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

PSYC 719
Human Factors in Artificial Intelligence
SYLLABUS (R2)

Prof. Rantanen, Fall Semester 2023 (2231)

October 30, 2023

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

Mondays 1200–1250 in George Eastman Hall (EAS)-3367

1.2 Instructor Information

Name: Esa M. Rantanen, Ph.D.
Office: George Eastman Hall (EAS)–2353.
Office hours: Mondays and Fridays 1000–1100; 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

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. The main three topic areas covered in the course are (1) methods of design and evaluation, (2) the psychology of sensation and perception, memory, attention, judgment, decision-making, and problem solving, as well as human error and reliability, and (3) 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 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 selected topics in human factors and AI. 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. Because we only meet for 50 min each week, I will teach this course in a "blended" fashion, with much course activity happening online, in myCourses.

Each new week of the course starts on Monday at 1300, that is, after our weekly in-class meeting, and has five elements:

1. 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;
5. In-class discussion on the week's topic(s).

Hence, you should plan your weekly schedule as follows:

1. On Monday afternoon, after our class, check out the assigned readings in myCourses and plan to read them within the next 36 hrs;
2. Post any questions you may have about them in the Q&A forum in myCourses for me to answer;
3. Post your integrative reflections on the week's topic in the designated myCourses discussion forum by Thursday morning (to leave time for online discussion with your classmates);
4. Prepare to discuss the week's topic(s) in-class on Monday at noon; I will ask you questions to prompt discussion, but you should also be prepared to bring up issues, controversies, and questions in these class meetings.

2.1 Readings

I have prepared brief handouts about the most important human factors topics for you. We will also read several original articles throughout the course. All readings will be posted in myCourses by Monday noon. 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 will explain them to you in further detail and answer your questions about them as needed in the myCourses Q&A forum. 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 and in-class discussions.

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 introducing 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 Generative AI Tools

You are required to do your own work in this course. Therefore, using generative AI tools such as ChatGPT is not allowed for your assignments. As this is a course on AI, I am happy to have discussion in class about why this policy is in your best interest. However, and as this is a course on AI, you certainly may present examples of AI-generated content to illustrate a point you wish to make, but you must clearly indicate what part(s) of your submissions have been generated by AI (i.e., the same rules apply here as in accurate citation of any sources). If I doubt authorship, I may ask you to explain the submitted content to show that you have mastered the materials.

4.4 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 of our course 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 refined grading system (i.e., "plus/minus grading" scheme) adopted by RIT:

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. Note that reading assignments will be specified for each week in myCourses.

Week	Dates	Topics
1	Aug 28–Sep 11	Introductions, Human Factors, Human-Centered AI [1, 2];
	Sep 4	**Labor Day; no class this week**
2	Sep 11–18	Design and evaluation methods in HF [3, 4];
3	Sep 18–25	Experimental research;
4	Sep 25–Oct 2	Human visual auditory, vestibular, and tactile systems [5];
5	Oct 2–16	Information processing models of cognition [6];
	Oct 9	**Fall Break; no class this week**
6	Oct 16–30	Models of memory and attention;
	Oct 23	**HFES Annual Meeting; no class this week**
7	Oct 30–Nov 6	Decision-making [7];
8	Nov 6–13	Situation awareness;
9	Nov 13–20	Displays and controls;
10	Nov 20-27	Human and machine intelligence;
11	Nov 27–Dec 4	Trust and reliance;
12	Dec 4–11	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.

Appendix

A few more words about this course. This is the second time this course is offered (the first time was a year ago, in 2221). It is still a brand-new design, and substantially redesigned for this semester based on feedback from students last fall. 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 several original articles on diverse aspects of AI. Although I have (mostly) selected the readings ahead of time, I welcome your suggestions for reading assignments, too. The second component is (traditional) *human factors*. I will provide you this component in written handouts. 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 the readings and me. Figure 1 illustrates this course structure, and the aspiration of achieving individualized learning outcomes.

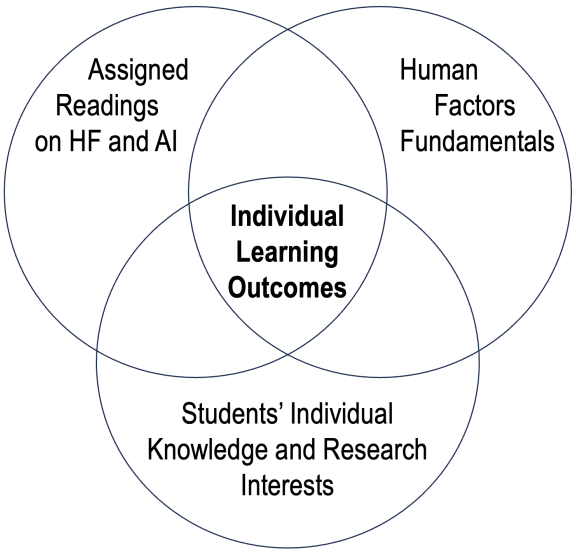

Figure 1: The course components arranged in a Venn diagram. Learning outcomes are in the intersection of these components.

We may also view the problem with human factors in AI in another Venn diagram with two sets of Knowledge, Skills, and Abilities (KSAs), one for HF/E and the other for any other specific domain (e.g., AI) [8]. The goal is to increase the size of their intersection as much as possible (left pane in Fig. 2). Yet 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.

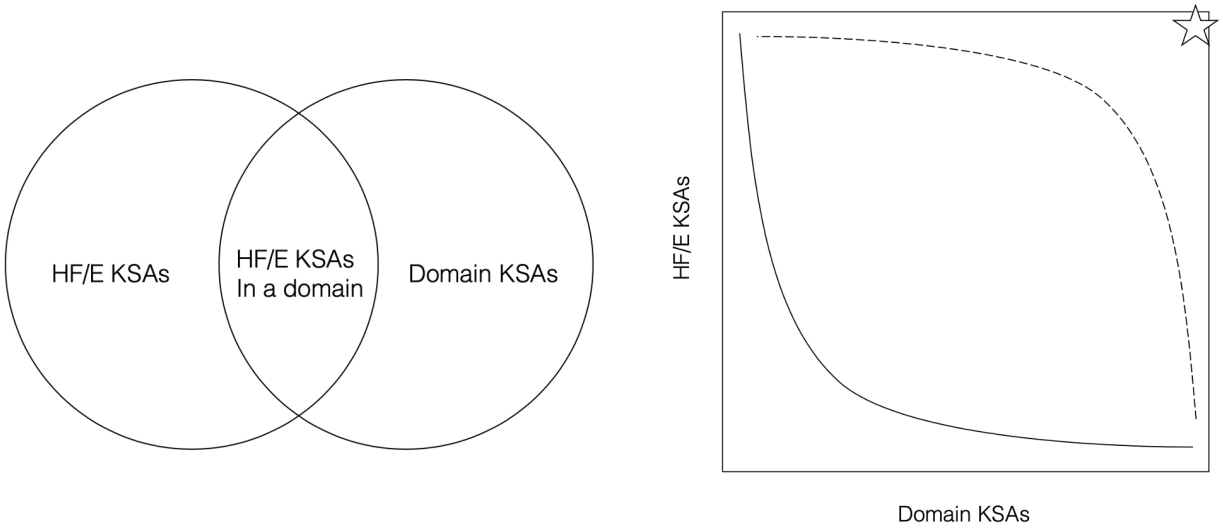

Figure 2: A specific goal of this course is to increase the intersection of knowledge, skills, and abilities (KSAs) in human factors and the domain-specific (in AI) KSAs, as illustrated in the Venn diagram on the left. Alternatively, a goal of this course is to "push the envelope" depicted by the solid 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.

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

References

[1] C. S. Lewis. *The Abolition of Man.* Oxford University Press, 1943.

[2] B. Shneiderman. Human-centered artificial intelligence: Three fresh ideas. *AIS Transactions on Human-Computer Interaction*, 12(3):109–124, 2020.

[3] K. M. Feigh and A. R. Pritchett. Requirements for effective function allocation: A critical review. *Journal of Cognitive Engineering and Decision Making*, 8(1):23–32, 2014.

[4] P. M. Salmon, T. Carden, and P. A. Hancock. Putting the humanity into inhuman systems: How human factors and ergonomics can be used to manage the risks associated with artificial general intelligence. *Human Factors and Ergonomics in Manufacturing & Service Industries*, 31(2):223–236, 2021.

[5] R. Dahl. William and Mary. In *Kiss Kiss.* Alfred A. Knopf, 1960.

[6] R. Epstein. The empty brain. *Aeon.com*, 18, 2016.

[7] D. Kahneman and G. A. Klein. Conditions for intuitive expertise: a failure to disagree. *American Psychologist*, 64(6):515–526, 2009.

[8] D. Hannon, E. M. Rantanen, B. Sawyer, A. Hughes, K. Darveau, R. O'Donnell, J. Intriligator, and J. D. Lee. The education of the human factors engineer in the age of data science. In

Proceedings of the Human Factors and Ergonomics Society Annual Meeting, volume 64, pages 480–484. SAGE Publications, 2020.