Human Factors Engineering for Health Informatics- INFO B626

Fall

Course Info
3 Credit hours

Location
Class

Prerequisites:
None

COURSE DESCRIPTION
In this course, students review and critique traditional and emerging human factors engineering approaches, concepts, and methods and apply them to contemporary health informatics problems. Class activities include discussions and interactive peer review of articles, presentations, and original research proposals.

EXTENDED COURSE DESCRIPTION
In this highly participatory advanced seminar course, classic and emerging human factors engineering approaches, concepts, and methods are reviewed, critiqued, and applied to contemporary health informatics issues. Example human factors engineering topics include automation, cognitive task analysis, field research methods, human information processing, process redesign, product design, safety science, team cognition, usability engineering, user-centered design, work system models, and workflow assessment. Health informatics applications areas include consumer health informatics, clinical decision support, health data visualization, learning health systems, technology-enabled care coordination, team-based care, patient/family engagement, technology implementation and evaluation, change management, and simulation. Class activities include interactive discussions and peer review of articles, presentations, and original research proposals. Students enrolled in 3 credits develop and present a research project, formulated as a peer-reviewed proposal.

Communication policies:
These policies are intended to minimize lost or delayed e-mails. They are not meant to create a barrier between you and your instructor.

1) If possible, use your instructor’s actual e-mail instead of writing through Canvas.
2) Your email should contain the course number in the subject line (no space, no dash). This is done so that your e-mail is flagged for your instructor’s attention.
3) Attend office hours or make an appointment if you wish to speak to the instructor in person. Phone- or Skype-based appointments are acceptable but must be made by appointment. Note that your instructor may not be able to accommodate evening or weekend meetings.
Rationale: Human factors engineering is the scientific and practice-based discipline concerned with studying and improving work performance in sociotechnical systems. Human factors engineering is listed as a core competency area for medical and nursing informatics graduate programs (Gardner et al., 2009; Kulikowski et al., 2012; Staggers & Thompson, 2002). It is, therefore, acknowledged as a key topic in biomedical informatics education by the accrediting body for health informatics education programs (AMIA, CAHIIM) and the American Board of Medical Specialties (ABMS) offering certification in the medical informatics specialty. Furthermore, human factors engineering and the affiliate disciplines usability engineering and human-computer interaction are promoted in national and global reports on the future of health, healthcare, and health information technology (Institute of Medicine, 2000, 2012; National Research Council, 2009; World Health Organization, 2000).


For more on human factors engineering:

http://www.hfes.org/Web/EducationalResources/HFEdefinitionsmain.html (Human Factors & Ergonomics Society)


TEXTBOOKS AND READINGS

This course does not use a textbook. Weekly course readings of articles, chapters, proceedings papers, and reports are assigned and posted on Canvas. Course readings are selected at the start of the semester from: 1) human factors engineering scholarly works and 2) literature in the area of health informatics. Each week, about 2–3 readings are assigned.

Students are expected to complete the readings and come prepared to discuss them. *Not doing so hurts every single learner in the class and defeats the purpose of a graduate-level, discussion-based seminar course.* Students not completing readings or unprepared for to discuss them will be asked to withdraw from the class.

The full schedule of readings is created over the course of the semester and reflects student topic selections.

REQUIRED SOFTWARE

None.

STUDENT LEARNING OUTCOMES

<table>
<thead>
<tr>
<th>Upon completion of the course, the student will</th>
<th>Revised Bloom’s</th>
<th>PGPL</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Apply human factors engineering, including its principles and subspecialties.</td>
<td>3</td>
<td>1</td>
<td>Project, Quiz</td>
</tr>
<tr>
<td>2. Evaluate a health informatics problem using human factors engineering concepts and methods.</td>
<td>5</td>
<td>2</td>
<td>Paper, Project, Quiz, Reflection</td>
</tr>
<tr>
<td>3. Critique scientific articles and other readings on human factors engineering.</td>
<td>5</td>
<td>2</td>
<td>Paper, Reflection, Leading, Discussion</td>
</tr>
<tr>
<td>4. Synthesize knowledge from different areas of human factors engineering to solve a contemporary health informatics problem.</td>
<td>5, 6</td>
<td>2</td>
<td>Paper, Project</td>
</tr>
<tr>
<td>5. Develop and communicate a research study proposal to apply human factors engineering to a contemporary health informatics issue.</td>
<td>6</td>
<td>2</td>
<td>Paper</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>----------</td>
<td>-------------</td>
<td>-------------</td>
</tr>
<tr>
<td>1. Weekly readings</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Mini lectures</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Discussion / reflection</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>4. Lead discussion</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>5. Work-in-progress</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>6. Class paper</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>7. Class project</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

Principles of Graduate and Professional Learning (PGPL)

Learning outcomes are assessed in the following areas:

1. Knowledge and skills mastery (K&S) Moderate emphasis
2. Critical thinking and good judgment (CT) Major emphasis
3. Effective communication (EC) Some emphasis
4. Ethical behavior (EB)

GRADING

Grade calculation:

- Paper (× 3) 30%
- Project (× 2) 20%
- Quiz (× 6) 20%
- Reflection paper (× 13) 20%
- Weekly discussions (× 16) 5%
- Leading discussions (× 8) 5%

Grading Scale:

- A+ 97 – 100 Outstanding achievement, given at the instructor’s discretion
- A 93 – 100 Excellent achievement
- A– 90 – 92.99 Very good performance and quality of work
- B+ 87 – 89.99 Good performance and quality of work
- B 83 – 86.99 Modestly acceptable performance and quality of work
- B– 80 – 82.99 Marginal acceptable performance and quality of work
- F Below 80 Unacceptable work (Course must be repeated for credit)

No credits toward major, minor, or certificate requirements are granted for a grade below B–.
TOPIC 1

Topic: What is Human Factors?

Readings:

TOPIC 2

Topic: What is Consumer Health Information Technology/eHealth?

Readings:

TOPIC 3

Topic: Work Systems Models

Readings:

TOPIC 4

Topic: Workflow Research and Field Research Methods

Readings:


TOPIC 5

Topic: Implementation, Adoption, and Acceptance

Readings:


TOPIC 6

Topic: Macrocognition

Readings:


TOPIC 7

Topic: User-Centered Design

Readings:

TOPIC 8

Topic: Online Patient Education

Readings:

TOPIC 9

Topic: Distributed Cognition

Readings:

TOPIC 10
**Topic: Cognitive Workload**

**Readings:**


**TOPIC 11**

**Topic: Expertise**

**Readings:**


**TOPIC 12**

**Topic: Naturalistic Decision Making**

**Readings:**

TOPIC 13

Topic: Resilience Engineering / Safety II

Readings:


ADDITIONAL TOPICS

- Human factors field work methods in emerging settings
- Emerging topics in sensing, augmented reality, and virtual reality
- Technologies spanning personal and clinical computing
- Health and the Web
- Individual and team situation awareness
- Human-system integration
- Physical ergonomics issues and product design
- Cognitive task analysis
- Cultural ergonomics
- Health literacy and numeracy in the context of human factors engineering
- Automation and trust in sociotechnical systems
- Social networks and social network analysis
- HCI models for health information technology

CLASS ACTIVITIES AND ASSESSMENT METHODS:

1. **Weekly readings and quizzes.** These pair 1) human factors engineering scholarly works on a given topic with 2) either an application of human factors engineering to the topic or a publication describing a health informatics problem to which the human factors engineering topic can be applied. Each week, approximately 2–3 readings are selected by the instructor or Discussion Leader, as described below. Unannounced quizzes are administered to check whether the readings were understood.

2. **Mini lectures.** These are 10–20 min. presentations given by the instructor or invited expert, most often a faculty member from within or outside the university. Mini lectures introduce either 1) a novel topic, theory, or method from human factors engineering or related field or 2) a health informatics topic or problem to which human factors engineering can be applied. Mini lectures will include an interactive question and answer session with the presenter.

3. **In-class discussion and reflection papers.** These are facilitated discussions between students and instructor in which participants discuss the content of readings, connect readings to prior readings and class activities, apply the readings to health informatics topics, identify strengths and weaknesses of assigned readings and the theories or methods they describe, identify opportunities for answering additional research questions or solving problems, and engage other relevant concepts, findings, or works from various disciplines.
Pass/fail written reflections are solicited from each student prior to class to enhance discussion.

4. **Student-led discussions.** Students self-assign a week to lead the in-class discussion. They may propose to supplement or replace assigned readings. The student or team of students is responsible for conducting a critical, constructive, and interactive discussion of the week’s topic and readings. Discussion leaders review classmates’ reflection papers prior to class and use these to facilitate discussion. Students leading discussions are expected to have given additional thought to the topic and will often benefit from completing additional readings. Discussion leaders are encouraged but not required to prepare supporting materials, including presentation slides, figures, tables, demonstrations, and summary documents.

5. **Work-in-progress (WIP) sessions.** Some weeks will be designated WIP sessions. For these, a student or team of students will present their work for feedback from classmates and course instructor(s). The presentation will be informative and professional, but need not describe a completed project. Completed projects may only be presented to obtain feedback on future directions, quality of the presentation (e.g., when preparing to present the work at a professional meeting), or preparation of publications. WIP presenters may assign supporting readings or provide a draft for feedback. Classmates will provide feedback and participate in an interactive Question and Answer session.

6. **Class papers.** Papers are designed to meet all learning objectives, but especially to apply human factors engineering to health informatics in a valid and thought-out manner. Students may collaborate on papers but are held to higher standards if choosing to do so. Students are strongly encouraged to pick a paper format that will be useful outside of the course, such as a peer-reviewed publication, proposal, technical report, introduction to empirical paper, etc.

7. **Class projects.** Projects are developed over the course of the semester and should address at least one human factors engineering topic to be covered during the semester. Projects components will vary but are proposed by the student and approved by the instructor. Students must present their projects. Presentations are to be graded by instructor(s) and student peers. Teamwork is permitted.

**Notes on advanced graduate courses**

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 the occasional 10–20 minute mini-lectures, 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. Both discussion leader(s) and non-leaders will write pre-class reflections and will post these to Canvas under the appropriate discussion thread. These will be graded and will be due by a pre-class deadline: **24 HOURS prior to class start time**.
g. 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.
h. 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.
i. After class, you may want to continue the discussion. You are free to do this in any way you like, including via Canvas discussion forums. Sometimes discussion will carry over from class to class and we will return to various discussion threads along our semester-long journey.
j. I will add other suggestions here as the semester progresses.

**EXPECTATIONS, GUIDELINES, AND POLICIES**

**Statement on graduate-level coursework:**

In accordance with IUPUI policies and expectations, a 3:1 workload is expected for three-credit, graduate-level courses. On-average, in addition to 3 hours in-class, this course should take approximately 12 - 15 hours per week. This workload will increase dramatically before assignments are due. This translates to a significant commitment of time each week. A graduate course is the equivalent of a rigorous, part-time job (15+ hours per week). Plan accordingly, pace yourself, and frontload your workflow."

**Attendance:**

A basic requirement of this course is that you will participate in all class meetings, whether online or face-to-face, and conscientiously complete all required course activities and assignments. Class attendance is required for classroom-based courses. It entails being present and attentive for the entire class period. Attendance shall be taken in every class. If you do not sign the attendance sheet while in class, you shall be marked absent. Signing the attendance sheet
for another student is prohibited. The instructor is required to submit to the Registrar a record of student attendance, and action shall be taken if the record conveys a trend of absenteeism.

Only the following are acceptable excuses for absences: death in the immediate family (e.g. mother, father, spouse, child, or sibling), hospitalization or serious illness; jury duty; court ordered summons; religious holiday; university/school coordinated athletic or scholastic activities; an unanticipated event that would cause attendance to result in substantial hardship to one’s self or immediate family. Absences must be explained with the submission of appropriate documentation to the satisfaction of the instructor, who will decide whether missed work may be made up. Absences that do not satisfy the above criteria are considered unexcused. To protect your privacy, doctor’s excuses should exclude the nature of the condition and focus instead on how the condition impacts your attendance and academic performance.

If you miss class due to an excused or unexcused absence, you are still responsible for that week’s work. However, because much of the work occurs during in-class discussion, students missing class must:

- Send the instructor a complete but concise set of notes and discussion points ahead of the class session (if the absence is anticipated) OR
- Send the instructor a 5-page discussion paper on the readings within 48 hours of the end of class (if the absence is unanticipated)

Missing class reduces your grade through the following grade reduction policy: You are allowed two excused or unexcused absences. Each additional absence, unless excused, results in a 5% reduction in your final course grade. More than four absences result in an F in the course. Missing class may also reduce your grade by eliminating opportunities for class participation. For all absences, the student is responsible for all covered materials and assignments.

Incomplete:

The instructor may assign an Incomplete (I) grade only if at least 75% of the required coursework has been completed at passing quality and holding you to previously established time limits would result in unjust hardship to you. All unfinished work must be completed by the date set by the instructor. Left unchanged, an Incomplete automatically becomes an F after one year. http://registrar.iupui.edu/incomp.html

Deliverables:

You are responsible for completing each deliverable (e.g., assignment, quiz) by its deadline and submitting it by the specified method. Deadlines are outlined in the syllabus or in supplementary documents accessible through Canvas. Should you miss a class, you are still responsible for completing the deliverable and for finding out what was covered in class, including any new or modified deliverable. In fairness to the instructor and students who completed their work on time, a grade on a deliverable shall be reduced 10%, if it is submitted late and a further 10% for each 24-hour period it is submitted after the deadline.