

Human Factors in Systems Design

EIN 4905

Class Periods and Location: M,W,F | Period 8 (3-3:50pm), CSE E122

Academic Term: Spring 2020

Instructor:

Wayne Giang, PhD

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Office Phone Number: 352-294-7729

Office Hours: Monday and Wednesday, 4-5pm

Course Description

This course will provide an understanding of concepts and methods in human factors and applications to human-machine system design. We will consider the system design implications of human cognitive and physical capabilities and limitations in perception, memory, decision-making and motor-control.

Course Pre-Requisites / Co-Requisites

None

Relation to Program Outcomes (ABET):

Outcome	Coverage*
1. Identify, formulate, and solve engineering problems	Medium
2. Apply engineering design ... consideration of public health, safety, and welfare as well as global, cultural, social, environmental, and economic factors	High
3. Communicate effectively with a range of audiences	Medium
4. Recognize ethical and professional responsibilities ... impact of engineering solutions in global, economic, environmental, and societal contexts	
5. Function effectively on a team ... provide leadership, create a collaborative and inclusive environment ...	
6. Develop and conduct appropriate experimentation, analyze, and interpret data ...	High
7. Ability to acquire and apply new knowledge as needed ...	

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

Course Objectives

- Develop knowledge of human factors and ergonomics (hf/e) terminology and issues in design;
- Learn models of human-machine interaction;
- Develop an understanding of basic human factors research methods;
- Learn human capacities in information processing;
- Develop an understanding of approaches to human-systems design and how the principles of human factors can be applied;
- Develop familiarity with a model of human information processing;
- Develop a familiarity with the human factors literature;
- Apply human factors design principles to real-world problems through exercises; and
- Learn outcomes that can be expected from human factors in systems design.

Required Textbooks and Software

- Lee, J.D., Wickens, C. D., Liu, Y. D. & Boyle, L.N. (2017). Designing for People: An Introduction to Human Factors Engineering (3rd Ed.) ISBN: 978-1539808008 (Required).
- Supplemental readings will be provided.

Course Schedule

Course Schedule

Week	Date	Lecture Number	Topic	Readings and Problem Sets
1	M 1/6	1	Course Introduction	Ch 1
	W 1/8	2	Defining Human-Machine Systems and Cognitive Engineering (Introduction assignment assigned)	Woods and Roth, 1988, Cognitive Engineering: Human Problem Solving with Tools
	F 1/10	3	History of human factors	Ch 1
2	M 1/13	4	Research methods: Introduction and methods.	Ch 2
	W 1/15	5	Research methods: Analytic methods	Ch 2
	F 1/17	6	Research methods: Design methods. (Problem set 1 assigned.)	Ch 2 Introduction assignment due
3	M 1/20	7	No Class – MLK Day	-
	W 1/22	8	Research methods: Evaluative methods introduction.	Ch 3
	F 1/24	9	Research methods: Evaluative methods and experiment design.	Ch 3
4	M 1/27	10	Research methods: Experiment design.	Ch 3
	W 1/29	11	Human sensory systems: Vision.	Ch 4
	F 1/31	12	Human sensory systems: Vision. (Problem set 2 assigned.)	Ch 4 Problem set 1 due
5	M 2/3	13	Human sensory systems: Hearing.	Ch 5
	W 2/5	14	Human sensory systems: Hearing.	Ch 5
	F 2/7	15	Human sensory systems: Somatosensory system	Ch 5
6	M 2/10	16	Review and practice problems.	-
	W 2/12	17	Midterm Exam 1	-
	F 2/14	18	Perception to detection: Signal detection theory.	Ch 4, Ch 5
7	M 2/17	19	Perception to detection: Receiver operating characteristic curves (practice problems). (Problem set 3 assigned.)	McNicol, 1972
	W 2/19	20	Perception to detection: Receiver operating characteristic curves (practice problems).	McNicol, 1972
	F 2/21	21	Cognition and Human information processing (HIP): Memory (Problem set 3 assigned.)	Ch 6 Problem set 2 due
8	M 2/24	22	Cognition and Human information processing (HIP): Attention	Ch 6
	W 2/26	23	Cognition and Human information processing (HIP): Examples	Ch 6
	F 2/28	24	Decision-making: Frameworks for study, level of control (Mini-project assigned)	Ch 7
9	M 3/2	-	No class – Spring break	-
	W 3/4	-	No class – Spring break	-
	F 3/6	-	No class – Spring break	-
10	M 3/9	25	Decision-making: Biases and heuristics	Ch 7

			<i>(Problem set 4 assigned.)</i>	Problem set 3 due
	W 3/11	26	Decision-making: Situational awareness, problem solving and diagnostics, scheduling and planning, metacognition	Ch 7
	F 3/13	27	Displays: Principles of display design, displays, maps, visual scanning, visualizations	Ch 8
11	M 3/16	28	Displays: Displays classification, types of displays	Ch 8
	W 3/18	29	Information Theory: Information Theory	Supplementary reading Problem set 4 due
	F 3/20	30	Review and practice problems.	-
12	M 3/23	31	Midterm Exam 2	-
	W 3/25	32	Controls: Principles of control design, Proximity compatibility principle, Hick-Hyman law. <i>(Problem set 5 assigned.)</i>	Ch 9
	F 3/27	33	Controls: Stability, Open and closed loop systems, Fitts's Law Revisited	Chp 9, Fitts 1992 (1954 reprint); MacKenzie (2018)
13	M 3/30	34	Hick-Hyman and Fitts' Law Lab Activity	Fitts 1992 (1954 reprint); MacKenzie (2018)
	W 4/1	35	Safety and accident prevention: Safety culture, error classification <i>(Problem set 6 assigned.)</i>	Ch 16.1, 16.3, 16.5, 16.6 Problem set 5 due
	F 4/3	36	Safety and accident prevention: Applications and examples	Ch 16.1, 16.3, 16.5, 16.6
14	M 4/6	37	Teamwork and organization factors: Social factors, and work organizations	Ch 18.1, 18.2
	W 4/8	38	Selection and Training: personnel selection and training	Ch 17
	F 4/10	39	Human-Action Cycle	Ch. 10.1, 10.3
15	M 4/13	40	Human Automation Interaction	Ch. 11.1-11.4; Lee & See (2004) Problem set 6 due
	W 4/15	41	Review and practice problems.	-
	F 4/17	42	Project presentations	-
16	M 4/20	43	Project presentations	-
	W 4/22	44	Project presentations	Mini-project Due
	F 4/24	45	No Class – Reading Day	-

Evaluation of Grades

Assignments	Points
Problem sets and assignments (7)	35%
Mini-project	15%
Post-class diary + In-class Participation	5%
Midterm exam 1	10%
Midterm exam 2	10%
Final exam	25%

Grading Policy

Percent	Grade	Grade Points
90.0 - 100.0	A	4.00
87.0 - 89.9	A-	3.67
84.0 - 86.9	B+	3.33
81.0 - 83.9	B	3.00

78.0 - 80.9	B-	2.67
75.0 - 79.9	C+	2.33
72.0 - 74.9	C	2.00
69.0 - 71.9	C-	1.67
66.0 - 68.9	D+	1.33
63.0 - 65.9	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:

<https://catalog.ufl.edu/UGRD/academic-regulations/grades-grading-policies/>

Problem sets and Mini-Project

Problem sets cover material discussed during lectures and from the readings. They will consist of short-answer and calculation questions. Problem sets must be completed individually. Please submit your completed problem sets online through Canvas.

The mini-project will consist of an analysis and design activity where you will synthesize and apply your knowledge of the course material to a real-life problem that you encounter in your daily lives. This mini-project is done in teams and all members of the team are expected to contribute equally to the success of the project. Please submit your completed mini-project online through Canvas.

Post-class diary

The diary entries for the week are due at midnight on Saturday. However, it is useful for you to complete these entries as early as possible so that I can incorporate your feedback into our next class and because the material is fresh on your mind. You must complete a diary entry for at least 75% of the lectures to receive full marks.

This is not meant to be a long essay, and point-form is okay. The goal is for you to organize your thoughts about you have learned and provide feedback for me about your understanding.

- **reflect** on what new concepts that you have learned, and how they apply to your own research interests
- include any **outstanding questions** you may have about the class material from that week
- for EDGE students, the diary is also a chance for you to provide any of your thoughts about the discussions and activities that are being done in class; I will provide you with feedback on these comments

Exams

Midterm exams are held during class hours. The final exam will occur during the exam period.

Attendance Policy and Class Expectations

It is important to complete the required readings before your class in order to fully benefit from the class activities. Teaching and learning is a shared responsibility, influenced by individual knowledge and experience, and achieved through expanding our awareness of the different issues and approaches involved in human factors and ergonomics. Commitment, preparation, and active participation are important ingredients to realize this goal. Your preparation and participation is important to your learning and the learning of your colleagues. As such, you should attend and participate in every class.

Make-Up and Regrade Policy

In the case of a series illness or emergency that will result in you missing an exam, please contact the instructor by e-mail as soon as possible. Please provide a written explanation for the missed exam accompanied by a doctor's note, an accident report, or any other relevant documentation. If there is a legitimate emergency or illness then you will either be given a make-up exam within one week of the original exam date, or the final exam score will be substituted for the missing exam score. The choice is left to the instructor.

Please submit all requests for regrading in writing to the instructor within one week of receiving the grade. Late requests will not be accepted. Be as specific as possible about the issue that needs to be addressed in your request; generic requests for regrading the entire assignment or exam will not be accepted. Please be aware that regrades may result in both increases and decreases in your grade as we will regrade the entire component in question.

Assignment Policy

Please make every effort to meet the assignment and problem set deadlines. If you absolutely require an extension, please send the instructor a request with the following information: (i) reason for extension, (ii) current status of the assignment, and (iii) due date requested. If an extension is granted, you must include correspondence regarding the request and the reply with your assignment. In the absence of an extension, late assignments will be accepted for 24 hours after the due date with a 25% deduction.

Communication Policy

Please do not email course content questions directly to the instructor. If you have a question, there is a good chance other people in the course have the same question or, at least, will benefit from the answer. Please post all questions related to course content on E-Learning using the questions discussion board so that everyone in the course can benefit from your questions and the replies. Alternatively, you may include the questions in your lecture learning diary. Questions posted to question discussion board will be answered within two (2) business days.

Students Requiring Accommodations

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, <https://www.dso.ufl.edu/drc>) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure 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.ua.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.ua.ufl.edu/public-results/>.

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/policies/student-honor-code-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.

- Your academic advisor or Undergraduate Program Coordinator
- Robin Bielling, Director of Human Resources, 352-392-0903, rbielling@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@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: <http://www.counseling.ufl.edu/cwc>, 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](mailto:title-ix@ufl.edu), 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 Resource Center, Reitz Union, 392-1601. Career assistance and counseling. <https://www.crc.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://care.dso.ufl.edu>.

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