Course Syllabus

Designing Human-Centered Software (DHCS)

05-391 / 05-891, Spring 2021

Instructor: Prof. Chris Harrison
Email: chris.harrison@cs.cmu.edu
Class Time: Tuesday/Thursday, 12:20-1:40pm ET
Teaching Assistant: Sai Swaminathan <saiganes@cs.cmu.edu>

1 Description

Why are things so hard to use these days? Why doesn't this thing I just bought work? Why is this website so hard to use? These are frustrations that we have all faced from systems not designed with people in mind. The question this course will focus on is: how can we design human-centered systems that people find useful and usable? This course is a broad introduction to designing, prototyping, and evaluating user interfaces. If you take only one course in Human-Computer Interaction (HCI), this is the course for you. We will cover theory as well as practical application of ideas from Human-Computer Interaction. Coursework includes lectures, class discussion, homework, class presentations, and group projects.

2 Prior Knowledge / Prerequisites

This class is open to all students, with either technical or non-technical backgrounds. However, there is a programming prerequisite, as you be expected to code small assignments.

3 Attendance

Lectures will be delivered live, twice a week. The expectation is that you attend ***synchronously*** and it is highly appreciated if your ***video is on***. I expect your full attention, professionalism, and interactive participation ***as if this were a real in-person class***. This arrangement is not to place undue stress on you, but rather provide the best educational experience.

The only excused absences this course accepts are medical and family emergencies, academic conference travel, religious events, and a small set of approved collegiate activities. Note that

interviews, family vacations, weddings, sleeping through alarms, etc. are not excused. Pop quizzes are given in part to assess attendance – that said, your lowest two quiz grades will be dropped, allowing you to miss up to two classes without penalizing your grade.

4 Projects

The bulk of the work in this class will be a series of group projects, comprised of an interdisciplinary group of roughly three people. Each project will go thru an iterative human-centered process, with each phase having a video report and in-class presentation. Peer reviews are collected following group assignments and make up a significant part of your grade.

5 Inclusivity

To design human-centered systems, we must understand people and their lived experiences. A diversity of backgrounds and opinions is thus paramount to identifying the best ideas, iterating on them with deep insight, and crafting a final artifact that improves usability and utility for everyone. It is my intention that students from all backgrounds and perspectives be well served by this course and feel comfortable sharing their views and experiences to enrich class discussions. I am always open to suggestions, so please let me know ways to improve the effectiveness of the course for you personally or for other students.

6 Grading and Late Policy

Lectures and homework will be posted to canvas. The due date is posted as well. Each day late will result in a 10% deduction (up to a maximum of 50% off). Students caught cheating or plagiarizing will receive no credit for the assignment. Additional actions – including assigning the student a failing grade in the class or referring the case for disciplinary action – may be taken at the discretion of the instructor. Please note that Canvas has automated plagiarism detection built-in now, so please do not cheat or turn-in uncited work. Your final grade in this course will be based on (these percentages may change ±15% depending on how the semester progresses given the uncertainty with the ongoing pandemic):

- Participation & in-class activities 20%
- Homeworks 20%
- Quizzes 35%
- Bakeoffs 25%

7 Incompletes & Pass/Fail

It is the policy of this class to not give incompletes. Several assignments have in-class components, so you will need to have each one finished on time. There is no option to take DHCS pass/fail.

8 Tentative Semester Schedule

Lecture 1 - Welcome & Introduction
(HCI, UX, context, waterfall model, durability of ideas. grading/class policies)

Lecture 2 - History of Computing Interfaces 1
(MMI, computer input pre-1950s, Vannevar Bush, Grace Hopper, Sketchpad, the mouse)

Lecture 3 - Prototyping 1
(Why prototype, fidelity, dangers, materials, storyboards, user testing, paper prototypes, Wizard of Oz, wireframes/schematics)

Lecture 4 - Prototyping 2
(HTML, Powerpoint, Keynote, Balsamiq, Axure, Invision)

Lecture 5 - History of Computing Interfaces 2
(Mice/NLS, Dynabook, Xerox Star, GUIs, multitouch, long nose of innovation)

Lecture 6 - Prototyping 3
(Bodystorming, video prototypes)

Lecture 7 - Prototyping 4
(Interactive prototyping, intro to Processing, deploy to Android, processing.js)

Lecture 8 - Groupwork and Bakeoff 1 Design Jam
(working in groups, bakeoff mechanics, teams)

Lecture 9 - Design Process
(Design myths, design-prototype-evaluate cycle, wireframes, storyboards, usability goals, know thy user, user is not like me, quality vs. quantity ideation, functional fixation)

Lecture 10 - Observation 1
(Needs finding, ethnography, contextual inquiry, market research, recording tech., affinity diagramming, expert blindness, survivorship bias)

Lecture 11 - Evaluation 1
(Ethics, IRB, experimental measures, experiment design, questionnaire design, stereotype threat, order effects, motivational effects, Hawthorne effect, novelty effect, experimenter bias)

Lecture 12 - Bakeoff 1

Lecture 13 - Humans 1
(Bakeoff 1 debrief, Human Factors, Fitts law, steering law, targeting interaction techniques)

Lecture 14 - Evaluation 2
(Cognitive walkthrough, Heuristic Evaluation, UARs)

Lecture 15 - Visual Design 1
(Grid systems, hierarchy of size, grouping, gestalt principles, small multiples, color use, color perception)

Lecture 16 - Humans 2
(Hick-Hyman law, Four and a Half rule, mental models, recognition vs. recall, Model Human Processor, action analysis, GOMS)

Lecture 17 - Visual Design 2
(Design patterns, metaphors, affordances, skeuomorphs)

Lecture 18 - Humans 3
(Resolution of eye, DPI/PPI, visual perception, gestalt grouping, change blindness, animation, faces, biological motion, kinecticons research)

Lecture 19 - Input/Output 1
(Physiological computing, gaze tracking, FNIR, galvanic skin response, heartrate, EKG, EMG, affect tracking, breathing)

Lecture 20 - Bakeoff 2

Lecture 21 – Humans 3
(Bakeoff 2 debrief, framerate, visual perception, time perception, latency, progress bars research examples, peak and end effects)

Lecture 22 - Observation 2
(Diary studies, application logging, experience sampling, lifelogging, cultural probes, day reconstruction method, elicitation studies, crowdsourced studies)

Lecture 23 - Input/Output 2
(Acoustics and HCI, common terms/units, time/frequency domain, code demos)

Lecture 24 - Input/Output 3
(CV + HCI, common terms/units, basic techniques, uses in HCI, depth cameras, code demos)

Lecture 25 - Bakeoff 3

Lecture 26 - Input/Output 4
(Bakeoff 3 debrief, text entry history, keyboards, layouts, mobile text entry, research metrics)

Lecture 27 – Machine Learning & HCI
(Machine Learning and HCI, basic concepts, class demo, example ML+HCI research projects)

Lecture 28 - Input/Output 5
(Misc. output technologies, screens, sound, smell/taste, haptics, VR, muscle I/O)

Final Exam – Bakeoff 4

(No final exam, but there will be final bakeoff presentations on the scheduled final examination date. Attendance is mandatory.)