Department of Psychology, College of Liberal Arts
Rochester Institute of Technology

PSYC 719
Human Factors in Artificial Intelligence
SYLLABUS

Prof. Rantanen, Fall Semester 2022 (2221)

August 21, 2022

This syllabus is subject to change during the semester. Please see myCourses for up-to-date information about course schedule, readings, and assignments.

1 Course Information

1.1 Meeting Time and Place

Wednesdays 1:00–1:50 PM in George Eastman Hall (EAS)-4287

1.2 Instructor Information

Name: Esa M. Rantanen, Ph.D.
Office: Eastman Hall (EAS)–2353.
Office hours: Wednesdays 12 noon–1:00 PM; also by myCourses discussion topic "General Course Questions", email, and in exceptional cases via Zoom (scheduled by email).
Email: esa.rantanen@rit.edu, **tel.** (585) 475-4412.

1.3 Course Texts

1. Shneiderman, B. (2022). *Human-Centered AI*. Oxford University Press. ISBN: 978-0-19-284529-0

2. Original articles and handouts will be assigned for supplementary readings on most of the topics covered in this class. Please see myCourses website for reading assignments and PDF copies of the papers.

1.4 Course Description

This course will provide students with fundamental information for human-centered design of applications of artificial intelligence. There are three parts to the course. The first part is about methods of design and evaluation. The second part introduces students to the psychology of sensation and perception, memory, attention, judgment, decision-making, and problem solving, as well as human error and reliability. Finally, students will become familiar with design principles as they apply to displays and controls, human-computer interaction, human-automation interaction, and human-centered automation. Guest lectures and case studies will be examined to illustrate topics covered in it and to provide a survey of the current state of AI research, development, and controversies.

Ethics and moral responsibility in technology development, with links to current policy debates, are also discussed in this context. **Prerequisite:** Instructor approval; no co-requisites.

This course is also *required* for the **AWARE-AI NRT** trainees. For more information about the AWARE-AI NR, please see: `https://www.rit.edu/nrtai/`.

2 Course Mechanics

This course combines readings on human-centered AI (Shneiderman, 2022) with selected topics in human factors. In addition, students are expected to bring their own, individual knowledge and experience on AI to the course and integrate them with the prepared course materials.

Each week of the course starts on Monday AM and ends on Sunday at midnight and has four elements:

1. Readings from the Shneiderman (2022) book and other assigned readings;
2. Human factors topics with a brief handout on their most important elements;
3. A reflections writing assignment;
4. A Weekly Q&A forum

2.1 Readings

We will read the Shneiderman (2022) book in this course with chapters from it assigned for each week. Additionally, I have prepared brief handouts about the most important human factors topics for you. We will also read several original articles throughout the course. It is very important that you read *all* assigned materials *prior* to our only weekly meeting so that you come prepared to discuss and apply what you learn from the readings.

2.2 Human Factors Topics

We will cover several topics fundamental to the human factors discipline over the semester. I will have a brief handout for you on each topic and expect to spend most of our weekly class session explaining them to you and answering your questions about them. Given the very limited time together we have this semester, integration of the course materials will be left primarily to you, in the weekly reflections.

2.3 Weekly Reflections

You are expected to reflect on the materials presented each week and share your reflections with your classmates in myCourses discussion forum. These reflections should integrate materials from all the readings each week as well as from your existing interests and knowledge in your individual areas of scholarship (with references!). Please keep these reflections brief (<500 words, excluding references), to the point, and use language that is clear to a broad audience with diverse backgrounds (i.e., your classmates). You should also discuss each others' reflections here.

2.4 Weekly Q&A

We will extend the very short time together each week (merely 50 min) with this myCourses forum. There will be no specific discussion prompts provided, but you should feel free to post *any* questions

you may have here for me to answer, *any* special insights you may have to the readings, and also engage in discussions with your classmates.

3 Learning Outcomes

In addition to introduding the concept of Human-Centered AI and selected topics from the human factors discipline to the students, this course has been designed to provide the students with education and practice with several essential tasks and *skills* to further their careers in AI. Therefore, the students should learn to:

1. Identify methods of evaluation of cognitive aspects of human-technology interfaces to reduce human error, optimize mental workload, and enhance health, comfort, safety, effectiveness, and efficiency;
2. Identify theories and models of human performance applicable to design of hardware and software products and tasks and task environments, including functions, information displays, interactions, communication modalities etc., within the system and human constraints and capabilities and task context to enable individuals and groups to accomplish a particular set of goals;
3. Critically read and evaluate different materials from different sources and integrate their contents in a concise, systematic, and coherent manner;
4. Communicate effectively and clearly articulate their understanding of different topics in brief written reflections and online discussions.

4 Course Policies

4.1 Academic Accommodations

RIT is committed to providing academic adjustments to students with disabilities. If you would like to request adjustments such as special seating or testing modifications due to a disability, please contact the Disability Services Office. It is located in the Student Alumni Union, Room 1150; the website is `www.rit.edu/dso`. After you receive adjustment approval, it is imperative that you see me during office hours so that we can work out whatever arrangement is necessary.

4.2 Academic Integrity

As an institution of higher learning, RIT expects students to behave honestly and ethically at all times, especially when submitting work for evaluation in conjunction with any course or degree requirement. The Department of Psychology encourages all students to become familiar with the RIT Honor Code and with RIT's Academic Integrity Policy; please review them here:

RIT Honor Code: `https://www.rit.edu/academicaffairs/policiesmanual/p030`
RIT Academic Integrity Policy: `https://www.rit.edu/academicaffairs/policiesmanual/d080`

4.3 Absences

Please review RIT's official policy on attendance (RIT Governance Policy D4.0, Section I.B) `https://www.rit.edu/academicaffairs/policiesmanual/d040`. If a student needs to miss class, there are mutual responsibilities for students and faculty:

1. It is the student's responsibility to notify the faculty member in advance of the planned absence.

2. With advance notice of the planned absence, it is the faculty member's responsibility to ensure that the student can fulfill all class assignments and expectations without penalty or bias.

5 Expectations and Grading

Because this is only a one credit hour course, the expectations are quite modest. You are expected to read the assigned materials and reflect on them in the weekly reflections. Participation in the weekly Q&A forum is voluntary and depends on the questions and insights you may have about the course materials. Of course, I hope for your active participation in all the course activities for you to get the most our of this semester.

5.1 Grading Scheme

The grading scheme for these course components is as follows:

Course Component	Proportion of Course Grade
In-class participation	30%
Weekly reflections	70%
Total	100%

The letter grade distribution reflects the new refined grading system (i.e., "plus/minus grading" scheme) adopted by RIT this academic year:

Percent Score	Letter Grade	Points toward GPA
93.00–100.0	A	4.00
90.00–92.99	A-	3.67
87.00–89.99	B+	3.33
83.00–86.99	B	3.00
80.00–82.99	B-	2.67
77.00–79.99	C+	2.33
73.00–76.99	C	2.00
70.00–72.99	C-	1.67
60.00–69.99	D	1.00
< 60.00	F	0.00

6 Tentative Course Schedule

The weekly coverage might change as it depends on the progress of the class. The chapters refer to the course text (Shneiderman, 2022). Note that reading assignments will be specified for each week in greater detail in myCourses. Make sure that you check myCourses regularly for current assignments and Q&A for each week.

Week	Dates	Topics, Readings, Labs
1	Aug 22–28	Introductions, Human Factors, Human-Centered AI
2	Aug 29–Sep 4	Design methods in HF; Ch. 1–2
3	Sep 5–11	Evaluation methods in HF; Ch. 3–5
4	Sep 12–18	Experimental research; Ch. 6–7
5	Sep 19–25	Human visual system; Ch. 8–10
6	Sep 26–Oct 2	Human auditory, vestibular, and tactile systems; Ch. 11–12
7	Oct 3–9	Information processing models of cognition; Ch. 13–14
	Oct 10-11	**Fall Break**
8	Oct 12–16	Human memory; Ch. 15–17
9	Oct 17–23	Models of attention; Ch. 18–19
10	Oct 24–30	Decision-making; ; Ch. 20–21
11	Oct 31–Nov 6	Situation awareness; Ch. 22–23
12	Nov 7–13	Displays; Ch. 24–25
13	Nov 14–20	Controls; Ch. 26–27
	Nov 23–27	**Thanksgiving Holiday**
14	Nov 28–Dec 4	Human-automation interaction

7 Supplementary Readings

All supplementary readings will be provided as PDF copies in the myCourses website, under the "Content" tab. Additional readings may be assigned as necessary to gain the required competence on the course topics. Please refer to myCourses regularly for up-to-date reading assignments and PDF copies of the readings.

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APPENDIX TO SYLLABUS

Prof. Rantanen, Fall Semester 2022 (2221)

August 26, 2022

A few more words about this course. This is the first time this course is offered. It is a brand-new design. As far as I know, a course *like* this has never been offered at RIT, and probably not even anywhere else. Hence, I hope that you agree to make this course a collaborative effort, where your participation is essential not only for the learning outcomes, but for the future success of this course as well.

I have organized the course around three major components. We will read a new book about *human-centered AI* by Ben Shneiderman. if you have not looked up Shneiderman's bio yet, please do. His credentials are impeccable and we are fortunate to learn from him in this course. However, let us make sure we read the book *critically*; AI is a huge field, and Shneiderman's is but one voice addressing the many huge issues associate with it. The second component is (traditional) *human factors*. I will provide you this component in written handouts and short lectures on Wednesdays. The third, and most important, component must be provided by you. I ask you to bring your your individual, special, experiences and expertise in AI and anything related to the class, and *integrate* with that what you learn from Shneiderman and me. Figure 1 illustrates this course structure, and the aspiration of achieving individualized learning outcomes.

We may view the problem with human factors in AI in a Venn diagram with two sets, one for HF/E and the other for any other specific domain (e.g., AI). The goal is to increase the size of their intersection in this course as much as possible (left pane in Fig. 2). Another way of looking at this problem is depicted as a hypothetical tradeoff between HF/E and domain-specific KSAs in the right pane of Figure 2. The ideal professional is marked with a star in the upper right-hand corner, but we may assume that such ideal is humanly unattainable, save for some rare polymaths. Most likely the solid line represents the present situation: We may hope to train HF/E specialists with limited domain expertise, or domain experts with limited HF/E knowledge. The goal is to "push the envelope" towards the top right-hand corner in university curricula, as depicted by the dashed line.

I hope you are ready to embrace these challenges in this course, and have some fun while doing so!

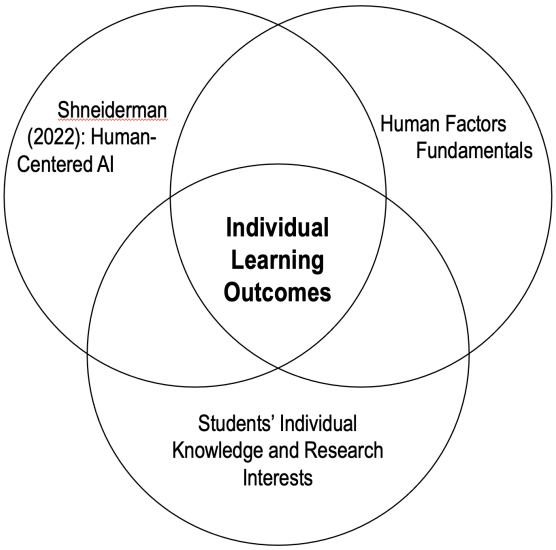

Figure 1: The course components arranged in a Venn diagram. Learning outcomes are in the intersection of these components.

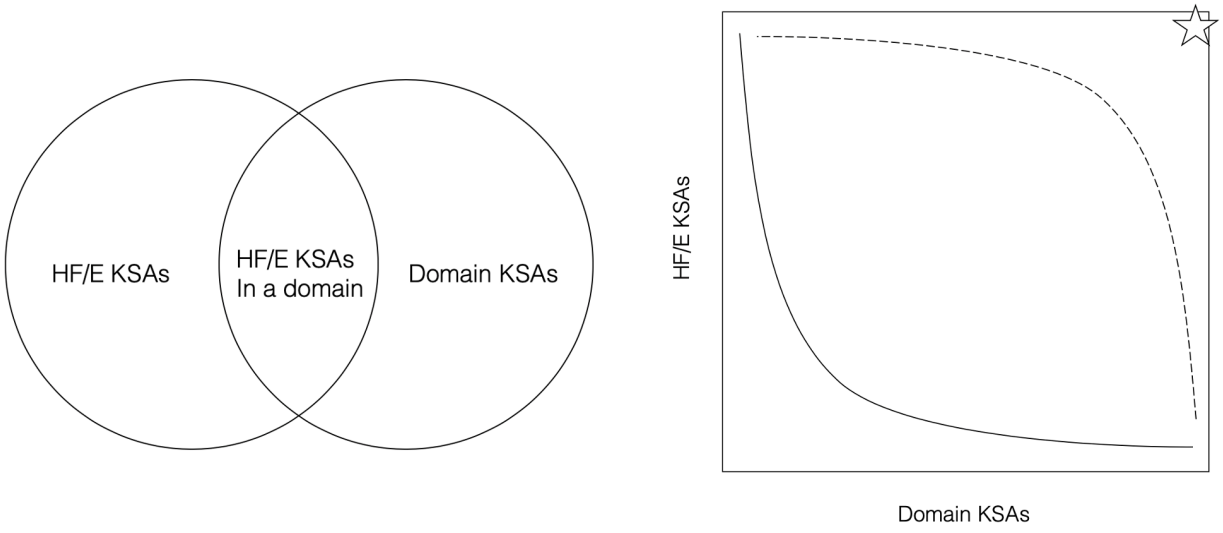

Figure 2: A specific goal of this course is to increase the intersection of knowledge, skills, and abilities (KSAs) in human factors and the domain-specific (in AI) KSAs, as illustrated in the Venn diagram on the left. Alternatively, a goal of this course is to "push the envelope" depicted by the solid line in the right-hand diagram towards the upper right-hand corner, where students would have high KSAs in both human factors and their domains of speciality