

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 T 1:00 p.m. - 2:00 p.m. (or by appt.)

Location Christmas-Saucon Hall 303

Semester Fall 2017

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:

- Usability – What makes a system or an interface usable? How would you evaluate a system’s usability?
- Design – Given a functionality specification for a system, how does one generate concepts for the way that users should interact with the system?
- 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 have the skills necessary to answer each of the above questions.

ASSIGNMENTS

All 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.

DESIGN WORKBOOKS

Each class day 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 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. Grades will be assigned for each exercise individually. Exercises will be on a letter scale of A (100%), B (85%), or C (70%).

PROJECT 1 – USABILITY

You will be designing the interface for a web-based photo-sharing application. The backend functionality is fully provided. Your job will be to use the techniques learned in class to make the best interface possible. Specifically, you will focus on usability, as measured by the time that it takes people to complete a set of tasks and by the number of errors that they make in doing so. Less time and fewer errors results in greater usability.

Project 1 will be completed in groups of 3. These groups will be assigned randomly during the third week of class (when Project 1 is assigned).

The project will result in three deliverables.

- *The Interface*: The interface that you design will be subjected to an in-class usability evaluation. Several of your class mates will use your design to complete some pre-specified tasks. Although you will be given specifications of what the interface is for and the functionalities it should provide, the specific tasks will be given on the day of the usability tests.

- *Design Rationale*: You will submit a written description of the final interface, along with justifications. What were the decisions and trade offs you made, and why? This rationale can include concept sketches, early prototypes, screenshots of the final version, and whatever other visuals will help you convey your design rationale. Use the readings both as a model and as a source of justifications for your design.

- *Performance Evaluation*: How well did the system do in terms of speed? Which errors were the most common? Where were the bottle necks? What issues emerged, both anticipated and unanticipated?

The combined written component (the Design Rationale and Performance Evaluation) should be somewhere between 500 and 1000 words in length.

PROJECT 2 – DESIGN METHODS

This class involves exposure to a number of advanced techniques for designing interactive computing systems. For Project 2, you will gain experience applying these methods.

The prompt for this project will come from the Student Design Competition at the ACM Conference on Human Factors in Computing Systems (CHI), which is the premiere publication venue for the field of HCI. You are not required to submit the outcome of your project to this competition. However, if you choose to do so, please notify Prof. Baumer as soon as possible.

Given the time constraints of an academic semester, it will be difficult (perhaps even impossible) to complete an entire design, implementation, and evaluation process. Thus, you will focus on one portion of that process as is appropriate to the method you select. For example, if you choose to use ethnographic methods, you might study some existing sociocultural subgroup or try to evaluate some existing technology, rather than designing, implementing, deploying, and evaluating your own system. If you choose to use research through design methods, you might create and deploy a prototype system, but you likely would not conduct multiple rounds of iterative deployment and redesign.

Project 2 will be completed in groups of 3 to 4 students. You will choose your own groups.

This project's deliverables will occur in several stages.

- *Speed Networking*: During Week 8, one class day will be spent sharing ideas with your classmates in a networking exercise. You should come to class this day with ideas prepared (and written and/or sketched in your design workbook) of what you might like to do for your project. This exercise will both generate new ideas and help you find teammates.

- *Proposal, Progress, and Critiques*: During Week 10, your group will present the idea you plan to pursue for your project. You will spend roughly half the time presenting your idea and half the time responding to questions, comments, and critiques from your classmates. During Week 13, you will give a progress report on what you have thus far completed and what you still have yet to do.

- *Final Presentation*: On the last day of class, you will present the results of your work in class. As with the initial critiques, you will spend roughly half the time describing your process and its outcomes, and half the time fielding questions from your classmates. These questions should be used to inform the final write-up.

- *Written Report*: You will provide a 6-page paper in SIGCHI Extended Abstracts Format, as per the CHI Student Design Competition.

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. Any in-class assignments or 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 assignment and participation grades.

GRADING

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

- 15% Attendance & Participation
- 20% Design Workbooks
- 25% Project 1
- 35% Project 2
- 5% Critique Feedback for Other Groups

Grading Scale

98% – 100% A+	78% – 79.9% C+
92% – 97.9% A	72% – 77.9% C
90% – 91.9% A-	70% – 71.9% C-
88% – 89.9% B+	68% – 69.9% D+
82% – 87.9% B	62% – 67.9% D
80% – 81.9% B-	60% – 61.9% 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 other days, you will be required to bring a personal computing device (e.g., a laptop computer), with these days noted on the syllabus. 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

DATE	TOPIC & READINGS	ASSIGNMENTS ETC.
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WEEK 1 INTRODUCTION

8/28	What is Human-Computer Interaction?	
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8/30	Bush, V., 1945. As We May Think. <i>The Atlantic</i> . Carroll, J.M., n.d. Human Computer Interaction - brief intro. The Encyclopedia of Human-Computer Interaction. https://www.interaction-design.org/literature/book/the-encyclopedia-of-human-computer-interaction-2nd-ed/human-computer-interaction-brief-intro [<i>only sections 2.1 and 2.2 required, remainder is Optional</i>]	
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UNIT 1 – FOUNDATIONS

WEEK 2 BASIC INTERFACE DESIGN PRINCIPLES

9/4	Smith, D.C., Irby, C., Kimball, R., Verplank, B., Harslem, E., 1982. Designing the Star User Interface. <i>BYTE Magazine</i> 7, 242–282.	
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9/6	Norman, D.A. 1988. The Psychopathology of Everyday Things. in <i>The Design of Everyday Things</i> (Revised & Expanded Edition), 1-36. Basic Books: New York.	
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WEEK 3 THE NEED FOR SPEED

9/11	UI with jQuery – <i>Bring your laptop</i> <i>Before Class:</i> Get a local web server running on your machine (see the Project 1 description for details)	Assign Project 1
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DATE	TOPIC & READINGS	ASSIGNMENTS ETC.
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9/13	<p>Fitts, P.M., 1954. The Information Capacity of the Human Motor System in Controlling the Amplitude of Movement. <i>Journal of Experimental Psychology</i> 47, 381–391. doi:10.1037/0096-3445.121.3.262</p> <p>MacKenzie, I.S., Buxton, W., 1992. Extending Fitts' Law to Two-dimensional Tasks, in: <i>Proceedings of the ACM Conference on Human Factors in Computing Systems (CHI)</i>. ACM, Monterey, CA, pp. 219–226. doi: 10.1145/142750.142794</p> <p><i>Optional:</i></p> <p>Goldberg, K., Faridani, S., Alterovitz, R., 2015. Two Large Open-Access Datasets for Fitts' Law of Human Motion and a Succinct Derivation of the Square-Root Variant. <i>IEEE Transactions on Human-Machine Systems</i> 45, 62–73. doi:10.1109/THMS.2014.2360281</p>	
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WEEK 4	PROTOTYPING AS A PROCESS	
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9/18	<p>Buxton, B., 2007. <i>Sketching User Experiences: Getting the Design Right and Getting the Right Design</i>. Morgan Kaufmann, San Francisco, CA. pp. 104-123.</p>	
9/20	<p>Dow, S.P., Glassco, A., Kass, J., Schwarz, M., Schwartz, D.L., Klemmer, S.R., 2010. Parallel Prototyping Leads to Better Design Results, More Divergence, and Increased Self-efficacy. <i>ACM Transactions on Computer-Human Interaction</i> 17, 18:1–18:24. doi: 10.1145/1879831.1879836</p>	

UNIT 2 – ADVANCED DESIGN METHODS

WEEK 5	ENGAGING USERS	
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9/25	<p>Holtzblatt, K., Beyer, H.R., n.d. Contextual Design. The Encyclopedia of Human-Computer Interaction. https://www.interaction-design.org/literature/book/the-encyclopedia-of-human-computer-interaction-2nd-ed/contextual-design</p>	
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DATE	TOPIC & READINGS	ASSIGNMENTS ETC.
9/27	<p>Muller, M.J., Kuhn, S., 1993. Participatory Design. Commun. ACM 36, 24–28. doi:10.1145/153571.255960</p> <p>Muller, M.J., 1991. PICTIVE—an Exploration in Participatory Design, in: Proceedings of the ACM Conference on Human Factors in Computing Systems (CHI). ACM, New Orleans, LA, pp. 225–231. doi: 10.1145/108844.108896</p> <p><i>Optional:</i></p> <p>Beck, E.E., 2002. P for Political: Participation is not enough. Scandinavian Journal of Information Systems 14, 1.</p>	
WEEK 6	ETHNOGRAPHY	
10/2	<p>Salvador, T., Bell, G., Anderson, K., 1999. Design Ethnography. Design Management Journal (Former Series) 10, 35–41. doi: 10.1111/j.1948-7169.1999.tb00274.x</p> <p><i>Optional:</i></p> <p>Dourish, P., 2014. Reading and Interpreting Ethnography, in: Olson, J.S., Kellogg, W.A. (Eds.), Ways of Knowing in HCI. Springer, New York, pp. 1–24.</p>	Submit Project 1 Source Code
10/4	Round robin usability testing in-class	Evaluation Results Returned by Friday, October 6
WEEK 7	RESEARCH THROUGH DESIGN AND CULTURAL PROBES	
10/9	<p>Zimmerman, J., Forlizzi, J., n.d. Research through Design in HCI, in: Olson, J.S., Kellogg, W.A. (Eds.), Ways of Knowing in HCI. Springer, New York, pp. 167–189.</p> <p><i>Optional:</i></p> <p>Gaver, W., 2011. Making Spaces: How Design Workbooks Work, in: Proceedings of the ACM Conference on Human Factors in Computing Systems (CHI). ACM, Vancouver, BC, pp. 1551–1560. doi: 10.1145/1978942.1979169</p>	Assign Project 2

DATE	TOPIC & READINGS	ASSIGNMENTS ETC.
10/11	Gaver, B., Dunne, T., Pacenti, E., 1999. Cultural Probes. interactions 6, 21–29. doi: 10.1145/291224.291235	Assign Project 2
	Gaver, W.W., Boucher, A., Pennington, S., Walker, B., 2004. Cultural probes and the value of uncertainty. interactions 11, 53–56. doi: 10.1145/1015530.1015555	Project 1 Due Friday, October 13
	<i>Optional:</i> Boehner, K., Vertesi, J., Sengers, P., Dourish, P., 2007. How HCI interprets the probes, in: Proceedings of the ACM Conference on Human Factors in Computing Systems (CHI). ACM, San Jose, CA, pp. 1077–1086. doi: 10.1145/1453152.1453155	

WEEK 8 NETWORKING

10/16	No Class Meeting – Pacing Break	
10/18	Speed Networking for Project 2 Groups	Project 2 Groups (Due 10/20)

WEEK 9 RESEARCH THROUGH (CRITICAL) DESIGN

10/23	[no class – Prof. Baumer away]	
10/25	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	
	<i>Optional:</i> Dunne, T. and Raby, F. (2001). Designer as Author, in: Design Noir: The Secret Life of Electronic Objects. Birkhäuser, Berlin, pp. 57-65.	

UNIT 3 – DEVELOPMENTS IN THE FIELD

WEEK 10 BTW... COMMENTARIES

DATE	TOPIC & READINGS	ASSIGNMENTS ETC.
10/30	<p>Greenberg, S., Buxton, B., 2008. Usability Evaluation Considered Harmful (Some of the Time), in: Proceedings of the ACM Conference on Human Factors in Computing Systems (CHI). ACM, Florence, Italy, pp. 111–120. doi: 10.1145/1357054.1357074</p> <p><i>Optional:</i></p> <p>Dourish, P., 2006. Implications for Design, in: Proceedings of the ACM Conference on Human Factors in Computing Systems (CHI), CHI '06. ACM, Montréal, QC, pp. 541–550. doi:10.1145/1124772.1124855</p>	
11/1	Project 2 Proposals / Design Critiques	In-class Presentations
WEEK 11	THE THIRD WAVE	
11/6	<p>Grudin, J., 1990. The Computer Reaches out: The Historical Continuity of Interface Design, in: Proceedings of the ACM Conference on Human Factors in Computing Systems (CHI). ACM, Seattle, WA, pp. 261–268. doi:10.1145/97243.97284</p> <p><i>Optional:</i></p> <p>Bannon, L., 1991. From Human Factors to Human Actors: The Role of Psychology and Human-Computer Interaction Studies in System Design, in: Design at Work: Cooperative Design of Computer Systems. pp. 25–44.</p>	
11/8	<p>Bødker, S., 2006. When second wave HCI meets third wave challenges, in: Proc NordiCHI. ACM, Oslo, Norway, pp. 1–8. doi:10.1145/1182475.1182476</p> <p><i>Optional:</i></p> <p>Bertini, E., Perer, A., Plaisant, C., Santucci, G., 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). ACM, Florence, Italy, pp. 3913–3916. doi:10.1145/1358628.1358955</p>	
WEEK 12	CASE STUDY – AFFECTIVE COMPUTING	

DATE	TOPIC & READINGS	ASSIGNMENTS ETC.
11/13	<p>Russell, J.A., 1980. A circumplex model of affect. <i>Journal of Personality and Social Psychology</i> 39, 1161–1178. doi:10.1037/h0077714 [only read pages 1161-1167, stop at the heading <i>Multidimensional Scaling of Terms</i>]</p> <p>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</p>	
11/15	<p>Sengers, P., Boehner, K., Mateas, M., Gay, G., 2008. The Disenchantment of Affect. <i>Personal and Ubiquitous Computing</i> 12, 347–358. doi:10.1007/s00779-007-0161-4</p>	
WEEK 13	PROGRESS	
11/20	Project 2 Progress Reports / Design Critiques	In-class presentations
11/22	No Class – Thanksgiving Break	
WEEK 14	THE INTERNET OF THINGS (OR, THE FIELD FORMERLY KNOWN AS UBICOMP)	
11/27	<p>Weiser, M., 1991. The Computer for the 21st Century. <i>Scientific American</i> 265, 94–104.</p> <p><i>Optional:</i></p> <p>Cooper, G., Bowers, J., 1995. Representing the User: Notes on the Disciplinary Rhetoric of HCI, in: Thomas, P.J. (Ed.), <i>The Social and Interactional Dimensions of Human-Computer Interfaces</i>. Cambridge University Press, Cambridge, pp. 48–66.</p>	
11/29	<p>Genevieve Bell and Paul Dourish. 2007. Yesterday’s tomorrows: notes on ubiquitous computing’s dominant vision. <i>Personal and Ubiquitous Computing</i> 11, 2 (January 2007), 133–143. DOI:10.1007/s00779-006-0071-x</p> <p><i>Optional:</i></p> <p>Woolgar, S., 1991. Configuring the user: the case of usability trials, in: Law, J. (Ed.), <i>A Sociology of Monsters: Essays on Power, Technology and Domination</i>. Routledge, London, pp. 58–99.</p>	

DATE	TOPIC & READINGS	ASSIGNMENTS ETC.
WEEK 15	"A STILL MORE GLORIOUS DAWN AWAITS . . ."	
12/4	<p data-bbox="381 384 841 411"><i>Choose and read One of the following:</i></p> <p data-bbox="381 428 1122 590">Ishii, H., Ullmer, B., 1997. Tangible Bits: Towards Seamless Interfaces Between People, Bits and Atoms, in: Proceedings of the ACM Conference on Human Factors in Computing Systems (CHI). ACM, Atlanta, GA, pp. 234–241. doi:10.1145/258549.258715</p> <p data-bbox="381 606 1110 737">Shneiderman, B., 1996. The Eyes Have It: A task by data type taxonomy for information visualizations, in: Visual Languages, 1996. Proceedings., IEEE Symposium on. IEEE, pp. 336–343. doi: 10.1109/VL.1996.545307</p> <p data-bbox="381 753 1062 884">Starnier, T., Mann, S., Rhodes, B., Levine, J., Healey, J., Kirsch, D., Picard, R.W., Pentland, A. (1997). Augmented Reality Through Wearable Computing. Presence: Teleoperators and Virtual Environments, 6(4), 396–398.</p>	
12/6	Project 2 Final Presentations	<p data-bbox="1146 930 1414 957">In-class poster session</p> <p data-bbox="1146 974 1414 1071">Project 2 Due Online Wednesday, December 13 at 11:59 p.m.</p>