

CARLETON UNIVERSITY  
SCHOOL OF INDUSTRIAL DESIGN

**COURSE OUTLINE IDES 2600A • HUMAN FACTORS/ERGONOMICS IN DESIGN •  
WINTER (2022)**

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**Instructor:** Michelle Optis

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Location: **Online**

Office Hours: By appointment.

**Teaching Assistant:**

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Office Hours: By appointment.

**Time and Location:** Please refer to Carleton Central under Student Services – Registration – Search Schedule: <https://admissions.carleton.ca/faqs/where-can-i-find-the-class-schedule/>. Classes are asynchronous and live weekly Q&A discussions will take place on Thursdays from 4:30-5:25 PM. We may adjust the discussion time when we have group presentations or guest speakers.

**Course Description**

Foundation course in human factors/ergonomics providing an overview of physical and cognitive considerations in product design and related design fields. Anthropometrics, biomechanical considerations, cognition, social interaction, and emotional interaction are introduced in relation to supporting user experience, health and safety, performance and productivity. Includes: Experiential Learning Activity. Prerequisite(s): PSYC 1001 and PSYC 1002, or PSYC 1000. Lectures and discussion three hours a week.

## **Learning Outcomes**

By the end of this course, students will be able to:

1. Identify and apply HF/E principles and methods to better understand issues affecting people and systems to inform potential design interventions to improve quality of life.
2. Apply relevant principles and information on anthropometrics and the physiological limitations/capabilities of people to identify issues and opportunities affecting user experience, health, safety, performance and/or productivity.
3. Apply relevant knowledge of cognitive, social and/or emotional factors in design to improve people's experience, health, safety, performance and/or productivity.
4. Identify possible environmental influences on people's experience and design such as spatial considerations, materiality, lighting, thermal considerations, noise and vibration, and air quality.
5. Describe possible work/activity influences on design such as pace of work, stress, fatigue, and boredom.
6. Apply HF/E principles and methods to evaluate and/or design: seating, handles, manual materials handling devices or systems, digital devices or experiences, wearables, consumer electronics, work areas, residential products or areas, services and/or systems.
7. Produce written reports, oral and visual presentations demonstrating HF/E research, analysis and design recommendations/proposals.
8. Collaborate with team members and take responsibility for individual contributions.
9. Demonstrate professional behaviour.

## **Course Deliverables**

These are the deliverables for this course. Please see 'Appendix A Course Schedule' for more detailed information.

<b>Deliverable</b>	<b>Weight</b>	<b>Deadline</b>
Participation (Attendance, forum posts, discussions)	10%	Forum posts complete on Wednesdays by 11:55 PM
Assignment 1 - Group poster	20%	Assign Jan 27 Due Feb 11 11:55 PM
Assignment 2 - HF Analysis	30%	Assign Feb 10 Due Mar 18 11:55 PM
Final Assignment	40%	Assign Mar 24 Due Apr 22 11:55 PM

## **Student Access to Quiz, Test and Exam Papers**

Examinations are for evaluation purposes only and will not be returned to the student.

## **Required Materials**

Materials required for the course are listed below. You may be asked by your instructor to refer to cuLearn for a more comprehensive list of required materials.

1. Laptop or computer with internet connection
2. Zoom Video Conferencing

Both textbooks below are required and are available at the Carleton Bookstore. There are also hardcopies of each book on reserve at the Carleton Library and E-books available (for more information see Library Reserves - View course in Ares on Brightspace). Required journal articles available in Ares on Brightspace.

## **Required Reading:**

- Pheasant, S. & Haslegrave, C.M., (2018). *Bodyspace: Anthropometry, Ergonomics and the Design of Work*, 3rd Edition. CRC Press, Taylor & Francis Group, Boca Raton FL.
- Preece, J., Sharp, H. & Rogers, Y. (2019). *Interaction Design: Beyond Human-Computer Interaction*, 5th Edition. John Wiley & Sons Ltd., West Sussex, UK.

## **Additional Reading:**

Select chapters from the following book are recommended to be downloaded as a PDF from the E-book:

- Bridger, R.S (2018). *Introduction to human factors and ergonomics, 4th Edition*. CRC Press, Taylor & Francis Group, Boca Raton FL
- Chapter 9 from Preece, J., Sharp, H. & Rogers, Y. (2011). *Interaction Design: Beyond Human-Computer Interaction*, 3rd Edition. John Wiley & Sons Ltd., West Sussex, UK.

## **Computer and Internet Requirements**

Please refer to the computer requirements on the School of Industrial Design Website. You may be asked by your instructor to refer to cuLearn for other information or requirements related to computer work.

<http://www.id.carleton.ca/undergraduate/about-the-bid-program/computer-requirements>

## **Individual/Group Work**

Courses may include individual and group work. It is important in collaborative work that students clearly demonstrate their individual contribution.

## **Review/Presentation Attendance**

Attendance at scheduled SID Reviews/Presentations is mandatory. These are equivalent to exams when indicated in the course outline. Failure to attend the Review/Presentation without reasonable cause, will result in a grade of F. Students arriving late for the Review/Presentation or not remaining for the complete session without approval from the instructor, will be addressed on a case-by-case basis at the discretion of the instructor.

If you are not able to attend a Review/Presentation, foresee arriving late or need to leave before it is complete, please email your instructor in advance explaining the reason for the situation. It is important that you provide a reasonable rationale for your absence, late arrival or early departure. In the event of an illness or death in the family, you will be required to sign a form verifying your claim and this form is available through the SID administration office.

## **Late Submission of Lecture & Studio Deliverables**

Students who do not hand in deliverables on time will have their earned grade reduced by 10% per day up to a maximum of 3 days.

## **Participation and Professionalism**

Active participation and professional conduct (e.g. class discussion, consultations with instructors, work ethic, etc.) are important in lecture and studio courses and may be formally evaluated by a grade. Professionalism also includes Carleton's Policy on Academic Integrity described in more detail below with links to content which you are required to review.

## **Academic Integrity**

*Carleton's Policy on Academic Integrity* is available at: <https://carleton.ca/registrar/academic-integrity/> and covers the following topics:

*Plagiarism* (e.g. submitting work in whole or in part by someone else, failing to acknowledge sources through the use of proper citations when using another's work).

*Test and Exam Rules* (e.g. attempting to read another student's exam paper, speaking to another student even if the subject matter is irrelevant to the text, using material not authorized by the examiner).

*Other Violations* (e.g. improper access to confidential information, disruption in classroom activities, misrepresentation of facts for any academic purpose).

This policy governs the academic behavior of students. In industrial design, ideas and concepts come from a multitude of sources and may be modified and utilized in the design and development process. The student should reference such sources appropriately and it is strongly advised that you read Carleton's Policy on Academic Integrity prior to conducting any work at the University.

## **Requests for Academic Accommodation**

You may require special arrangements to meet your academic obligations during the term. For an accommodation request for any of the following topics below, refer to the link provided for more information: <https://students.carleton.ca/course-outline/>

- *Parental Leave*
- *Religious/Spiritual Obligation*
- *Academic Accommodations for Students with Disabilities*
- *Survivors of Sexual Violence*
- *Accommodations for Student Activities*

## **Student Responsibility**

The student is responsible for knowing the content of this course outline; the schedule of classes, assignments, and/or Reviews; and the material that was covered when absent. The studio is a professional environment and students should be working during the scheduled hours.

Unless otherwise arranged, the class will meet during scheduled class hours. Please note that attendance is important since issues and questions may be raised in class, and announcements made, along with information disseminated through cuLearn. As external professionals are often involved in our work, scheduling changes for guest lectures, presentations, and Reviews may occur at short notice, requiring students to stay informed.

## **Changes to the Course Outline**

The course outline may be subject to change in the event of extenuating circumstances.

## **Appendix A - Course Schedule**

Phase	Time	Topic	Deliverables
Fundamentals	Unit 1 Jan 10-14	<b>Introduction</b> to human factors/ergonomics (HF/E), history, applications. <ul style="list-style-type: none"><li>• Read <i>Bodyspace</i> Ch. 1</li><li>• Read <i>Introduction to Ergonomics and Human Factors</i> Ch. 1</li><li>• Read Davis KG et al.(2020)</li></ul>	<ul style="list-style-type: none"><li>• <b>Forum Activity:</b> After reading Davis et al. (2020), post before/after photos of your workspace, introduce yourself and share what you hope to learn from the course.</li></ul>
	Unit 2 Jan 17-21	<b>Anthropometrics:</b> data, posture, normal distribution, design constraints. Introduction to the <b>musculoskeletal system</b> . <ul style="list-style-type: none"><li>• Read <i>Bodyspace</i> Ch. 2</li><li>• Read <i>Introduction to Ergonomics and Human Factors</i> Ch. 2 p.31-46</li><li>• <u>Optional:</u> Read <i>Introduction to Ergonomics and Human Factors</i> Chap 3</li></ul>	<ul style="list-style-type: none"><li>• <b>Forum Activity:</b> Measure stature and elbow height.</li><li>• <b>Guest speaker</b></li></ul>
	Unit 3 Jan 24-28	<b>Human variability</b> in sex, body proportion, strength, developmental, ethnicity, social class, occupation, ageing. Introduction to <b>safety</b> , foreseeable use, vulnerable populations, safety standards. <ul style="list-style-type: none"><li>• Read <i>Bodyspace</i> Ch. 3</li><li>• Read <i>Human Factors Standard Practice</i></li></ul> <b>Assignment 1 assigned</b>	<ul style="list-style-type: none"><li>• <b>Guest speaker TBC</b></li></ul>

	Unit 4 Jan 29-Feb 4	<b>Workspace design:</b> Clearances, reach, range of motion, postural loading, posture and strength, vision related to posture of head and neck, physical considerations in barrier-free/accessible design. <b>Environmental considerations:</b> thermal comfort, lighting, noise, air quality. <ul style="list-style-type: none"><li>• Read <i>Bodyspace</i> Ch. 4</li><li>• Read: <i>Introduction to Human Factors and Ergonomics</i>, summaries for Chap 9, 10, 11</li></ul>	
Application to Design	Unit 5 Feb 7-11	<b>Sitting &amp; seating:</b> spine considerations, anthropometric principles of seat design and evaluation. <ul style="list-style-type: none"><li>• Read <i>Bodyspace</i> Ch. 5</li><li>• <u>Optional:</u> Read <i>Introduction to Human Factors and Ergonomics</i> Ch. 4</li><li>• <b>Assignment 2 assigned</b></li></ul>	<ul style="list-style-type: none"><li>• <b>Submit Assignment 1 (due Feb 12 11:55 PM)</b></li><li>• <b>Guest speaker</b></li></ul>
	Unit 6 Feb 14-18	<b>Hands &amp; handles:</b> handedness, strength, handle design, biomechanics, neutral posture. <ul style="list-style-type: none"><li>• Read <i>Bodyspace</i> Ch. 6</li></ul>	<ul style="list-style-type: none"><li>• Group presentations for Assignment 1</li><li>• Product selection for assignment 2 due</li></ul>
	<b>Winter break Feb 22-25</b>		
Cognitive Ergonomics	Unit 7 Feb 28-Mar 4	<b>What is Interaction Design?</b> Introduction, User Experience (UX) design and who's involved? Conceptual Models of Interaction, Metaphors, Interaction Types, Paradigms <ul style="list-style-type: none"><li>• Read <i>Interaction Design</i> Ch. 1.,2, 3</li></ul>	<ul style="list-style-type: none"><li>• Forum Activity TBD</li></ul>
	Unit 8 Mar 7-11	<b>Basics of Cognition and Frameworks</b> <ul style="list-style-type: none"><li>• Read <i>Interaction Design</i> Ch. 3, 4</li></ul>	
	Unit 9 Mar 14-18	<b>Social Interaction &amp; Design</b> <ul style="list-style-type: none"><li>• Read <i>Interaction Design</i> Ch. 5</li><li>• Optional: Read Ch. 14 to prep for final</li></ul>	<ul style="list-style-type: none"><li>• Forum Activity TBD</li><li>• <b>Submit Assignment 2 (due Mar 18 11:55 PM)</b></li></ul>
	Unit 10 Mar 21-25	<b>Emotional Interaction &amp; Design</b> <ul style="list-style-type: none"><li>• Read <i>Interaction Design</i> Ch. 6</li><li>• Optional: Read Ch. 12 to prep for final</li></ul> <b>Exam assigned</b>	
	Unit 11 Mar 28-Apr 1	<b>Types of Interfaces</b> <ul style="list-style-type: none"><li>• Read <i>Interaction Design</i> Ch. 7</li></ul>	
	Unit 12 Apr 4-8	<b>Interaction Design and Process</b> <ul style="list-style-type: none"><li>• Read <i>Interaction Design</i> Ch. 9 (3rd edition) You need to consult the older edition for this chapter</li></ul>	
	Exam Apr 14-28	Q&A	<ul style="list-style-type: none"><li>• <b>Submit Final Assignment</b></li></ul>

			• (due Apr 22 11:55 PM)
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