

# Industrial Engineering 340/Psychology 358: Human Factors

University of Illinois at Urbana-Champaign  
Department of Industrial and Enterprise Systems Engineering  
Spring 2019

## Course Description

Introduction to human factors and ergonomics, covering topics of human information processing, physiological and biomechanical functioning, and implications for design of the workplace and jobs in that workplace. The field of Human Factors and Ergonomics (HFE) is interdisciplinary, with applications wherever humans interact with equipment in a system context. Examples will be drawn from manufacturing, medicine, aerospace, ground transportation, and computer interaction. Students will learn an overview of HFE principles and understand how they fit into engineering design and analysis. Typical design and operational problems in work domains, as well as their HFE solutions, will be highlighted. Students will apply HFE principles to design problems. Also, the course will seek to improve the teamwork, written and oral presentation skills of each student.

**Credits:** 4

## Schedule:

Lectures: Mondays and Wednesdays, 8:30-9:50am,  
218 Ceramics Building  
Laboratories: Thursdays, either 9-9:50, 10-10:50 or 11-11:50am,  
L440 (Linux) Digital Computer Laboratory (DCL)

## Instructor:

Dr. Abigail R. Wooldridge  
Office: 209A Transportation Building  
Lab: 2311/2313 DCL  
Email: [arwool@illinois.edu](mailto:arwool@illinois.edu)  
Phone: 217-300-8086  
Office Hours: Mondays and Wednesdays, 1-2pm in DCL 2311, or by appointment

## Teaching Assistant:

Nitin Tangellamudi  
Email: [tangell2@illinois.edu](mailto:tangell2@illinois.edu)  
Office Hours: Fridays, 12-2pm in TB 215 or DCL 2311 (to be updated)

## Course Goals:

1. Demonstrate the relevance and importance of human factors and ergonomics in society and industry.
2. Increase your interest and awareness of human factors and ergonomic issues in and outside of work.
3. Illustrate how to recognize and identify human factors and ergonomics problems.
4. Provide you with basic concepts, tools and methods to solve these problems.

## Course Outcomes:

1. Identify human factors and ergonomic problems.
2. Use appropriate biomechanical, cognitive, physiological formulas to analyze/solve human factors and ergonomic problems.
3. Use organizational ergonomics (macroergonomics) concepts and theories to analyze/solve human factors and ergonomics problems.
4. Use anthropometric data in design.
5. Prepare human factors and ergonomics analysis reports.

## Course Prerequisites:

PSYC 100, PSYC 103 (not necessary, updating system), or consent of instructor.

**Textbook:**

"Designing for People: An Introduction to Human Factors Engineering"  
 (3rd edition, August 31, 2017)  
 Editors: J. D. Lee, C. D. Wickens, Y. Liu, and L. N. Boyle.  
 Publisher: CreateSpace Independent Publishing Platform  
 ISBN-10: 1539808009; ISBN-13: 978-1539808008

**Course website:** <https://compass2g.illinois.edu>

Course materials such as syllabus, handouts, notes, assignment instructions, etc. can be found on the Compass 2g Learning management system course website at <https://compass2g.illinois.edu>. You are responsible for regularly checking the course site as well as your email and compass messages to learn of any updates. Lab assignments will also be submitted via Compass.

Note: Class material is copyright to the University of Illinois at Urbana-Champaign and should not be distributed or disseminated.

**Grading Scale: Straight (i.e., no +/-)**

90% and up: A            80% - 89%: B            70% - 79%: C            60% - 69%: D            below 59%: F

**Grade Determination**

- 25% in-class exercises/"quizzes": Every Wednesday except the week of the midterm and the last week, so there are 13 total in the semester and your grade is based on the top 10. Thus, each exercise (of your top 10) is 2.5% of your final grade.
- 20% labs/homework: Happens every week except the week before the midterm, so there are 13 total in the semester and your grade is based on the top 10. Sometimes you do the whole thing in the lab; if you cannot finish during the lab section, it is due by the beginning of the following Monday lecture. Thus, each assignment (of the top 10) is 2% of your final grade.
- 10% Midterm Exam
- 10% Final Exam
- 3% Student bio – based on turning in your student bio by 12pm Thursday of the first week (3%)
- 2% come to my office hours during the first three weeks of class (slots of 5 minutes will be available during regularly scheduled office hours plus extra time to accommodate students as needed).
- 30% Project – 5 page maximum written report and poster presentation equally weighted (each component worth 15%). Additional details below with more to be provided.

Item	Points out of Maximum Points	
In-class Exercises/Quizzes	Sum of top 10 scores	out of maximum 25 points
Labs/homework	Sum of top 10 scores	out of maximum 20 points
Midterm Exam	Score	out of maximum 10 points
Final Exam	Score	out of maximum 10 points
Student Bio Survey	3 points	out of maximum 3 points
Come to office hours in first three weeks of class	2 points	out of maximum 2 points
Project	Score	out of maximum 30 points
<i>Extra Credit (optional)</i>	<i>Extra credit points will be available over the course of the semester as described below; additional opportunities may be announced during class</i>	
Final Grade	Summation of all of the above, out of max 100 points	

**Extra Credit:**

You can earn 0.5 extra credit point (to be added on to your final grade, i.e., worth 0.5% extra) by coming to my or Nitin's office hours any week other than the first three weeks to *have a conversation* (can be about this course, it could be about HFE in a broader sense, career advice, life advice, etc.). This can be repeated each

week, except for spring break and after the last day of class, for a total of 6 extra credit points over the course of the semester. Other opportunities for extra credit may be announced in class throughout the semester.

### Project:

Projects are to be done in teams of 2-3 or individually. The project will be one of your own design. However, the project topic and design must be approved by the instructor. Deadline for topic approval and more details will be announced at a later date. Expectations are that the project is representative of the knowledge, tools, and techniques obtained in this course. To govern these criteria, each report should be done as if it was to be submitted to the Human Factors and Ergonomics Society (HFES) conference. The project has two components:

1. **Written report:** Reports will be written as a technical document using proper spelling and grammar (i.e. technical writing). The structure will be done in *HFES Annual Meeting paper* format. Reports should be typed and formatted in style of conference of submission. The report will be worth 50% of the total project points. Report submission is due on the last Monday of class and includes two parts:
  - a. IN CLASS: a hard copy of the report
  - b. ELETRONIC: a copy of the report word document & poster
2. **Posters presentations:** The last two days of class will be presentations (half of the class will go on the Monday, half on Wednesday – each half should bring their posters to their respective day). Poster sessions will be given in a gallery format. Poster presenters will stand by their posters to field questions from faculty, staff, and students. Posters are to be submitted at the end of the gallery session. Poster printing is responsibility of the student(s). **(NOTE: Posters printing is available through Beckman for ~\$36 – do not leave printing until the last minute. Let me know if you anticipate printing cost will be problematic so we can find a solution in advance.)**

### Email policy

Please check the syllabus and Compass2g before asking questions. When sending an email, observe the following rules or professionalism:

- Title the email “**IE340 – (subject of your email)**” in the subject line. This prevents your email from going to the junk folder.
- Maintain [professional etiquette](#), including a respectful greeting, and clear, polite body of the email.
- Frame your question clearly and professionally. Include all relevant information about what you need up front.
- Email in advance. Allow 48 hours for a response.

### Expectations for course meetings

- Participate in class discussions, contribute individual experiences when relevant to the topic so that others can benefit and learn
- Ask questions...there is no bad question if you learned something from the response
- Maturity and respect for others is mandatory (see statement on diversity).
- Cell Phones should be turned off at the beginning of class unless you are emergency personnel on-call. Activation or use of a cell phone will be penalized.
- Use other electronic devices (tablets, laptops, etc.) for course-related purposes only. Do not bring any electronic devices to exams.
- Take individual responsibility for completing assignments on time.
- Check e-mail and Compass frequently (just not in class)
- All readings should be completed prior to class (except for first day, but those need to be done before the first lab).
- Lecture notes will be available in the “Lectures” tab prior to class. I recommend you bring them (printed or otherwise) to help you take notes.
- Class begins and ends on time. Arriving late or leaving early may result in missed points on the exercise.

### **Absences and make up/late assignments**

- Attendance and participation are expected as part of the course. Missing a class will result missing any quiz/participation points for that period.
  - A request for excuse (sickness) must include appropriate documentation from the Office of the Dean of Students, **but is rarely granted due to dropping 3 lowest grades on in-class exercises/quizzes and labs.**
- Make-up for examinations and presentations must have absence letter from the Office of the Dean of Students (<https://odos.illinois.edu/community-of-care/resources/students/absence-letters/>).

### **Academic Integrity**

As a student it is your responsibility to refrain from infractions of academic integrity, from conduct that may lead to suspicion of such infractions, and from conduct that aids others in such infractions. A short guide to academic integrity issues may be found at [www.provost.illinois.edu/academicintegrity/students.html](http://www.provost.illinois.edu/academicintegrity/students.html). The authoritative source is the Student Code (<http://studentcode.illinois.edu/>). If you are unsure whether a situation may violate Academic Integrity, you can visit <https://engineering.illinois.edu/online/current-students/policies/academic-integrity.html> for examples or ask me for clarification.

I will enforce the university's standards of Academic Integrity. All alleged infractions will be documented in the campus-wide FAIR database and investigated, and all committed infractions will result in sanctions.

### **Accommodations for Individuals with Disabilities**

To obtain disability-related academic adjustments and/or auxiliary aids, students with disabilities must contact the course instructor and the Disability Resources and Educational Services (DRES) as soon as possible **during the first week of the course**. To contact DRES, you may visit 1207 S. Oak St., Champaign, call 333-4603, e-mail [disability@illinois.edu](mailto:disability@illinois.edu) or go to the <http://www.disability.illinois.edu/>. If you are concerned you have a disability-related condition that is impacting your academic progress, there are academic screening appointments available on campus that can help diagnosis a previously undiagnosed disability by visiting the DRES website and selecting "Sign-Up for an Academic Screening" at the bottom of the page.

### **Additional University Resources**

If you are interested in obtaining information to improve writing, study skills, time management or organization, the following campus resources are available to all students:

- Writer's Workshop
  - Undergrad Library
  - 217-333-8796
- <http://www.cws.illinois.edu/workshop>
- <https://www.disability.illinois.edu/strategies>
- <http://www.counselingcenter.illinois.edu/self-help-brochures/>

Also, most college offices and academic deans provide academic skills support and assistance for academically related and personal problems. Links to the appropriate college contact can be found by going to this website and selecting your college or school: <http://illinois.edu/colleges/colleges.html>

If you are experiencing symptoms of anxiety or depression or are feeling overwhelmed, stressed, or in crisis, you can seek help through the following campus resources:

Kenneth L. Nafziger, PhD  
Embedded Counselor in Engineering, Licensed Psychologist  
210-A5 Engineering Hall

Counseling Center  
206 Student Services Building  
7:50 a.m.-5:00 p.m., Monday through Friday

Last updated: January 3, 2019

Phone: 217-333-3704

McKinley Mental Health  
313 McKinley Health Center  
8:00 a.m.-5:00 p.m., Monday through Friday  
Phone: 333-2705

McKinley Health Education offers individual consultations for students interested in learning relaxation and other stress/time management skills, call 333-2714.

### **General Emergency Response Recommendations**

Emergency response recommendations can be found at the following website: <http://police.illinois.edu/emergency-preparedness/>. I encourage you to review this website and the campus building floor plans website within the first 10 days of class. <http://police.illinois.edu/emergency-preparedness/building-emergency-action-plans/>. Check out campus safety video and be sure to join Illini Alerts.

### **Family Educational Rights and Privacy Act (FERPA)**

Any student who has suppressed their directory information pursuant to *Family Educational Rights and Privacy Act* (FERPA) should self-identify to the instructor to ensure protection of the privacy of their attendance in this course. See <https://registrar.illinois.edu/academic-records/ferpa/> for more information on FERPA.

### **Sexual Misconduct Policy and Reporting**

The University of Illinois is committed to combating sexual misconduct. Faculty and staff members are required to report any instances of sexual misconduct to the University's Title IX and Disability Office. In turn, an individual with the Title IX and Disability Office will provide information about rights and options, including accommodations, support services, the campus disciplinary process, and law enforcement options. A list of the designated University employees who, as counselors, confidential advisors, and medical professionals, do not have this reporting responsibility and can maintain confidentiality, can be found here: <https://wecare.illinois.edu/resources/students/#confidential>.

### **Statement on Diversity and Inclusion**

The diversity of the participants in this course is a valuable source of ideas, problem solving strategies, and engineering creativity. If you feel that your contribution is not being valued for any reason, please speak with me privately. If you wish to communicate anonymously, you may do so in writing. We are all members of an academic community where it is our shared responsibility to cultivate a climate where all students/individuals are valued and where both they and their ideas are treated with respect. Developing and maintaining that climate is part of the expectations for this course. If you have made it this far paying attention, thank you. Email me before the second class, using the correct subject line format with your name in the subject line to receive 1 extra credit point.

## Schedule

Week	Day	Date	Lecture/Lab	Topic	Reading	Due	
1	Mon	1/14/19	Lecture	Course organization, overview of HFE (key concepts and goals) examples of good/bad design	T: 1-15		
	Wed	1/16/19	Lecture	Vision	T: 85-103	Quiz 1	
	Thu	1/17/19	Lab	Lab 1: Examples of bad design on campus		Student Bio due via compass at 12p	
2	Mon	1/21/19	<b>MLK Day! No class</b>				
	Wed	1/23/19	Lecture	Vision Search and perception	T: 103-111	Lab due via compass at 8:30a Quiz 2	
	Thu	1/24/19	Lab	Lab 2: Vision			
3	Mon	1/28/19	Lecture	Auditory processes Note: last day to add a class	T: 123-141	Lab due via compass at 8:30a	
	Wed	1/30/19	Lecture	Noise and hearing protection	T: 131-135	Quiz 3	
	Thu	1/31/19	Lab	Lab 3: Noise and hearing		Office hours visit due by 2/1/2019	
4	Mon	2/4/19	Lecture	Anthropometry	T: 389-405	Lab due via compass at 8:30a	
	Wed	2/6/19	Lecture	Workspace design	T: 405-417	Quiz 4	
	Thu	2/7/19	Lab	Lab 4: Computer workstation design			
5	Mon	2/11/19	Lecture	Biomechanics and NIOSH	T: 419-439	Lab due via compass at 8:30a	
	Wed	2/13/19	Lecture	Environmental stressors	T: 479-485	Quiz 5	
	Thu	2/14/19	Lab	Lab 5: Anthropometry and NIOSH lifting equation		Project topic due via Compass at 12p	
6	Mon	2/18/19	Lecture	Work physiology	T: 449-476	Lab due via compass at 8:30a	
	Wed	2/20/19	Lecture	Cumulative trauma	T: 439-445	Quiz 6	
	Thu	2/21/19	Lab	Review for exam, technical writing refresher (no lab assignment).			
7	Mon	2/25/19	Lecture	<b>Midterm exam!</b>		No lab due!	

NOTE: Schedule subject to change with fair notice, check "Announcements" on Compass for updates.  
Last updated: January 3, 2019

Week	Day	Date	Lecture/Lab	Topic	Reading	Due	
	Wed	2/27/19	Lecture	Memory and attention	T: 161-199	No quiz!	
	Thu	2/28/19	Lab	Lab 6: Memory and attention			
8	Mon	3/4/19	Lecture	Decision making	T: 201-228	Lab due via compass at 8:30a	
	Wed	3/6/19	Lecture	Signal detection and warnings	T: 111-117	Quiz 7	
	Thu	3/7/19	Lab	Lab 7: decision making Note: last day to drop without grade of W is tomorrow (3/8/19)! Early feedback			
9	Mon	3/11/19	Lecture	Displays	T: 243-279	Lab due via compass at 8:30a	
	Wed	3/13/19	Lecture	Controls	T: 283-302	Quiz 8	
	Thu	3/14/19	Lab	Lab 8: Fitts Law and Control Theory		Project paper outline due via Compass at 12p if you want feedback	
10	Mon	3/18/19	<b>Spring break! No class</b>				
	Wed	3/20/19					
	Thu	3/21/19					
	Mon	3/25/19					
11	Mon	3/25/19	Lecture	Job evaluation and design (including work system model)	T: 17-47, 74-75	Lab due via compass at 8:30a	
	Wed	3/27/19	Lecture	Stress/workload	T: 485-499	Quiz 9	
	Thu	3/28/19	Lab	Lab 9: work system analysis			
12	Mon	4/1/19	Lecture	Scheduling and shift design	T: 500-506	Lab due via compass at 8:30a	
	Wed	4/3/19	Lecture	Work study	Readings on compass	Quiz 10	
	Thu	4/4/19	Lab	Lab 10: work study			
13	Mon	4/8/19	Lecture	HCI	T: 323-355	Lab due via compass at 8:30a	
	Wed	4/10/19	Lecture	Automation	T: 357-387	Quiz 11	
	Thu	4/11/19	Lab	Lab 11: software usability evaluation			

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Last updated: January 3, 2019

Week	Day	Date	Lecture/Lab	Topic	Reading	Due	
14	Mon	4/15/19	Lecture	Accidents and errors	T: 511-546, readings on compass	Lab due via compass at 8:30a	
	Wed	4/17/19	Lecture	Teams	T: 581-604	Quiz 12	
	Thu	4/18/19	Lab	Lab 12: accident investigation			
15	Mon	4/22/19	Lecture	Contemporary issues in HF/E	Readings on compass	Lab due via compass at 8:30a	
	Wed	4/24/19	Lecture	Contemporary issues in HF/E	Readings on compass	Quiz 13	
	Thu	4/25/19	Lab	Lab 13: repeat lab 1 with reflection			
16	Mon	4/29/19	Lecture	Group 1 presents posters		Lab due via compass at 8:30a Electric copies of project report and poster presentation due via Compass Hard copies of group 1 posters due	
	Wed	5/1/19	Lecture	Group 2 presents posters Last day of class!		Hard copies of group 2 posters due	
	Thu	5/2/19	Reading day! No class				
17	Wed	5/8/19	<b>Final Exam: 1:30-4:30 p.m.</b>				

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