Stevens Institute of Technology
EM533-Human Factors in Engineering

Instructor:
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Course meeting: Monday 3:00-5:30pm, Edwin A. Stevens 229A
Office Hours: Thursday 1-3 pm, By appointment

Catalog Description:
This course provides introduction to human factors concepts including physical, cognitive and macro ergonomics and their applications. The students will learn how to design for people-machine interaction, including an introduction to the relevant underlying human sciences, theory, data, and measurement problems in human information processing, anthropometry, training and industrial safety.

**Please note: This class is reading intensive. **

Course Objectives:

This course aims to:

1. Analyze and evaluate Human Factors (HF) problems

2. Identify, interpret, and synthesize HF methods and approaches for its pros and cons

3. Analyze, Understand and apply HF methods in real life problems

4. Apply the techniques, skills, and modern human factors engineering tools necessary for designing human-machine, human systems interaction as well as understand capabilities of human beings as user of the system.

List of Course Outcomes:

1) Understand how people fit into technological systems

2) Recognize the limits of human perceptual-motor capabilities.

3) Recognize the limits of human cognitive functioning and why people make errors.

4) Assess workstation and task design for ergonomic deficiencies.

5) Define safety hazards and general approaches for their control.

6) Define the ethical application of human factors in designing products and processes.

Textbook(s) or References:

There is no required textbook for this class. A packet of articles will be provided, and additional readings will be distributed as needed. Most reading assignments will be from the following recommended textbooks

-Wickens, C. D., Lee, J. D., Liu, Y., & Becker, S. E. G. (2004). An Introduction to Human Factors Engineering (2nd ed.). Prentice Hall.

-Salvendy (Ed.), (2006) Handbook of Human Factors and Ergonomics (3rd ed). John Wiley and Sons

-Carayon, P. (Editor) Handbook of Human Factors and Ergonomics in Health Care and Patient Safety, Lawrence Erlbaum Associates, Hillsdale, NJ, 2007. ISBN: 0805848851

Instruction:
We will meet weekly at the class time in person. For some weeks, we may meet over the zoom if we need to. The course has different parts as explained below. Each student is expected to participate in discussions and show they have read the assigned papers for the week.

Grading:
- Class participation (10%)
- Assignments (Weekly reading summary/ Leading Discussion) (30%)
- Midterm Application Project (25%)
- Final Project (Presentation+ Report) (35%)

CLASS ACTIVITIES AND ASSESSMENT METHODS:

1. **First part: Lectures** These are 1 hour presentations given by the instructor or invited expert, most often a faculty member from within or outside the university. These lectures introduce the concept of the week's topic. These lectures will include an interactive Question and Answer session with the presenter.
2. **Second part: Weekly readings and Student-led discussions.** Each week, 2 readings are selected by the faculty instructor. These reading are the critical part of the class, since rest of the class time will be spent on student led discussions based on these readings. Unannounced quizzes may be administered to check whether the readings were understood. *(Readings materials will be uploaded to canvas 5 days before the class)*
3. **Student-led discussions. *** Each student will be assigned a paper to lead the in-class discussion. They may propose to supplement to assigned readings. The student is responsible for conducting a critical, constructive, and interactive discussion of the week's topic and readings. Students leading discussions are expected to have given additional thought to the topic. Discussion leaders are encouraged but not required to prepare supporting materials, including presentation slides, figures, tables, demonstrations, and summary documents.

Other students will join the discussion with the questions/comments they prepare as a part of weekly assignment.

4. **Weekly Assignments:** It is important that you prepare for class in order to be an effective participant and to contribute to the discussion. Read all assigned readings before class. You have to submit your weekly reading summary before the class in canvas. The format is below

FORMAT:
- MS-Word document
- Minimum of 1 page (Max 1,5 page)
- 1,5 spacing
- 12 point Times
- 1-inch margins
- Run the spell checker and check the English.

OBJECTIVE: Show me that you have read the research papers and thought about them. If it is not clear you really read the material, I cannot give you an A. If it is not clear you have really thought about the material, I cannot give you an A. Make it easy for me to see that you have done both.

5. Midterm Application Project/Case study (TBA)

6. Final Design Project/Presentation (TBA)

Attendance policy
Students are expected to attend every class (part of evaluation). However, it is understood that there may be times when absences are unavoidable, such as illness. For every absence, the student must 1) read all assigned articles and book chapters, 2) prepare a 3-page document addressing key points in the readings, points of discussion, and responses to these discussion points, 3) email this paper to me (on the Friday before the class to be missed for a planned absence or within a week after the class for an unplanned absence), and 4) speak with another student about the in-class discussion. I will also record the zoom sessions (if we do it) so you will have the opportunity to catch up with the lecture part.

Notes on seminar
a. Students assume responsibility for the quality of weekly discussion. This means doing the readings, preparing your thoughts, and actively participating in discussion.
b. Ground rules and best practices for discussion:
- Be respectful.
- Listen!
- Try not to cut off others; try to let others take turns; try to make eye contact with your fellow classmates.
- Take notes – these will help you during and after the discussion.
- Don't go off on long monologues. Let everyone talk.

- Respond to one another – build on what one another is saying.
- Either "jump in" or raise your hand to be heard. I will help "direct traffic" but all participants are responsible for
- The strongest arguments are based on scientific evidence. Your experiences are also evidence, but of a different sort.
- Be active. Think, ask, suggest, question, hypothesize, brainstorm, summarize, reflect, assert, challenge, and connect (to other work). If students are not participating, I may put them on the spot. If for some reason you are uncomfortable talking in class, please see me about alternative activities.

c. Except for lectures at the beginning of the class time, I will not give lectures. Instead, I will facilitate discussion, provide interpretation of what I am hearing or try to connect the discussion with the relevant literature, and otherwise add to the discussion. I will ask questions or offer ideas as a way to provoke your thinking, sometimes playing "devil's advocate," but this should not be interpreted as "instructing" you how to think.

d. Attend to both strengths and weaknesses of the readings. Critiquing the methods, theories, and other aspects of a reading is of some value, but can distract us from learning from the readings.

e. When leading the discussion:
- Strongly consider doing additional readings beyond what is assigned!
- Provide a short introduction to the topic and readings (rule of thumb: less than 10 minutes). It is okay to use powerpoint and handouts, but not required.
- Have discussion questions ready. Plan to lead off discussion with a question or exercise.
- Facilitate the subsequent discussion (I will help, too). Take notes to help you.

f. Because you have to be present to discuss, you should minimize absences. Multiple absences will be penalized; if unable to attend class for some reason, please speak to me about make-up assignment options.

g. To avoid disrupting class discussion and to maximize class flow, show up on time. If tardiness becomes a problem, additional rules and penalties will be imposed.

h. I will add other suggestions here as the semester progresses.

Additional Links on Human Factors Engineering

*http://www.hf.faa.gov/Portal/default.aspx. Awesome website with descriptions of over 300 human factors tools, web tutorials.
☐ *www.useit.com Extremely practical set of HFE links, articles, tools, and tidbits – especially as applied to computer systems. Operated by leader in the field, Jakob Neilsen, with several commentaries and lay press reports.
*http://www.fda.gov/cdrh/humanfactors/ Fantastic web site about applying practical human factors tools and principles to device and software design. "Do it By Design" is especially good primer on HFE process (free download).
*http://www.hf.faa.gov/Webtraining/Usability/usability1.htm Nice web-based HFE training. Designed by FAA human factors professionals for all the people in the FAA that build or buy devices and software (e.g., air-traffic control software).
http://usability.gov/basics/index.html
http://www.stcsig.org/usability/resources/toolkit/toolkit.html
Human Factors and Ergonomics Society. www.hfes.org

International Ergonomics Association. www.iea.cc
ACM/Special interest group on computer human interaction (SIGCHI) sigchi.org
Usability Professionals Association www.upassoc.org
Information Architecture Institute/ newsletter iainstitute.org
HCI Bibliography < http://www.hcibib.org/>
(Jesse James Garrett's) Information architecture resources jjg.net/ia/
Information Design resources/newsletter www.boxesandarrows.com
Usability First www.usabilityfirst.com

Course Schedule

WEEK 1: September 11th
Topic: Course overview, Introduction to Human Factors and Ergonomics and HF in Healthcare

WEEK 2: September 18th
Topic: HF in Digital Health/MHealth/ Health Information Technologies

WEEK 3: September 25th
Topic: Human Information Processing (Cognitive Ergonomics)
Introduce Midterm project

WEEK 4: October 2rd
Topic: Mental Workload, Situation Awareness and Technology Acceptance

WEEK 5: October 10th (Tuesday class)
Topic: Guest Lecturer

WEEK 6: October 16th
Topic: Midterm Project Presentations/Report Submission

WEEK 7: October 23th
Topic: Anthropometry, Physical Ergonomics

WEEK 8: October 30st
Topic: HF in User Centered Design

WEEK 9: November 6th
Topic: Usability and Usability Testing 1

WEEK 10: November 13th
Topic: Guest Lecturer (Chao Shi, Evaluation Methods in HF)

WEEK 11: November 20ˢᵗ
Topic: Usability and Usability Testing 1

WEEK 12: November 27ᵗʰ
Topic: HF in Automation and AI

WEEK 13: December 4th
Topic: Teams, Communication, Training, Selection

WEEK 14: December 11th
Topic: Final Project Presentations

WEEK 15: December 18th
Topic: Final Reports due