definition, process, risk assessment methods, hierarchy of controls, cost of risks.	
	10/11/2023	Module 5 Part 1 (cont.)	
	10/13/2023	Exam review & HW2 overview – Systems safety application.	
9	10/16/2023	Module 5 Part 2 - Systems safety: Hazard analysis and control throughout lifecycle.	HW2
	10/18/2023	Module 5 Part 2 (cont.)	
	10/20/2023	Module 5 discussion & HW2 discussion	
10	10/23/2023	Module 6 Part 1 – Intro to data mining for systems design: Motivations, definitions, tasks, example applications, challenges.	Quiz 2
	10/25/2023	Module 6 Part 2 – Data mining: Defining data, attributes, properties, types of sets, quality characteristics, preprocessing.	
	10/27/2023	Midterm discussion & Term project overview	
11	10/30/2023	Module 6 Part 3 – Data sampling: Motivation, types, size, dimensionality, feature selection, discretization, outliers, similarity, distances, correlation, density.	HW3
	11/1/2023	Module 6 Part 3 (cont.)	

	11/3/2023	Module 6 discussion & HW3 overview – Data sampling/preprocessing application.	
12	11/6/2023	Module 7 Part 1 – Focus on classification task: examples and specific techniques. Focus on decision trees, examples, splitting, algorithms, measures of entropy.	
	11/8/2023	Module 7 Part 1 (cont.)	
	11/10/2023	Holiday - Veterans Day	
13	11/13/2023	Module 7 Part 2 – Characteristics and issues in decision tree analysis: Search strategies, data fragmentation, decision boundaries, under/overfitting, classification model evaluation, neural networks.	HW4
	11/15/2023	Module 7 Part 2 (cont.)	
	11/17/2023	Module 7 discussion & HW4 overview – Classification task/decision analysis application.	
14	11/20/2023	Module 8 Part 1 – Cluster analysis: applications, types, examples, K-means, hierarchical, pros and cons.	
	11/22/2023	Holiday - Thanksgiving	
	11/24/2023	Holiday - Thanksgiving	
15	11/27/2023	Module 8 Part 1 (cont.)	Term Project
	11/29/2023	Module 8 Part 2 – Golden rules of systems design	
	12/1/2023	HW4 discussion & term project discussion	
16	12/4/2023	Module 8 discussion & Quiz 2 discussion	Final Exam **12/14/2023 @ 10:00 AM - 12:00 PM**
	12/6/2023	Exam review discussion	

Attendance Policy, Class Expectations, and Make-Up Policy

This course is offered through the UF EDGE program. All lectures will be pre-recorded and made available to all students (EDGE and on-campus). It is expected that students will watch the course lectures in advance of online discussion sessions (at the regularly scheduled class times). Attendance of discussion sessions is not required, but available students are encouraged to attend.

Attendance is required exams online via Canvas Honorlock online proctoring services. Make-up exams will only be arranged in cases of documented family or medical emergencies (Please contact the instructor prior to the exam to discuss any circumstances).

Excused absences must be consistent with university policies in the Graduate Catalog (https://catalog.ufl.edu/graduate/regulations) and require appropriate documentation. Additional information can be found here: https://gradcatalog.ufl.edu/graduate/regulations/

Late Assignment Policy: The assignments are to be submitted on or before the posted due date. Students are responsible for all material presented in each session. Late submission penalty of 25% per day (4 days maximum allowance) will be applied to late submissions. If the grades have been released/assignments have been evaluated, your assignment is excessively late, a zero will be given. **It is your responsibility to visit the course website regularly, read the posted announcements and be aware of assignment submission deadlines and procedures.**

Evaluation of Grades

Assignment	Total Points	Percentage of Final Grade
Homework Sets (4)	25 each	24% (6% each)
Quizzes (2)	10 each	10% (5% each)
Midterm Exam	100	20%
Final Exam	100	26%
Project	100	20%
TOTAL		100%

Grading Policy

Percent	Grade	Grade Points
93.0 - 100.0	A	4.00
90.0 - 92.9	A-	3.67
87.0 - 89.9	B+	3.33
83.0 – 86.9	B	3.00
80.0 – 82.9	B-	2.67
77.0 - 79.9	C+	2.33
73.0 – 76.9	C	2.00
70.0 - 72.9	C-	1.67
67.0 - 69.9	D+	1.33
63.0 - 66.9	D	1.00
60.0 - 62.9	D-	0.67
0 - 59.9	E	0.00

More information on UF grading policy may be found at:
UF Graduate Catalog
Grades and Grading Policies

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 varied perspectives and lived experiences within our community and is committed to supporting the University's core values, including the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of race, creed, color, religion, age, disability, sex, sexual orientation, gender identity and expression, marital status, national origin, political opinions or affiliations, genetic information, and veteran status.

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
• HWCOE Human Resources, 352-392-0904, student-support-hr@eng.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:
<u>Health and Wellness</u>

> **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 support, 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/getting-help/; https://distance.ufl.edu/state-authorization-status/#student-complaint.*