USER INTERFACE SYSTEMS AND TECHNIQUES

aka, Human-Computer Interaction Design CSE 331

Class Meetings	MW 12:45 p.m. - 2:00 p.m.
Office Hours	ericpsb.youcanbook.me
Location	Building C, Room 210
Semester	Fall 2018
Professor	Eric P. S. Baumer
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"Human-computer interaction is a discipline concerned with the design, evaluation and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them." – Association for Computing Machinery, Special Interest Group on Computer-Human Interaction, Curricula for Human-Computer Interaction

This course deals with the design and implementation of interfaces for human interaction with computing systems. The materials and activities cover four main focus areas:

- Design – Given a functionality specification for a system, how does one generate concepts for the way that users should interact with the system?

- Usability – What makes a system or an interface usable? How would you evaluate a design's usability?

- Implementation – Given an interface design, how does one translate that into an implemented, functioning system?

- Critique – Given an implemented interface, how can one assess its strengths and weaknesses without carrying out an empirical evaluation?

The above constitute the *learning objectives* for this course. That is, by the completion of this course, you should the skills necessary to answer each of the above questions.

COURSE PHILOSOPHY

"I hear and I forget. I see and I remember. I do and I understand." – mixed origin

You cannot learn, let alone understand, interface design without doing it. This class will provide you with hands-on experience in designing, implementing, and evaluating an interface for a

computational system. While there are "lecture" days, "lab" days, and others, almost every class meeting will involve significant interaction.

ASSIGNMENTS

All typed written assignments should be submitted in 10-12 point font, single column, single spaced, with 1" to 1.5" margins, in a legible and appropriate typeface of your choosing. Any references should be cited using APA format. Assignment lengths specified in word count are exclusive of figures, references, tables, captions, footnotes, etc. Assignment lengths specified in page count are all inclusive. These formatting requirements do not apply to hand-written assignments, such as the Design Workbooks.

DESIGN WORKBOOKS

Lecture-based class days will begin and end with a hands-on exercise. Usually, these exercises will pertain directly to the assigned readings for the day. While completing the exercises, you may consult any notes you have taken, but you may *not* directly consult the readings themselves. Some of these assignments will involve writing, some of them will involve concept sketching.

You will need to purchase a standard size composition notebook in which to complete these exercises. Each day's exercises will start on a new (right hand) page. At the end of class, your design workbooks will be collected for grading and feedback.

During the course of the semester, you will need to select **seven (7)** days worth of these workbook assignments to be graded on a letter scale, according to the following rubric:

- A (95%): Thorough comprehension of material, strongly-motivated and clever design, and thorough use of readings.

- B (85%): Sufficient comprehension of the material and thoughtful design grounded in readings.

- C (75%): May be missing one or two minor points, use of readings may show misunderstanding and/or design may lack motivation.

- D (65%): Misses the central point of the prompt/activity, little to no use of readings in the design.

- F (50%): Off-topic, no response, or similar issues.

- A+ (100%): Truly outstanding, novel insights or designs that go beyond the material and exercises from class.

You must designate the workbook days that are to be graded for a letter and indicate them by writing **GRADE** at the top of the page for that day. Those workbook activities selected for a letter grade will receive detailed comments and feedback. The remainder will receive less

detailed attention and will count toward your participation grade.

SEMESTER PROJECT AND LABS

You will complete a semester-long group project to design, implement, and evaluate an interface for a web-based photo-sharing application. Work on this project will be completed throughout the semester, partially in a series of in-class Lab activities. This will ensure that your work on the project is iterative, that each stage builds on the next, and that the work spreads out over the course of the semester.

Groups for this project will be self-selected using, in-part, an in-class speed networking exercise. Your group will collectively identify the particular users for whom you will design and the specific design methods you will use. You will have the option of using a backend that provides minimal photo-sharing functionality, or you may choose to implement your own backend. As a class, you will collectively develop a protocol for conducting a usability evaluation of all resulting interfaces near the end of the semester.

For each of the four Lab activities, you and your group will prepare and submit a written report. More details about the project, the labs, and the grading rubrics for each will be available on CourseSite.

ATTENDANCE

Attendance is **mandatory**. Class time will be spent engaging in a series of activities, discussions, critiques, and other exercises. As such, in-class activities are integral, both to your own and to others' learning, as well as fulfill a non-negligible portion of your grade.

Sometimes, though, life happens. In such instances, you will receive **two personal days** to use at your discretion during the semester. There is no need to notify the instructor, and no excuse or justification need be given. Your in-class participation grade that day will not count toward your total. If you miss additional days, those will be counted as a zero toward your in-class participation grade.

GRADING

You will receive a grade based on the following break down.

15% Attendance & Participation

15% Design Workbooks

50% Lab Reports (12.5% each for 5 labs)

10% Poster Presentation

10% Critique Feedback for Other Groups

97% – 100% A+	77% – 79.9% C+
93% – 96.9% A	73% – 76.9% C
90% – 92.9% A-	70% – 72.9% C-
87% – 89.9% B+	67% – 69.9% D+
83% – 86.9% B	63% – 66.9% D
80% – 82.9% B-	60% – 62.9% D-
	< 60% F

POLICIES

TECHNOLOGY IN CLASS

While in class, your attention should be on class. Please silence, disable, or turn off any device that makes noise.

Use of computational technology during class will vary, depending on the in-class activities. On some days, you will be asked not to use computational technology during class. On Lab days, you will be required to bring a personal computing device (e.g., a laptop computer), according to the schedule below. On remaining days, you will be given the choice as to whether to use computational technology as part of your learning process.

This policy is subject to revision, depending on student engagement over the course of the semester.

ACADEMIC HONESTY

"If I have seen further, it is by standing on the shoulders of giants" (Isaac Newton, 1676).

In this class, you are both encouraged and will need to draw on the work and ideas of others. However, you must do so with appropriate acknowledgement. For scholarly writing, news media, books, or other publications, this usually means citation. In other cases, a footnote and/or an acknowledgement section may be more appropriate (for instance, see the footnote on the Project 1 specification).

Plagiarism will not be tolerated. If in doubt, ask the Professor or see Lehigh's plagiarism policies (available from http://library.lehigh.edu/content/plagiarism_policies).

ACCOMMODATIONS

If you have a disability for which you are or may be requesting accommodations, please contact both Prof. Baumer and the Office of Academic Support Services, Williams Hall, Suite 301 (610-758-4152) as early as possible in the semester.   You must have documentation from the

Academic Support Services office before accommodations can be granted.

TEAM WORK

A significant portion of the work in this class will be completed in groups or teams. At the end of any group work, you will be asked to evaluate the other members of the teams in which you have worked. Individuals who receive a negative evaluation from *one* team member will receive a notification that a complaint was made (though not by whom). Individuals who receive a negative evaluation from *two* team members will receive a 10% deduction in their grade on the project. Individuals who receive a negative evaluation from *more than two* team members will receive a 50% reduction in their grade on the project. Individuals who receive positive comments from *every* group member will receive a 5% bonus on their project grade. Complex cases may involve external dispute resolution if necessary.

DISSENT

In this class, you will be asked to critique other designer's work, including that of fellow classmates. Disagreements that arise in this process are both allowed and encouraged. However, disagreement must be voiced and conducted in a civil manner. From the Lehigh Principles of our Equitable Community:

> *We recognize each person's right to think and speak as dictated by personal belief*
> *and to respectfully disagree with or counter another's point of view.*

Lehigh University endorses The Principles of Our Equitable Community. We expect each member of this class to acknowledge and practice these Principles. Respect for each other and for differing viewpoints is a vital component of the learning environment inside and outside the classroom. See http://www.lehigh.edu/~inprv/initiatives/PrinciplesEquity_Sheet_v2_032212.pdf

SCHEDULE

Readings listed on each day are to be done *before* that day. The astute reader will notice two days designated as [flex topic] days. These days serve two purposes on the schedule. First, they allow the instructor and the students to custom tailor the class to specific areas of interest that emerge over the course of the semester. Second, they ensure that the core material is covered in the event that any class meeting days need to be cancelled (e.g., for weather).

DATE	TOPIC & READINGS	ASSIGNMENTS ETC.
	UNIT 1 – WHAT TO BUILD?	
WEEK 1		

DATE	TOPIC & READINGS	ASSIGNMENTS ETC.

8/27

WHAT IS HUMAN-COMPUTER INTERACTION?

8/29

INTERVIEWING USERS

Karen Holtzblatt and Hugh R. Beyer. Contextual Design. The Encyclopedia of Human-Computer Interaction. Retrieved from https://www.interaction-design.org/literature/book/the-encyclopedia-of-human-computer-interaction-2nd-ed/contextual-design

Optional:

Robert S. Weiss. 1994. Interviewing. In *Learning from Strangers: The Art and Method of Qualitative Interview Studies*. The Free Press, New York, 61–119.

WEEK 2

9/3

PARTICIPATORY DESIGN

Michael J. Muller and Sarah Kuhn. 1993. Participatory Design. *Communications of the ACM* 36, 4: 24–28. https://doi.org/10.1145/153571.255960

Michael J. Muller. 2001. Layered Participatory Analysis: New Developments in the CARD Technique. In *Proceedings of the ACM Conference on Human Factors in Computing Systems (CHI)*, 90–97. https://doi.org/10.1145/365024.365054

Optional:

Eevi E. Beck. 2002. P for Political: Participation is not enough. Scandinavian Journal of Information Systems 14, 1: 1.

9/5

ETHNOGRAPHY

Tony Salvador, Genevieve Bell, and Ken Anderson. 1999. Design Ethnography. *Design Management Journal (Former Series)* 10, 4: 35–41. https://doi.org/10.1111/j.1948-7169.1999.tb00274.x

Optional:

Paul Dourish. 2006. Implications for Design. In *Proceedings of the ACM Conference on Human Factors in Computing Systems (CHI)*, 541–550. https://doi.org/10.1145/1124772.1124855

WEEK 3

Date	Topic & Readings	Assignments etc.
9/10	CULTURAL PROBES	Assign Project 1

Bill Gaver, Tony Dunne, and Elena Pacenti. 1999. Cultural Probes. *interactions* 6, 1: 21–29. https://doi.org/10.1145/291224.291235

William W. Gaver, Andrew Boucher, Sarah Pennington, and Brendan Walker. 2004. Cultural probes and the value of uncertainty. *interactions* 11, 5: 53–56. https://doi.org/10.1145/1015530.1015555

Optional:

Kirsten Boehner, Janet Vertesi, Phoebe Sengers, and Paul Dourish. 2007. How HCI interprets the probes. In *Proceedings of the ACM Conference on Human Factors in Computing Systems (CHI)*, 1077–1086. https://doi.org/10.1145/1240624.1240789

| 9/12 | Speed Networking for Project Teams | |

UNIT 2 – HOW TO BUILD?

WEEK 4

| 9/17 | LAB 1 | In-class Lab 1 |

Talking to Users

| 9/19 | SKETCHES AND PROTOTYPES | |

Bill Buxton. 2007. *Sketching User Experiences: Getting the Design Right and Getting the Right Design.* Morgan Kaufmann, San Francisco, CA. pp. 104-123.

Dan Nessler. 2016. A guide to paper prototyping & testing for web interfaces. *Digital Experience Design.* https://medium.com/digital-experience-design/a-guide-to-paper-prototyping-testing-for-web-interfaces-49e542ba765f

WEEK 5

DATE	TOPIC & READINGS	ASSIGNMENTS ETC.

9/24

INTERFACE DESIGN GUIDELINES

David Canfield Smith, Charles Irby, Ralph Kimball, Bill Verplank, and Eric Harslem. 1982. Designing the Star User Interface. *BYTE Magazine* 7, 4: 242–282.

Donald A. Norman. 1988. The Psychopathology of Everyday Things. in *The Design of Everyday Things* (Revised & Expanded Edition), 1-36. Basic Books: New York.

9/26

FITTS'S LAW

Pual M. Fitts. 1954. The Information Capacity of the Human Motor System in Controlling the Amplitude of Movement. Journal of Experimental Psychology 47, 381–391. doi:10.1037/0096-3445.121.3.262

I. Scott MacKenzie and William Buxton. 1992. Extending Fitts' Law to Two-dimensional Tasks. In *Proceedings of the ACM Conference on Human Factors in Computing Systems (CHI)*, 219–226. https://doi.org/10.1145/142750.142794

Optional:

Ken Goldberg, Siamak Faridani, and Ron Alterovitz. 2015. Two Large Open-Access Datasets for Fitts' Law of Human Motion and a Succinct Derivation of the Square-Root Variant. *IEEE Transactions on Human-Machine Systems* 45, 1: 62–73. https://doi.org/10.1109/THMS.2014.2360281

WEEK 6

10/1

LAB 2
Interactive Mock Up

Lab 1 Due

In-class Lab 2

DATE	TOPIC & READINGS	ASSIGNMENTS ETC.
10/3	**AFFECTIVE COMPUTING 1** [flex topic] Russell, J.A., 1980. A circumplex model of affect. Journal of Personality and Social Psychology 39, 1161–1178. doi:10.1037/h0077714 [*only read pages **1161-1167**, stop at the heading Multidimensional Scaling of Terms*] Picard, R.W., Daily, S.B., 2005. Evaluating affective interactions: Alternatives to asking what users feel. Presented at the CHI Workshop on Evaluating Affective Interfaces, Portland, OR. https://www.sics.se/~kia/evaluating_affective_interfaces/Picard.pdf	

WEEK 7

10/8	Project Progress: In-class Presentation of Interactive Mock-Up	
10/10	**CRITICAL DESIGN** Anthony Dunne and Fiona Raby. 2013. Design as Critique. in *Speculative Everything: Design, Fiction, and Social Dreaming*. MIT Press, Cambridge, Massachusetts; London, pp. 33-45. *Optional*: Bardzell, S., Bardzell, J., Forlizzi, J., Zimmerman, J., Antanitis, J., 2012. Critical Design and Critical Theory: The Challenge of Designing for Provocation, in: *Proceedings of the ACM Conference on Designing Interactive Systems (DIS).* ACM, Newcastle, pp. 288–297. doi: 10.1145/2317956.2318001	

WEEK 8

10/15	No Class Meeting – Pacing Break	

DATE	TOPIC & READINGS	ASSIGNMENTS ETC.
10/17	USABILITY EVALUATION	Lab 2 Due
	Assistant Secretary for Public Affairs. 2013. Planning a Usability Test. *usability.gov*. Retrieved from https://www.usability.gov/how-to-and-tools/methods/planning-usability-testing.html	
	Assistant Secretary for Public Affairs. 2014. Running a Usability Test. *usability.gov*. Retrieved from https://www.usability.gov/how-to-and-tools/methods/running-usability-tests.html	
	John Brooke. 1996. SUS: A "Quick and Dirty" Usability Scale. In *Usability Evaluation In Industry*, Patrick W. Jordan, Bruce Thomas, Ian L. McClelland and Bernard A. Weerdmeester (eds.). Taylor & Francis, London, pp. 189–194.	

UNIT 3 – HOW TO EVALUATE?

WEEK 9

10/22	DESIGNING EXPERIMENTS	
	David W. Martin. 2008. How to Do Experiments. in *Doing Psychology Experiments*. Thomson Wadsworth, Belmont, CA, pp. 25-35 [*stop* at the heading ***Statistical Regression***]	
10/24	WIZARD OF OZ	
	Jiannan Li and Sutapa Dey. 2013. Wizard of Oz in Human Computer Interaction. http://pages.cpsc.ucalgary.ca/~jiannali/course/wizard_of_oz.html	
	Optional:	
	Steven P. Dow, Manish Mehta, Blair MacIntyre, and Michael Mateas. 2010. Eliza Meets the Wizard-of-oz: Blending Machine and Human Control of Embodied Characters. In *Proceedings of the ACM Conference on Human Factors in Computing Systems (CHI)*, 547–556. https://doi.org/10.1145/1753326.1753408	

WEEK 10

10/29	LAB 3	Lab 3 Presented in Class
	Implementation Demo / Milestone	

DATE	TOPIC & READINGS	ASSIGNMENTS ETC.
10/31	PROTOCOL PLANNING Work through Qualtrics Documentation/Tutorials (*read and do before class*): https://www.qualtrics.com/support/survey-platform/survey-module/survey-module-overview/	Before Class: Sign Up for Qualtrics (https://lehigh.qualtrics.com)

WEEK 11

11/5	GUEST LECTURE Prof. Haiyan Jia – Human-Computer Interaction from a Communication Perspective S. Shyam Sundar, Haiyan Jia, T. Franklin Waddell, and Yan Huang. 2015. Toward a Theory of Interactive Media Effects (TIME): Four Models for Explaining How Interface Features Affect User Psychology. in *The Handbook of the Psychology of Communication Technology*, S. Shyam Sundar (ed.). John Wiley & Sons, Hoboken, NJ, pp. 47-86.	
11/7	[Prof. Baumer away]	

WEEK 12

11/12	USABILITY: BENEFITS AND DRAWBACKS Saul Greenberg and Bill Buxton. 2008. Usability Evaluation Considered Harmful (Some of the Time). In *Proceedings of the ACM Conference on Human Factors in Computing Systems (CHI)*, 111–120. Retrieved August 25, 2017 from http://dl.acm.org/citation.cfm?id=1357074 *Optional*: Enrico Bertini, Adam Perer, Catherine Plaisant, and Giuseppe Santucci. 2008. BELIV'08: Beyond Time and Errors: Novel Evaluation Methods for Information Visualization. In *Extended Abstracts of the ACM Conference on Human Factors in Computing Systems (CHI EA)*, 3913–3916. https://doi.org/10.1145/1358628.1358955	Submit Usability Protocol Link

DATE	TOPIC & READINGS	ASSIGNMENTS ETC.
11/14	[flex topic 2]	

LIMITATION AND NEGATION

James Pierce and Eric Paulos. 2014. Some Variations on a Counterfunctional Digital Camera. In *Proceedings of the ACM Conference on Designing Interactive Systems (DIS)*, 131–140. https://doi.org/10.1145/2598510.2602968

Optional:

Eric P. S. Baumer and M. Six Silberman. 2011. When the Implication Is Not to Design (Technology). In *Proceedings of the ACM Conference on Human Factors in Computing Systems (CHI)*, 2271–2274. https://doi.org/10.1145/1978942.1979275

WEEK 13

11/19	LAB 4
	In-class Usability Evaluation

11/21	No Class – Thanksgiving Break

UNIT 4 – HISTORIES AND FUTURES

WEEK 14

11/26	HISTORICAL VISIONS
	Vannevar Bush. 1945. As We May Think. *The Atlantic*.

DATE	TOPIC & READINGS	ASSIGNMENTS ETC.

11/28

THREE WAVES

Eric P. S. Baumer and Jed R. Brubaker. 2017. Post-userism. In *Proceedings of the ACM Conference on Human Factors in Computing Systems (CHI),* 6291–6303. https://doi.org/10.1145/3025453.3025740 [***stop*** *at the heading* ***Levels of Representation***]

Optional:

Geoff Cooper and John Bowers. 1995. Representing the User: Notes on the Disciplinary Rhetoric of HCI. In *The social and interactional dimensions of human-computer interfaces,* Peter J. Thomas (ed.). Cambridge University Press, Cambridge, 48–66.

Steve Woolgar. 1991. Configuring the user: the case of usability trials. In *A Sociology of Monsters: Essays on Power, Technology and Domination,* John Law (ed.). Routledge, London, 58–99.

WEEK 15

12/3

FRONTIERS

Choose and read **One** *of the following:*

Hiroshi Ishii and Brygg Ullmer. 1997. Tangible Bits: Towards Seamless Interfaces Between People, Bits and Atoms. In *Proceedings of the ACM Conference on Human Factors in Computing Systems (CHI),* 234–241. https://doi.org/10.1145/258549.258715

Thad Starner, Steve Mann, Bradley Rhodes, Jeffrey Levine, Jennifer Healey, Dana Kirsch, Rosalind W. Picard, and Alex Pentland. 1997. Augmented Reality Through Wearable Computing. *Presence: Teleoperators and Virtual Environments* 6, 4: 396–398.

Mark Weiser. 1991. The Computer for the 21st Century. *Scientific American* 265, 3: 94–104.

Optional:

Genevieve Bell and Paul Dourish. 2007. Yesterday's tomorrows: notes on ubiquitous computing's dominant vision. *Personal and Ubiquitous Computing* 11, 2: 133–143. https://doi.org/10.1007/s00779-006-0071-x

DATE	TOPIC & READINGS	ASSIGNMENTS ETC.
12/5	Final Project Presentations	In-class poster session
		Lab 4 Report **Due** Online Wednesday, December 12 at 11:59 p.m.