

ISE/PSY 540 – Human Factors in Systems Design

Spring 2024 Syllabus

Catalog description. Introduction to problems of the systems development cycle, including human-machine function allocation, military specifications, display-control compatibility, the personnel sub-system concept and maintainability design. Detailed treatment given to people as information processing mechanisms.

Detailed course description. ISE 540 is a 3 credit-hours course that aims for you to develop an understanding of human factors / ergonomics and applications of human factors principles in engineering human-machine system design and interaction. The course will consider the implications of human cognitive and physical capabilities and limitations in, for example, perception, memory, decision-making and motor-control, on designing systems for performance and safety. Pre-requisite: ISE452 or PSY340 or have taken courses in introductory human factors; co-requisite: ST507 or ST515.

Course Hours and Location

11:45AM – 1:00PM Tuesday and Thursday
2015 Engineering Building 1

Course Website

<http://wolfware.ncsu.edu/>
ISE 540 uses Moodle.

Course Instructor

Karen Chen, PhD
Email: kbchen2@ncsu.edu
Drop-in office hours: 1:30–2:30PM Tuesday, 4:30–5:30PM Wednesday, or by appointment.
Office: 4349 Fitts-Woolard Hall
Zoom link: <https://ncsu.zoom.us/j/2239793415>

Teaching Assistant (TA)

Naimur Rahman Chowdhury
Email: nchowdh2@ncsu.edu
Drop-in office hours: 10:30AM–11:30AM Monday, 10:30AM–11:30AM Wednesday, or by appointment.
Office: 4101 Fitts-Woodlard Hall, Desk #27
Office hour Zoom meeting ID: 989 6218 4907
Passcode: 319154

The office hours is for all students (both on-campus and EOL). All students, particularly the EOL students, are encouraged to schedule alternative office hours if unable to join the drop-in office hours.

Course Objectives

- Develop knowledge of human factors terminology and approaches to systems design;
- Develop an understanding of fundamental human factors research methods;
- Learn models of human information processing and human-machine interaction;
- Apply principles of human factors to interface (display / control) design;
- 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.

Readings, Textbook and Recordings

- ‡Lee, J. D., Wickens, C. D., Liu, Y. D., & Boyle, L. N. (2017). *Designing for People: An Introduction to Human Factors Engineering (3rd Ed.)*. CreateSpace (Required).
- Supplemental journal articles and readings (posted on Moodle).
- Panopto lecture recordings:
<https://ncsu.hosted.panopto.com/Panopto/Pages/Sessions/List.aspx#folderID=61ba6bf3-b539-495c-9f99-b0d50175b21d>

Communications. Email is the best way reach the instructor and the TA. Please included [ISE/PSY 540] in the email subject to ensure timely attention. Notifications will be sent to the students concerning any adjustments to the class

schedule or changes in due dates, exam schedule or cancellation of class lectures via Moodle Announcement (received via email and on Moodle). You also are encouraged post questions & answers and exchange ideas on the Student Discussion Forum on Moodle. The Student Discussion Forum is monitored by the instructor and the TA; the quality of the post matters, and please respect other when you post.

Captured lectures. This on-campus course will be captured and distributed via the Internet and/or electronic media as part of the EOL Program for the distance students. These video recordings may contain an image of you entering the classroom, asking a question, or being a part of the studio class. Please notify both the instructor and Dr. Linda Krute, Director at EOL (ldkrute@ncsu.edu) in writing if you DO NOT want your image to be included in the lecture presentation. If we do not hear from you after the first week of the class, we will assume that you are in agreement with this procedure.

Assignment: Problem set. You will work on and submit six (6) problem sets (see Course timeline). You are required to submit your own work. They are due at the beginning of class on the day that is identified as “Problem set due”. Please submit your problem set on Moodle by 11:45AM on the day it is due. Each problem set will be worth 35 points.

Assignment: Literature review on human factors. You will conduct a small-scale literature review on a self-selected human factors topic. The goal is to for students to develop a deeper understanding on a specific human factors topic. You will become familiar with developing questions for literature review, identifying appropriate resources for the review, and conducting scientific writing. You will submit (1) a literature review outline, (2) a literature writing progress, (3) a small-scale, completed literature review. You are required to submit individual own work. All submissions will be checked for plagiarism via NC State plagiarism check: <https://www.lib.ncsu.edu/faq/does-library-have-plagiarism-checker>.

In-class activities. There will be four (4) in-class activities that aim to help you better understand the course material. You will work in small groups or individually, depending on activity type, to complete an activity during class time and submit it during class for grading. There will be no make-up for missed in-class activities unless arranged for excused absence in advance (e.g., medical excuse, documented family emergency, or reasons listed on NCSU attendance / excused absence policies). EOL students will submit it on Moodle as soon as you watch the lecture or within 4 days of the in-class activities. Each in-class activity is worth anywhere between 5-15 points, depending on complexity.

Exams. There will be three (3) exams that are pre-scheduled and they rarely deviate from the course schedule. The third exam will be held during the NCSU final exam period with no exceptions. All exams will be graded on a 100-point scale. EOL students are permitted to take an exam \pm 1 day of the on-campus exam. For example, if an exam is on Feb 8 in class, the EOL students can take their exam starting Feb 7 through Feb 9. There will be no make-up for missed exams unless arranged for in advance (e.g., medical excuse, documented family emergency, or reasons listed on NCSU attendance and excused absence policies). A make-up exam must be taken within one (1) week of missing an exam unless personal circumstances do not allow. Anyone not meeting the criteria above will receive a “0” for a missed exam with no exceptions.

Grades. Class grades will not be curved. No extra credit will be offered to individual students to push to the next letter grade. Grades will be calculated by adding the points you earn on each assignment and dividing by the total achievable points. Regarding grading questions, after 24 hours of the assignment / exam has been returned, if you still have questions please send in writing within seven (7) days upon returning the graded assignments.

Grades will be assigned based on a standard NCSU letter grade scale, including “+” and “-”.

A+ (97.5-100%)	B+ (87.5-89.4%)	C+ (77.5-79.4%)	D+ (67.5-69.4%)	F ≤ 59.4%
A (92.5-97.4%)	B (82.5-87.4%)	C (72.5-77.4%)	D (62.5-67.4%)	
A- (89.5-92.4%)	B- (79.5-82.4%)	C- (69.5-72.4%)	D- (59.5-62.4%)	

Breakdown of grades for each assignment type and evaluation are:

Assignments and exams	Points
Problem sets	210 (35 each × 6)
Literature review	120 (35 outline + 35 progress + 50 complete review)
In-class activities	40 total (individual points may vary)
Exams	300 (100 each × 3)
Total achievable points	670

Assignment due date and late submission. All assignments are due at the beginning of class (11:45AM EST) for all students on the specified due date, unless stated otherwise. Points equivalent to one-letter grade will be deducted from late assignments per late day, effective immediately after deadline (e.g., 11:46AM).

Class attendance and participation policies. Attendance is important for success. Stated per NCSU Attendance Regulations, “Full participation in classes, laboratory period and examinations is expected of all students.” Please see <http://policies.ncsu.edu/regulation/reg-02-20-03>

- Repeated or egregious instances of classroom disruption (e.g., arriving late, leaving early, playing on your phone, talking to your neighbor, etc.) will result in referral to the Office of Student Conduct to consider whether student behavior violates the *Code of Student Conduct*.
- The use of computers is permitted in class only for the purpose of studying course materials or performing in class exercises. The use of cell phones during class is not permitted. Any other disruptive behaviors that affect the learning of others is not permitted.

Academic integrity. Students are required to comply with the university policy on academic integrity found in the Code of Student Conduct: <http://policies.ncsu.edu/policy/pol-11-35-01> and <https://studentconduct.dasa.ncsu.edu/code/>

- It is understood and expected that all work turned in under your name is your own work or, if a group assignment, the work of you and your group members, and that you have neither given nor received unauthorized aid. Any plagiarized content and any AI generate content will not receive credit. All submissions will be checked for plagiarism and AI generated content.
- Your signature on any test or assignment indicates, “I have neither given nor received unauthorized aid on this test or assignment.” Any cheating will result in a “0” on that assignment or test.

Dropping courses. If dropping this course becomes necessary, please review the information on *Adding and Dropping Course*: <http://policies.ncsu.edu/regulation/reg-02-20-02>

Auditing. All projects, homework assignments, and exams are integral to the learning experience thus auditing of this class will not be permitted.

Accommodations for disability. Reasonable accommodations will be made for students with verifiable disabilities upon registration with the Disability Resource Office (<https://dro.dasa.ncsu.edu/>), 919-515-7653. Please see the Academic Accommodations for Students with Disabilities for more information: <http://policies.ncsu.edu/regulation/reg-02-20-01/>

Non-discrimination policy. NC State University provides equality of opportunity in education and employment for all students and employees. Policies and regulations covering discrimination, harassment and retaliation may be accessed at <http://policies.ncsu.edu/policy/pol-04-25-05/> or <https://oied.ncsu.edu/divweb/>. Any person who feels that he or she has been the subject of prohibited discrimination, harassment, or retaliation should contact the Office for Institutional Equity and Diversity at 919-515-3148.

Other resources and accommodation. In an effort to affirm and respect the identities of transgender students in the classroom and beyond, please contact the instructor if you wish to be referred to using a name and/or pronouns other than what is listed in the student directory.

The ISE department seeks to create a learning environment that supports a diversity of thoughts, perspectives and experiences while honoring the identities (including but not limited to race, gender, class, sexuality, religion, ability, etc.) of our students. We must acknowledge the inherent dignity and value of every person and strive to maintain a climate for work and learning based on mutual respect and understanding. While we fully support and encourage open expression as a part of the process of academic discourse, we should engage one another with civility, sensitivity and cordiality. In affirming our common humanity, we reject all forms of prejudice, discrimination and bias. These new perspectives deepen our understanding, strengthen our community and propel our innovation. Only through thoughtful engagement can we create an environment of inclusive excellence for all. As faculty, staff and students we will navigate these challenges through dialogue, education, training, and development while adhering to our shared principles and community values.

Course timeline. Spring 2024, Tuesday & Thursday 11:45am – 1:00pm @ 2015 EB 1

Wk	Date	Topic	Assignment	Reading†		
1	T 1/9	Introduction to human factors.		Ch. 1		
	Th 1/11		Post problem set 1			
2	T 1/16	Research methods: classic human factors research methods, experimental design, limitations, and research ethics.		Ch. 3.3–3.8 Papers		
	Th 1/18					
3	T 1/23		Problem set 1 due			
	Th 1/25		Post problem set 2			
4	T 1/30		Human visual and auditory systems (sensory and perceptual).		Problem set 2 due	Ch. 4, 5.1–5.5
	Th 2/1				Lit review outline due	
5	T 2/6	Any remaining time for Exam 1 Q&A session.				
	Th 2/8	Exam 1				
6	T 2/13	Wellness Day – No classes				
	Th 2/15	Human information processing (cognition and decision making): short and long term memory, attention and action.	Post problem set 3	Ch. 6, 7.1–7.4		
7	T 2/20					
	Th 2/22					
8	T 2/27	Signal detection theory: receiver operating characteristics curves.	Problem set 3 due	Ch. 4.4		
	Th 2/29		Post problem set 4			
9	T 3/5	Information theory: Hick and Hyman studies, relation to Fitts’ Law, applications (cont. to next class).		Paper		
	Th 3/7	Automation interactions to support human cognitive capacity.	Problem set 4 due	Paper		
10	T 3/12	Spring Break (March 11–15) – No classes				
	Th 3/14					
11	T 3/19	Automation interactions (cont.)	Lit review progress due	Paper		
	Th 3/21	Any remaining time for Exam 2 Q&A session.	Exam 2			
12	T 3/26	Display and control (D/C): principles of display design, classifications, controls and inputs.	Post problem set 5	Ch. 8, 9		
	Th 3/28		In-class D/C pres			
13	T 4/2	Human-computer interaction and usability evaluations.		Ch. 2.4, 3.1–3.2, 10.1, paper		
	Th 4/4	Human motor performance: motor control theory, Fitts’ Law.	Problem set 5 due	Paper		
14	T 4/9	Macroergonomics and intro to sociotechnical systems theory.	Post problem set 6			
	Th 4/11					
15	T 4/16	Design for disability: needs and capabilities of individuals with disability, relationship between aging and disability, and experience of those with disability.	Problem set 6 due	Ch. 18.4, paper		
	Th 4/18					
16	T 4/23	Any remaining time for Exam 3 Q&A session.	Complete literature review due 5:00PM (submit on Moodle)	Paper		
	Final	T 4/30	Final Exam: 12:00PM - 2:30PM in 2220 in 2015 Engineering Building 1			