

PSYCH 494

Human Factors and Ergonomics

Winter, 2024

LEC B1 TR 2:00-3:20p.m. ES B1-33



Instructor: Dr. Karsten A. Loepelmann (he/him)

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Hours: Mon. 12:00-1:00p.m. or by appointment

Class Website: <https://sites.ualberta.ca/~kloepelm/psych494/>

Marker: TBA

Email: TBA

Prerequisites

The prerequisites for this course are any PSYCH course at the 300-level, or consent of the Department. See [UAlberta Calendar](#) section University Regulations: Registration: [Prerequisite Course Requirements](#).

Course Objectives & Learning Outcomes

Why are some things easy to use, but other things are hard to use? The field of human factors psychology and ergonomics uses scientific knowledge about human perception, cognition, and behaviour in aid the design and use of human-machine systems (such as tools, tasks, jobs, and systems) for productive, safe, comfortable, and effective human use. You will learn about the design of things that people use, intentionally taking into account human abilities and limitations; and the systems approach to understanding complex sociotechnical systems. You will explore these aspects in a range of contexts, from using everyday things (e.g., opening doors) to extraordinary systems failures (e.g., the Chernobyl nuclear disaster). You will develop the skills to be able to apply design principles and the systems approach to real-world objects and situations. Specific learning outcomes will be described in lectures for each topic, and the assignment documents.

Required Textbook

Available to buy at the Bookstore; available as a free ebook on the [UAlberta Library website](#).

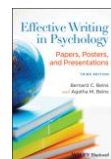
Norman, D. A. (2013). *The design of everyday things* (Revised and expanded edition). Basic Books.



Recommended Resources

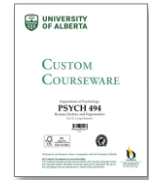
American Psychological Association. (2020). *Publication manual of the American Psychological Association* (7th edition). APA.

Beins, A. M., & Beins, B. C. (2021). *Effective writing in psychology: Papers, posters, and presentations* (3rd ed.). Wiley.



Required Readings

Almost all of the required readings are available in a print coursepack from the bookstore; all required readings are posted on the eClass website for this course. This is a Zero Textbook Cost course.



- Proctor, R. W., & Van Zandt, T. (2018a). Historical foundations of human factors. In R. W. Proctor & T. Van Zandt, *Human factors in simple and complex systems* (3rd ed.) (pp. 3-23). CRC Press.
- Gibson, J. J. (2015). The theory of affordances. In J. J. Gibson, *The ecological approach to visual perception* (Classic edition) (pp. 119-135). Psychology Press.
- Jordan, P. W. (1997). Putting the pleasure into products. *IEE Review*, 43(6), 249-252. <https://doi.org/10.1049/ir:19970608>
- Endsley, M. R., & Jones, D. G. (2011). What is situation awareness? In M. R. Endsley & D. G. Jones, *Designing for situation awareness: An approach to user-centered design* (2nd ed.) (pp. 13-29). CRC Press.
- Conkle, A., & West, C. (2008, June/July). Psychology on the road. *Observer*, 21(6), 18-23. <https://www.psychologicalscience.org/observer/psychology-on-the-road>
- Piattelli-Palmarini, M. (1994). The seven deadly sins. In M. Piattelli-Palmarini, *Inevitable illusions: How mistakes of reason rule our minds* (pp. 115-137). John Wiley & Sons, Inc.
- Croskerry, P. (2003). The importance of cognitive errors in diagnosis and strategies to minimize them. *Academic Medicine*, 78(8), 775-780. <https://doi.org/10.1097/00001888-200308000-00003>
- Brigham, F. (2001). Graphical symbols for consumer products in an international context. *Information Design Journal*, 10(2), 115-123. <https://doi.org/10.1075/idj.10.2.06bri> [not in print coursepack due to copyright restrictions]
- Schmidt, R. A., & Young, D. E. (2010). Cars gone wild: The major contributor to unintended acceleration in automobiles is pedal error. *Frontiers in Movement Science and Sport Psychology*, 1, Article 209. <https://doi.org/10.3389/fpsyg.2010.00209>
- Proctor, R. W., & Van Zandt, T. (2018b). Reliability and human error in systems. In R. W. Proctor & T. Van Zandt, *Human factors in simple and complex systems* (3rd ed.) (pp. 53-80). CRC Press.
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- Perrow, C. (1999). Normal accident at Three Mile Island. In C. Perrow, *Normal accidents* (pp. 15-31). Princeton University Press.
- Reason, J. (1987). The Chernobyl errors. *Bulletin of the British Psychological Society*, 40, 201-206.
- Griffin, E. (1997). Groupthink of Irving Janis. In E. Griffin, *A first look at communication theory* (3rd ed.) (pp. 235-246). McGraw-Hill. <http://www.afirstlook.com/docs/groupthink.pdf>
- Tufte, E. R. (1997). The decision to launch the space shuttle Challenger. In E. R. Tufte, *Visual explanations: Images and quantities, evidence and narrative* (pp. 38-53). Graphics Press.
- Parsons, S. O., Seminara, J. L., & Wogalter, M. S. (1999, January). A summary of warnings research. *Ergonomics in Design*, 7(1), 21-31. <https://doi.org/10.1177/106480469900700105>
- McCauley-Bush, P. (2012). Anthropometry. In P. McCauley-Bush, *Ergonomics: Foundational principles, applications, and technologies* (pp. 121-161). CRC Press.
- Guastello, S. J. (2014). Human-computer interaction. In S. J. Guastello, *Human factors engineering and ergonomics: A systems approach* (2nd ed.) (pp. 265-311). CRC Press.
- Moray, N. (1994). Error reduction as a systems problem. In M. Bogner (Ed.), *Human error in medicine* (pp. 67-91). Lawrence Erlbaum Associates.
- Bogner, M. S. (1994). Introduction. In M. Bogner (Ed.), *Human error in medicine* (pp. 1-11). Lawrence Erlbaum Associates.
- Reason, J. (1995). Understanding adverse events: Human factors. *Quality in Health Care*, 4(2), 80-89. <https://doi.org/10.1136/qshc.4.2.80>
- Hornick, R. J. (1987). Dreams--design and destiny. *Human Factors*, 29(1), 111-121. <https://doi.org/10.1177/001872088702900112>
- Rouse, W. B., & Boff, K. R. (1998, January). Packaging human factors for designers. *Ergonomics in Design*, 6(1), 11-17. <https://doi.org/10.1177/106480469800600104>

Assessment

Applied Project (worth 15%): This project is an experiential learning assignment, designed to give you the opportunity to apply human factors principles to a real-world case. You will write a brief paper (at least 5 pages, but no more than 10) reviewing the findings, and making critical evaluations; this paper **must** be written in **APA style**. More details are provided in the [applied project document](#).

Midterm Exam (worth 25%): The midterm will test material covered in the relevant assigned readings and in class. Although there is much overlap between the readings and lectures, it is not a complete overlap. Some content is only covered in one or the other. You are responsible for **all** material. The midterm will consist of short-answer and essay questions. If you miss the midterm for an acceptable reason such as incapacitating illness or severe domestic affliction, then the weight of the excused exam will be added to the final exam (you must complete and [digitally sign](#) this [statutory declaration form](#)). For religious conviction, see The Fine Print below. Documentation must be provided within 2 working days of the missed exam. **No** makeup exams or assignments are accepted. See *Calendar* sections Academic Regulations: [Attendance](#) and [Examinations \(Exams\)](#).

Term Paper (worth 30%): This paper is intended to immerse you in research in the field of human factors and ergonomics. This can be done in a literature review paper (e.g., a critical review and analysis of published research on a particular topic or aspect of human factors/design). However, you may go beyond the bounds of a traditional paper by also investigating the design of a particular system and talking to the designers to determine exactly how they incorporate (or *fail to* incorporate) human factors principles, or writing a research proposal. The paper **must** be written in **APA style**, and the body of the paper must be at least **12 full pages**. This is to ensure that you cover your selected topic in sufficient breadth and depth. More details are provided in the [term paper document](#) and in the APA Style & Research lecture. A **bonus 1%** will be added to your final grade for emailing your term paper topic before the topic submission deadline.

Final Exam (worth 30%): See the Office of the Registrar's [exam schedule](#) for official date, time, and location. The 2-hour final exam will be cumulative; it will have short-answer and essay questions, and will emphasize material covered after the midterm. If you miss this exam, you must apply to your Faculty Office for a deferral of the final exam within **two** working days of the final exam date. See *Calendar* sections Academic Regulations: [Attendance](#) and [Final Examinations](#).

Grading

The University of Alberta letter grading system will be used to assign final grades, based on your overall weighted mean. This grade translation is approximate; the instructor reserves the right to use expert judgment to adjust the grades as necessary.

A+	4.0	87-100%	B+	3.3	75-78%	C+	2.3	62-66%	D+	1.3	44-52%
A	4.0	83-86%	B	3.0	70-74%	C	2.0	57-61%	D	1.0	40-44%
A-	3.7	79-82%	B-	2.7	67-69%	C-	1.7	53-56%	F	0.0	0-39%

Schedule of Classes

Date:	Topic:	Assigned readings:
Jan 9, 11	Introduction to the course Introduction to HF/E & history of HF/E	Chapter 1, Proctor and Van Zandt (2018a)
Jan 16, 18	The systems approach Perception & Natural Design	Chapter 2 Gibson (2015)
Jan 23, 25	Emotional design Situation awareness	Jordan (1997) Endsley and Jones (2011)
Jan 30, Feb 1	Driver distraction; Cognitive illusions	Conkle and West (2008); Piattelli-Palmarini (1994), Chapter 3, Croskerry (2003)
Feb 6, 8	Knowledge vs. information Information design	Chapter 4 Brigham (2001)
Feb 13, 15	Human error & reliability Applied project due: Thursday, February 15	Chapter 5 Schmidt and Young (2010)
Feb 20, 22	No classes (Winter Term Reading Week)	
Feb 27, 29	Human error & systems Midterm exam: Thursday, February 29	Proctor and Van Zandt (2018b) (based on all above readings & lectures)
Mar 5, 7	Term paper topic due: Tuesday, March 5 Three Mile Island	Perrow (1999)
Mar 12, 14	Chernobyl APA style & research	Reason (1987)
Mar 19, 21	Team, group, & organizational factors <i>Challenger</i>	Griffin (1997) Tufte (1997)
Mar 26, 28	Accidents, safety, & risk Anthropometry & Universal Design	Parsons et al. (1999) McCauley-Bush (2012); Chapter 6
Apr 2, 4	Computers & HCI; Y2K; The systems approach Term paper due: Thursday, April 4	Guastello (2014); Moray (1994)
Apr 9, 11	Health care systems; Future directions	Bogner (1994), Reason (2001) Hornick (1987), Rouse and Boff (1998)

As per the exam schedule, the final exam is will be held on **Thursday, April 18, 2024 at 9:00a.m.** in **ES B1-33**.

You must verify this date on [Bear Tracks](#) when the final exam schedule is posted.

(Deferred final exam will be held Friday, May 3, 2024 at 10:00a.m. in BS P231.)

The Fine Print

Academic Integrity

The University of Alberta is committed to the highest standards of [academic integrity](#) and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the [Code of Student Behaviour](#) (and the [Student Conduct Policy](#)) and avoid any behaviour which could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University.

All forms of dishonesty are unacceptable at the University. Any offence will be reported to the College of Natural and Applied Sciences; they will determine the disciplinary action to be taken. Cheating, plagiarism, and misrepresentation of facts are serious offences. Anyone who engages in these practices will receive at minimum a grade of zero for the exam or paper in question and no opportunity will be given to replace the grade or redistribute the weights. As well, in the Faculty of Science the sanction for cheating on any examination will include a disciplinary failing grade (no exceptions) and senior students should expect a period of suspension or expulsion from the University of Alberta.

Unauthorized content generation is the production of academic work, in whole or part, for academic credit, progression, or award, whether or not a payment or other favour is involved, using unapproved or undeclared human or technological assistance. In other words, using AI (e.g., large-language models like ChatGPT) is a form of academic dishonesty and a violation of academic integrity.

Support Services & Accommodations

Students who need additional help in developing strategies for better time management, study skills, or examination skills should contact the [Academic Success Centre](#).

In accordance with the University of Alberta's [Discrimination, Harassment, and Duty to Accommodate Policy](#), accommodation support is available to eligible students who encounter limitations or restrictions to their ability to perform the daily activities necessary to pursue studies at a post-secondary level. Students have both rights and responsibilities with regard to accommodations. Adherence to procedures and due dates is required for the University to provide accommodations. Contact [Accessibility + Accommodations Services](#) for further information.

When an assessment presents a conflict based on [non-medical protected grounds](#), students must [register for accommodations](#) with the Academic Success Centre.

A student who cannot write the final examination due to incapacitating illness, severe domestic affliction or other compelling reasons can apply for a deferred final examination. An application must be made to the student's Faculty office within two working days of the missed examination and must be supported by appropriate documentation or a Statutory Declaration (see UAlberta *Calendar* section Academic Regulations: [Absence from Final Exams](#)).

In cases of temporary conditions that hamper your ability to complete an assignment or write an exam (e.g., a broken arm), the Office of Universal Design and Accessibility Facilitation can help determine what temporary accommodations are required. To request assistance in such cases, contact the Dean of Students Office at doshelp@ualberta.ca.

Deferral of exams or term work is a privilege and not a right; there is no guarantee that a deferral will be granted. Misrepresentation of facts to gain a deferral is a serious breach of the Code of Student Behaviour.

Term Work Policy

With the exception of term work for which students did not receive feedback before the posting of final grades, students must initiate a request for reevaluation of term work with the instructor prior to the day of the final exam.

Representative evaluative course material (e.g., sample questions) is available on eClass.

Recording Permissions Policy

Audio or video recording, digital or otherwise, of lectures, labs, seminars or any other teaching environment by students is allowed only with the [prior written consent](#) of the instructor or as a part of an approved accommodation plan. Student or instructor content, digital or otherwise, created and/or used within the context of the course (e.g., lecture notes) is to be used solely for personal study, and is not to be used or distributed for any other purpose without prior written consent from the content author(s).

Learning and Working Environment

The Department of Psychology, the Faculty of Science, and the College of Natural and Applied Sciences are committed to ensuring that all students, faculty, and staff are able to work and study in an environment that is safe and free from discrimination, harassment, and violence of any kind. It does not tolerate behaviour that undermines that environment. This includes virtual environments and platforms.

The Department of Psychology believes that organizational diversity and excellence go hand-in-hand. We are committed to identifying our limitations as a department in terms of equity, diversity, and inclusion and making actionable changes to overcome these limitations. We want all our constituents to feel welcome, safe, and valued in the core activities of teaching, research, and administration. See the [EDI in Psychology](#) website for more information.

The University of Alberta acknowledges that we are located on Treaty 6 territory, and respects the histories, languages, and cultures of the First Nations, Métis, Inuit, and all First Peoples of Canada, whose presence continues to enrich our vibrant community.

Other Policies

The [Office of Safe Disclosure and Human Rights](#) (OSDHR) provides confidential disclosure services as well as advising and consulting on any issue relating to human rights, discrimination, harassment, and accommodation issues. There are several ways to contact them, including anonymous options.

Any typographical errors in this course outline are subject to change and will be announced in class. The date of the final examination is set by the Registrar and takes precedence over the final examination date reported in this syllabus.

Policy about course outlines can be found in Academic Regulations: [Course Requirements, Evaluation Procedures and Grading](#) of the University *Calendar*.

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