

## Human Factors and Ergonomics

EIN 3241

**Class Periods:** M, W, F, Period 3, and 9:35 AM -10:25 AM

**Location:** FLG 0245

**Academic Term:** Fall 2024

### **Instructor:**

**Name:** Suman K. Chowdhury, Ph.D.

**Email Address:** [sk.chowdhury@ufl.edu](mailto:sk.chowdhury@ufl.edu)

**Office Phone Number:** 352-294-7731

**Office Hours:** Mondays 3:30 PM - 4:30 PM and Wednesday 2:30 PM-3:30 PM

**Office Location:** Weil 0417

### **Teaching Assistant/Peer Mentor/Supervised Teaching Student:**

Please contact through the Canvas website

- Gustavo M. Paulon, [gmarinpaulon@ufl.edu](mailto:gmarinpaulon@ufl.edu), Weil 446.
- TBA

### **Course Description**

Introduces the techniques/concepts to understand users and workplace requirements for the design of sociotechnical systems. Topics covered include methods for work measurement, human cognitive and physical capabilities and limitations, and workplace requirements. Applications for design, including computer displays, noise, repetitive, and high physical effort tasks, are presented.

### **Course Pre-Requisites / Co-Requisites**

Statics (EGM2511)

### **Course Objectives**

At the conclusion of this course, students will be able to:

- Describe the meaning and importance of human factors and ergonomics
- Relate cognitive and physical capabilities and limitations of human to the design of human-machine systems
- Select and correctly use appropriate work measurement, human-machine system analysis, and design tools
- To be able to identify and modify task characteristics that enhance human performance, efficiency, and safety in workplaces.
- Apply human-machine system design principles to real-world problems through exercises

### **Materials and Supply Fees**

None

### **Relation to Program Outcomes (ABET):**

This course contributes to ensuring that the following program educational objectives of our BSISE program are met: Within 5 years of graduation, BSISE graduates...

- Are successful professionals using industrial and systems engineering skills;
- Acquire advanced knowledge through continuing education or advanced degree programs;
- Are active leaders in their profession and/or community.

Outcome	Coverage*
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	High
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	Medium
3. An ability to communicate effectively with a range of audiences	

4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts	Medium
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	Low
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	Medium

### **Required Textbooks and Software**

The instructor developed course notes from various published sources, including the books recommended in the following section.

### **Recommended Materials**

- 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.
- *Fundamentals of Industrial Ergonomics*, Second Edition, B. Mustafa Pulat, ISBN-13: 978-0881339499
- Katrin Kroemer Elbert, Henrike Kroemer, Anne D. Kroemer Hoffman. (2018). *Ergonomics*. 3<sup>rd</sup> Ed. ISBN: 9780128132968
- Published articles in various journal and government agency sources.

### **Required Computer**

UF student computing requirement: <https://news.it.ufl.edu/education/student-computing-requirements-for-uf/>

### **Online Resources**

Most of the material for this class will be available on E-learning. It is, therefore, crucial that you know how to use E-learning efficiently. *In particular, the course is classified into multiple modules in which you can find lecture notes, assignments, and supplemental reading materials.* In addition to that, there are various folder categories, which are self-explanatory.

- 1. Project:** Contains any documents related to the project.
- 2. Syllabus:** Contains the syllabus for this class or any other documents regarding the course.
- 3. Modules and Files:** Contains any documents on class notes, lectures, PowerPoint presentations in pdf format. In additionally a helpful material folder that contains book chapters and other online reading resources that will help you to develop your fundamentals in human factors and ergonomics class.
- 4. Assignment:** Contains the statements/solutions to the homework assignments.
- 5. Exam:** This section contains information related to the exams and the exam review samples. This includes the rules that will be enforced during the exams.

There are also four tools that you will find handy to use.

- 1. Announcements:** These will contain time-sensitive important reminders or clarifications about the class. It is the student's responsibility to make sure to read the announcement actively.
- 2. Mail:** This allows you to send e-mail to the instructor/TA and/or to other students of the class. It is very easy to use and is the preferred way to communicate with the instructor/TA.
- 3. Grades:** Contains the grades you obtained for the class so far. If you observe a discrepancy between the grade you got on paper and the grade given in E-learning, you should directly contact the TA. Also, contact the TA if you have no grade on E-learning for an assignment returned to you.
- 4. Zoom:** The instructor and TA "may" have online classes for *some of the classes* to interact with students. The link of zoom meeting will be available on Canvas.

### **Class Communication Policy**

All communications related to the course are preferred to be made on E-learning. When possible, these announcements will be reiterated in class. Students are, therefore, responsible for checking **E-learning regularly for possible updates**. If you have a question, use of the following ways to communicate it:

**Discussion board:** There is a good chance other people in the class 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. Questions posted to the question discussion board will be answered within two (2) business days.

**During class meetings:** The best moment to ask a question about something you do not understand is probably during the class meetings. If you experience a problem, it is likely that other students will experience the same problem too.

**Office hours:** You can stop by anytime during the office hours of the instructor and TA. When you come to office hours or to an appointment, you should come prepared. You should have a list of specific problems you would like the instructor or the TA to answer.

**E-mail:** Very often, the questions you have are brief and do not require very long answers. If this is the case, you can send your questions by E-mail (copy both instructor and TA), clearly mentioning in the header that it is a question regarding EIN 3241.

**Appointments:** In university-approved extraneous situations, you are allowed to schedule an appointment with the instructor online. These appointments must be arranged by E-mail (copy both instructor and TAs). Include in your E-mail a list of time slots that are convenient for you. The more flexible the time slots you give, the quicker you will receive help. Please be aware that we will not make an appointment outside of regular workdays/hours.

### **Course Schedule (Tentative)**

Week	Week	Lecture Topics	Homework Due Dates	Module
1	Friday, August 23	Course Introduction		
2	Monday, August 26	Introduction to Human Factors and Ergonomics. Ergonomics Basics.		1
	Wednesday, August 28	Human-in-the-loop model.		
	Friday, August 30	Engineering Anthropometry (Homework 1 assigned.)		2
3	Monday, Sept 2	<b>Holiday</b>		
	Wednesday, Sept 4	Engineering Anthropometry		
	Friday, Sept 6	Engineering Anthropometry (Homework 2 assigned.)	Homework 1 Due @ 9:35 am	
4	Monday, Sept 9	Research Methods		3
	Wednesday, Sept 11	Design Methods		
	Friday, Sept 13	Evaluation Methods, Project Assignment; <b>Guest lecture</b> (Homework 3 assigned.)	Homework 2 Due @ 9:35 am	
5	Monday, Sept 16	Biomechanics Basics		4
	Wednesday, Sept 18	Biomechanics	Project formation is due @ 11:59 pm	
	Friday, Sept 20	Biomechanics; Cumulative Trauma Disorders (Homework 4 assigned.)	Homework 3 Due @ 9:35 am	
6	Monday, Sept 23	Work Physiology		5
	Wednesday, Sept 25	Metabolic Energy Expenditure		
	Friday, Sept 27	Metabolic Energy Expenditure (Homework 5 assigned.)	Homework 4 Due @ 9:35 am	

7	Monday, Sept 30	Psychophysical tools; NIOSH Equation		6
	Wednesday, Oct 2	NIOSH Equation		
	Friday, Oct 4	Midterm Exam Review (Homework 6 assigned.)	Homework 5 Due @ 9:35 am	
8	Monday, Oct 7	<b>Midterm Exam (Modules: 1 – 5)</b>		
	Wednesday, Oct 9	Work Measurement: Work Sampling		7
	Friday, Oct 11	Work Measurement: Time and Motion Study	Homework 6 Due @ 9:35 am	
9	Monday, Oct 14	Work Measurement: Time and Motion Study		
	Wednesday, Oct 16	Work Measurement: Time and Motion Study (Midterm Exam Return and Discussion) (Homework 7 assigned.)		
	Friday, Oct 18	<b>Homecoming Day</b>		
10	Monday, Oct 21	Sensory Ergonomics		8
	Wednesday, Oct 23	Sensory Ergonomics		
	Friday, Oct 25	Sensory Ergonomics (Homework 8 assigned.)	Homework 7 Due @ 9:35 am	
11	Monday, Oct 28	Environmental Ergonomics		9
	Wednesday, Oct 30	Environmental Ergonomics		
	Friday, Nov 1	Environmental Ergonomics (Homework 9 assigned.)	Homework 8 Due @ 9:35 am	
12	Monday, Nov 4	Lab Visit		
	Wednesday, Nov 6	Project Updates – 1		
	Friday, Nov 8	Project Updates – 2	Homework 9 Due @ 9:35 am	
13	Monday, Nov 11	<b>Holiday</b>		
	Wednesday, Nov 13	Cognitive Ergonomics	Team evaluation - 1 is due	10
	Friday, Nov 15	Cognitive Ergonomics (**Homework 10 assigned.)		
14	Monday, Nov 18	Cognitive Ergonomics	Project Report Due @ 9:35 am	
	Wednesday, Nov 20	Cognitive Ergonomics	Team evaluation - 2 is due	
	Friday, Nov 22	Final Exam Review	Homework 10 Due @ 9:35 am	
15	Monday, Nov 25	<b>Thanksgiving Holidays</b>		
	Wednesday, Nov 27			
	Friday, Nov 29			
16	Monday, Dec 2	Project Presentation		
	Wednesday, Dec 4	Project Presentation		
	Friday, Dec 6	No Class – Reading Day		
17	Tuesday, Dec 12 @ 12:30 PM – 2:30 PM	<b>Final Exam (Modules 6 – 10)</b>		

*\*\*Homework 10 will contain problems covered in Week 14, too.*

*This tentative syllabus was designed keeping in mind the human factors, ergonomics, and work design topics necessary to pass the fundamentals of engineering (FE) for Industrial and Systems Engineering exam:*

<https://ncees.org/wp-content/uploads/FE-Industrial-and-Systems-CBT-specs.pdf>

### **Administrative Issues**

- Class will begin promptly. Please let the instructor know in advance if you plan to miss a class.
- While in class, please silence your digital devices and turn off all music-listening devices.

- It is the student’s responsibility to bring a calculator to all class lectures.
- It is the student’s responsibility to pick up/check graded assignments and exam papers in a timely manner.
- All exams are allowed (1) 8.5 x 11 inch. study sheet. Using unauthorized aids on exams will result in a grade of zero; additional penalties may follow.
- The instructor reserves the right to amend this syllabus as needed.
- To achieve excellent grades, students are highly recommended to attend classes, participate in class discussions, and attempt homework and group projects at an advanced time.

**Important Dates**

- <Sept 13> *Project Assignment*
- <Sept 18> *Team Formation is due*
- <Oct 7> *Midterm Exam is @ 9:35 am – 10: 35 am in FLG 0245*
- <Nov 13> *Team Evaluation – 1 is due @ 9:35 am*
- <Nov 18> *Project Report is due @ 9:35 am*
- <Nov 20> *Team Evaluation – 2 is due @ 9:35 am*
- <Dec 2 & 4> *Project Presentation is @ 9:35 am in FLG 0245*
- <Dec 12> *Final Exam is @ 12:30 PM – 2:30 PM in FLG 0245*

**Evaluation of Grades**

Assignment	Total Points	Percentage of Final Grade
Homework Sets (10)	100 each	20%
Project Report (1)	100	20%
Project Presentation (1)	100	5%
Midterm Exam	100	25%
Final Exam	100	30%
		100%

**Grading Policy**

Final Grades will be based on classroom participation, exams, projects, and homework assignments and it will be rounded off to the nearest integer, and assigned on the standard scale as follows:

Percent	Grade	Grade Points
93.4 - 100	A	4.00
90.0 - 93.3	A-	3.67
86.7 - 89.9	B+	3.33
83.4 - 86.6	B	3.00
80.0 - 83.3	B-	2.67
76.7 - 79.9	C+	2.33
73.4 - 76.6	C	2.00
70.0 - 73.3	C-	1.67
66.7 - 69.9	D+	1.33
63.4 - 66.6	D	1.00
60.0 - 63.3	D-	0.67
0 - 59.9	E	0.00

More information on UF grading policy may be found at:  
<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

**Regrading Policy**

Requests for regrading of exams will be considered only with a written explanation and only within a one-week period from the time graded work is returned in class. Specifically, you need to write an email and explain what specifically you want regraded and why you believe the original grade was incorrect. The instructor will get back to you within a week. Grades will be posted on the course page on Canvas.

### **Attendance Policy and Class Expectations**

Attendance is not required; however, it is strongly recommended. It will be to your benefit to attend all lectures. Students will be responsible for **all** material covered in class.

### **Exam and Make-Up Policy**

To assess student learning, students will be given two Exams. Although a tentative schedule is given for the midterm exam, we may change the date based on the progression of the class lecture. The final date of the midterm exam will be announced one week in advance. The date and time for the final exam is final. The midterm exam will be based on lectures covered under modules 1 – 5 and the final exam will be based on lectures covered under modules 6 – 10. Missing an exam without substantial **PRIOR** notification will result in a zero grade for that exam. No make-up exam is allowed except for unanticipated absences **ONLY** (e.g., illness with a doctor’s report, death in family, but **NOT** for Employment interviews, employer events, weddings, vacations, etc). Excused absences must be consistent with university policies in the undergraduate catalog (<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>) and require appropriate documentation. If you missed an exam due to a health problem, you will need to provide documentation that indicates the date of the visit. A note indicating that you were seen at the health center the day of the exam is not sufficient documentation of a medically excused absence from an exam. The note must say that you were medically unable to take the exam. In case of an exam conflict, you will need to present evidence of the conflict to the instructor ONE week prior to the exam.

### **Homework Policies**

Homework is due at the **start of a class (9:35 am)** on each stated due date. Each homework is worth 2.0 points of the total. Homework turned in after the stated due date and time is considered late. Homework assignments late on the same due date will be graded out of 80 points; homework assignments submitted 24 – 48 hours beyond the due date and time will be graded out of 70; beyond 48 hours will receive zero. These policies on late homework submission will be strictly followed unless the instructor is coordinated with in **advance due** to excuses that are consistent with the university policies (<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>).

### **Project-related Policies**

The project (and report format) will be assigned in the classroom by September 13. The project report does not have any page limit or restriction. The project report is due by November 18 at 9:35 am and the project presentation will occur on December 2<sup>nd</sup> and 4<sup>th</sup> in regular class time in the classroom. The presentation **must be at most** 10 slides, and the total duration **must** not be more than 8 minutes. The project report must be submitted in **MS Word**. The instructor will use plagiarism checker software to compare texts for all project reports. Students bridging any academic dishonesty/cheating would face punishment as per university guidelines.

The project requires students to form a team. Students are encouraged to form their teams by the beginning of September (by September 18) and **e-mail** the team’s name and team member’s information to the instructor and TAs at the earliest convenience. Each team can have a maximum of six members. Each team should elect a team leader for all correspondences with the instructor and TA. The following format should be followed.

Team name	Member 1	Member 2	.	.	.		Member 6
Name							
Major							
Level							

To ensure that each team member contributes equally to the team discussion, team meetings, and project report and presentation, this class requires each member to rate other members. Each team member will rate their fellow team members based on the following criteria, where 1 and 5, respectively, refer to poor and very satisfactory contributions.

	Attend team meeting	Contribute towards project report	Contribute towards project work	Complete assigned task on time	Contribute to the concept development	Average
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Member 1	5	4	5	3	3	4.00
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.						
.						
Member 6	3	3	2	1	4	2.60

The instructor will incorporate the average rating of team member’s evaluation to calculate his/her final project report grade. Nevertheless, the instructor reserves the right to make the final decision on an individual member’s performance and contribution if any conflict arises with team member’s evaluations. A team is required to provide this evaluation criteria on two separate dates—one is on Wednesday, November 13 by 11:59 PM, and the other one is on Wednesday, November 20, by 11:59 PM. The individual group evaluation should directly be sent to the instructor and the TA. Any conflict within a group must be reported by 11:59 PM, November 14.

Further guidelines on the project report and the evaluation criteria for the project presentation will be provided in the class (and posted on the canvas).

**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.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/>.

**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 Undergraduate Coordinator
- HWC OE Human Resources, 352-392-0904, [student-support-hr@eng.ufl.edu](mailto:student-support-hr@eng.ufl.edu)
- Pam Dickrell, Associate Dean of Student Affairs, 352-392-2177, [pld@ufl.edu](mailto:pld@ufl.edu)
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, [nishida@eng.ufl.edu](mailto: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:***

#### ***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](mailto: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](mailto: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](mailto:Learning-support@ufl.edu).  
<https://elearning.ufl.edu/>.

**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>.