

PSYCO 494

Human Factors and Ergonomics

Fall, 2020

LEC A1 TR 2:00-3:20p.m. [remote]



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Prerequisites

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

Course Description & Learning Objectives

The field of human factors psychology and ergonomics uses scientific knowledge about human perception, cognition, and behaviour in specifying 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.

Assessment

Applied Project (worth 15%): This project is a “hands-on” case study assignment, designed to give you the opportunity to apply human factors principles to a real-world case. A brief paper (at least 5 pages, but no more than 10) will be required, 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- and long-answer questions. If you miss the midterm for an acceptable reason such as incapacitating illness, severe domestic affliction, or religious conviction (see The Fine Print below), then the weight of the excused exam will be added to the final exam (digitally signed [statutory declaration form](#) required), then the weight of the excused exam will be added to that of the final. Documentation must be provided within 2 working days of the missed exam. **No** makeup exams or assignments are accepted. See [UAlberta Calendar](#) sections Academic Regulation: [Attendance](#) and [Examinations \(Exams\)](#).

Final Exam (worth 30%): See the Office of the Registrar’s [exam schedule](#) for official date, time, and location. The final exam will have short-answer questions and an essay question, 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 [UAlberta Calendar](#) sections Academic Regulation: [Attendance](#) and [Final Examinations](#).

Practice Test (bonus 1%): A practice test will be given via eClass so that you can try out the exam integrity and proctoring software. You will receive 1% toward your final grade if you participate in this practice test before the midterm; your mark will not be based on how many questions you answer correctly.

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 lecture.

Grading

Final grades will be assigned based on the University of Alberta letter grading system. This grade translation is approximate; the instructor reserves the right to use expert judgment to adjust grades as necessary.

A+ = 87-100%	B+ = 75-78%	C+ = 62-66%	D+ = 45-52%
A = 83-86%	B = 70-74%	C = 57-61%	D = 40-44%
A- = 79-82%	B- = 67-69%	C- = 53-56%	F = 0-39%

Schedule of Classes

Date:	Topic:	Assigned readings:
Sep 1, 3	Introduction; History of HF/E	Chapter 1; Proctor & Van Zandt (2018a)
Sep 8, 10	The systems approach; Perception & Natural Design	Chapter 2, Gibson (2015)
Sep 15, 17	Emotional design; Situation awareness	Jordan (1997); Morphew, Balmer, & Khoury (2001), Endsley & Jones (2011)
Sep 22, 24	Driver distraction; Cognitive illusions	Conkle & West (2008); Piattelli-Palmarini (1994), Chapter 3, Croskerry (2003)
Sep 29, Oct 1	Knowledge vs. Information	Chapter 4, Brigham (2001)
Oct 6, 8	Human error & reliability Applied project due: Thursday, October 8 Practice test due: Monday, October 8	Chapter 5, Schmidt & Young (2010)
Oct 13, 15	Human error & systems Midterm exam: Thursday, October 15	Proctor & Van Zandt (2018b) (based on all above readings & lectures)
Oct 20, 22	Three Mile Island	Perrow (1999)
Oct 27, 29	Chernobyl; APA Style & Research	Reason (1987)
Nov 3, 5	Team, group, & organizational factors; <i>Challenger</i>	Griffin (1997); Tufte (1997)
Nov 10, 12	No classes (Reading Week)	
Nov 17, 19	Accidents, safety, & risk Anthropometry & Universal Design	Parsons, Seminara, & Wogalter (1999) McCauley-Bush (2012); Chapter 6
Nov 24, 26	Computers & HCI; Y2K; The systems approach	Guastello (2014); Moray (1994)
Dec 1, 3	Term paper due: Tuesday, December 1 Health care systems	Bogner (1994), Reason (2001) Hornick (1987), Rouse & Boff (1998)

As per the exam schedule, the final exam is scheduled for **Tuesday, December 15, 2020 at 9:00 a.m.** online.

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

(Deferred final exam will be held Monday, January 4, 2021 at 10:00 a.m. online.)

Required Readings

The required readings are available in a coursepack from the bookstore; all required readings are also available on the eClass website for this 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/jr:19970608>
- Morphew, M. E., Balmer, D. V., & Khoury, G. J. (2001, Fall). Human performance in space. *Ergonomics in Design*, 9(4), 6-11. <https://doi.org/10.1177/106480460100900403>
- 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>
- 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.

- 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>

Required Textbook

Norman, D. A. (2013). *The design of everyday things* (Revised and expanded edition). Basic Books. [ISBN-13: 9780465050659]

(This book is available as a free ebook on the [UALberta Libraries' website](https://libguides.library.ualberta.ca/).)



Recommended Resource

American Psychological Association. (2020). *Publication manual of the American Psychological Association* (7th edition). APA. [ISBN-13: 9781433805615]



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 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 Associate Dean of Science who 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.

Absences from Examinations

For an excused absence where the cause is religious belief, a student must contact the instructor(s) within two weeks of the start of Fall or Winter classes (within three days of the start of Spring or Summer classes) to request accommodation for the term (including the final exam, where relevant). Instructors may request adequate documentation to substantiate the student request.

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. Students who failed at the start of term to request exam accommodations for religious beliefs are expected to follow the normal deferred final examination process. Such 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](#)).

Deferred examinations are a privilege and not a right; there is no guarantee that a deferred examination will be granted. Misrepresentation of Facts to gain a deferred examination 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 or in the case of courses without final exams, before the posting of final grades.

Representative evaluative course material will be presented in class and posted on the eClass website for the course.

Support Services

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

Students registered with Accessibility Resources have both rights and responsibilities with regard to accessibility-related accommodations. Consequently, scheduling exam accommodations in accordance with Accessibility Resources' deadlines and procedures is essential. Please note adherence to procedures and deadlines is required for U of A to provide accommodations. Contact [Accessibility Resources](#) for further information.

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).

Other Policies

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.

Remote Teaching & Learning Appendix

Due to the COVID-19 pandemic, this course will be delivered remotely. Remote delivery is not the same as an online course that has been carefully designed from the ground up to be a fully integrated online experience. In being required to deliver this course remotely, some tradeoffs have been made to try to preserve the essential experience of the in-person course. Every effort has been made to provide a high-quality learning experience. Be aware, though, that circumstances may result in deviations from procedures in the Before Times. Your patience and understanding are appreciated.

To successfully participate in remote learning in this course, it is recommended that you have access to a computer with an internet connection that can support the tools and technologies the University uses to deliver content, engage with instructors, TAs, and fellow students, and facilitate assessment and examinations. Please refer to [Technology for Remote Learning](#) for details. If you encounter difficulty meeting the technology recommendations, please email the Dean of Students Office (dosdean@ualberta.ca) directly to explore options and support.

Please contact me by the add/drop deadline (Sept. 15) if you do not have access to the minimum technology recommended. I will try to make arrangements to accommodate those who contact me before this date. Failure to do so may result in a zero in any assessment that depends on the minimum technology.

Lectures

Although links to lecture videos will be posted throughout the semester on eClass, the videos themselves are hosted on YouTube. These videos are asynchronous; that is, they are **not** being run live at a specific day and time; this allows maximum flexibility to accommodate diverse situations (e.g., time zones, family obligations, work, etc.).

Office Hours

It will not be possible to have in-person office hours this term. Instead, you are encouraged to post general questions to the eClass discussion forum and ask personal questions via email. If there is enough interest, I may try holding sessions periodically via Google Chat, Google Meet, or Zoom.

Synchronous Activities

Students have the right to not participate in synchronous activities and may turn off their cameras and audio. It is recommended that students remove all identifiable and personal belongings from the space in which they will be participating. Synchronous activities will not be recorded/posted online.

Online Behaviour

Students from many different backgrounds participate in courses at the University of Alberta. Sexist, racist, homophobic comments and other inflammatory remarks are not conducive to learning in our courses, and absolutely are not permitted. All participants are governed by the [Code of Student Behaviour](#). Be mindful when discussions involve controversial topics or issues, and consider the possibility that members of our community have themselves experienced some of these issues and/or very different realities because of these issues. Participate in a respectful and considered manner.

If you are witness to or the target of abusive or offensive behaviour in any course, please inform your instructor immediately. You may also contact the Psychology Undergraduate Advisor Kerry Ann Berrisford (psyscience@ualberta.ca), Associate Chair (Undergraduate) Cor Baerveldt (cor@ualberta.ca), or Chair Anthony Singhal (psych.chair@ualberta.ca).

Exams

You will write the exams remotely online synchronously (on a scheduled day and time) using exam integrity software (ExamLock) and proctoring software (Smart Exam Monitor); see below for technological requirements. While writing the online exams, you are **not** to refer to any notes, books, websites, people, or deities. Any use of these materials will be considered a violation of academic integrity, and will result in the matter being sent to the Associate Dean of Science (Undergraduate) and the academic discipline team. You should arrange for a place to write your exams without interruption. If you have concerns about the exam writing and/or proctoring process, please contact me as soon as possible (for example, if you have religious or other reasons that do not permit you to show your face).

If, for whatever reason, you begin the exam late you will not be given additional time. For example, if you start the 80-minute midterm 10 minutes after the scheduled starting time, you will only have 70 minutes to write the exam.

[ExamLock](#) is software that you download and run on your computer. It will prevent you from navigating away from the exam, and it will take screenshots of all your on-screen activity. System requirements for ExamLock are:

- ✓ macOS version 10.10 (Yosemite) or newer
- ✓ Windows 10
- ✗ iPads, tablets, and Chromebooks are **not** supported

[Smart Exam Monitor](#) is software that works with eClass; you do **not** have to download this to your computer. You are asked to share your screen, turn on your webcam and microphone (for the duration of the exam), show your ID, and show your face. System requirements for Smart Exam Monitor are:

- ✓ laptop, desktop, or Chromebook computer (phones, tablets, and iPads are not supported)
- ✓ operating system: macOS X, Windows, ChromeOS
- ✓ Google Chrome browser
- ✓ webcam
- ✓ microphone
- ✓ fully charged device and/or power supply

⚠ It is important that you read the [information and privacy statement regarding remote exam proctoring](#).

If you have any technical questions, please contact eClass support at (780) 492-9372 or eclass@ualberta.ca.

Student Resources

Updates to university-related activities impacted by COVID-19 can be found on the [COVID-19 Information website](#).

General information about various services and resources for students, including academic, financial, health, safety, and career development, can be found on the website for [Current Students](#).