Course Syllabus

Jump to Today

A6857

Measuring the Great Indoors

Semester: Fall 2019

Meeting Time: Tuesday 7p-9p

Room: Avery 505

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Revised 9/3/19.

Refer to https://medium.com/measuring-the-great-indoors (Links to an external site.) for up to date course information.

Course Description

This course will explore techniques for working with data from the physical world, with the aim of understanding and manipulating dynamic, interactive environments. Students will use hardware (sensors, microprocessors, computer vision cameras), software (IFTTT and Processing), and their own powers of observation to characterize “the great indoors.” Our investigations will focus on heat, light, and motion: shifting temperature gradients, changing qualities of light, and traffic patterns in a busy hallway. We’ll interpret data using industry standards for indoor environmental quality, and consider how these standards may or may not capture the range of human experience in buildings.

After conducting baseline environmental measurements of a space in Avery Hall, students will construct their own interventions in the space and use prototyping workflows (hypothesis, test, conclusion, retest) to evaluate the results. While the course includes elements of building science and physical computing, its primary aim is to encourage students to consider dynamic spatial and environmental qualities in their design work.

Goals

- Understand and explore techniques embedding sensors and actuators in the built environment.

- Understand cybernetic systems and human computer interaction with the aim of reading and manipulating dynamic, interactive environments.
- Question how modern day digital systems (smart home sensors, Amazon Echos, Computer Vision Cameras, live projection, etc) influence habits, flows, cultures, and behaviors.

Course Content

The first half of the semester will be organized in modules addressing heat, light, sound, and motion. Each module will include a lecture covering building physics, relevant standards, and measuring techniques. Most lectures will be followed by a lab session consisting of hands-on exercises related to the lecture topic. Modules posted online will reinforce the lab exercises.

Alongside the lectures and labs, students will work on a semester-long project exploring the construction of a cybernetic feedback loop (**Measure/Act**). In the first half of the semester, students will work individually and focus on the technical resolution of their projects. In the second half of the semester, students will continue to develop their projects in groups, with the added complexity of siting their project in a public space in Avery Hall.

Guest lectures will feature professionals who use data from existing buildings in their daily work in a variety of contexts.

Avery Hall

Avery Hall will be the focus of our investigations and interventions. Students will collect and interpret data from spaces within the school, and use the building as the site for interactive installations during the second half of the semester. These installations will be exhibited to the wider GSAPP community as part of the End-of-Year Show.

Course Website

The course website on Medium [https://medium.com/measuring-the-great-indoors (Links to an external site.)] will be the hub for all course information and resources. Lectures, assignments and readings will be posted here, and students will upload their assignments to – and present them from – the site.

Course Materials

Students are expected to purchase their own materials for the course, including sensing hardware and instruments. Instructors may be able to share some hardware with students, and student teams may share hardware amongst themselves. Students are encouraged to use off-the-shelf hardware rather than building their own sensors. If students have prior experience with platforms like Arduino, they may pursue projects involving physical computing with the permission of the instructors.

Course Schedule

The preliminary schedule below is subject to change. Refer to the course website for the latest version.

Week	***Date***	***Topic***
Project: Measure/Act I (Links to an external site.) (Individual)		
1	3-Sep	NO CLASS - Vis/Tech Presentations
2	10-Sep	Lecture: Intro, Sensory Environments, Cybernetics / Human Computer Interaction (HCI) Lab: System Diagram, Intro to IFTTT Assignment: IFTTT Module: Time, Light
3	17-Sep	**Present: IFTTT** Lecture: Heat Lab: IFTTT w/ Environmental Data Module: Temperature Threshold
4	24-Sep	*--2nd Year Studio Travel Week--* Lecture: Light, Affordance / HCI Lab: Brainstorming Recipes Assignment: Measure/Act Project Proposal Module: Door, Plug

		Present: Measure/Act Project Proposal Lecture: Light, Interventions with Processing and Projectors
5	1-Oct	Assignment: Measure/Act Revised System Diagram, Materials List Read: Digital Privacy (TBD) Module: Equipment Sources
		Class Discussion: Digital Privacy Lecture: Motion
6	8-Oct	Lab: Computer Vision with Processing Assignment: Measure/Act Working Prototype Module: TBD
		Present: Measure/Act WorkingPrototype Lab: Desk Crits
7	15-Oct	Assignment: Final Project Module: TBD
		--*Studio Midterm Reviews*--
8	22-Oct	Guest Lecture: Sound Lab: Sound (TBD)
		--*Studio Midterm Reviews*--
9	29-Oct	**Present: Midterm**

Final Project: Measure/Act II
(Group)

10	5-Nov	NO CLASS - Election Day
		Lecture: User Testing / Interaction Design
11	12-Nov	Workshop: Final Project Lab: Site Selection & Observation
12	19-	Workshop: Final Project

	Nov	
13	26-Nov	Workshop: Final Project
	3-Dec	Guest Lecture - TBD
14	13-Dec	**Present: Final Review**

Grading and Assessment

- This class involves experimentation, and students should be prepared for hardware failures, software bugs, and more. Assessment will be based on student effort and process in addition to the final product.
- Work is to be completed at the beginning of class on the due date and uploaded to Medium prior to the start of class. Late work may receive a reduced grade.
- Grades for groupwork are assigned to the group. On rare occasions, individual grades may be awarded for exceptional or deficient performance within a group. All group members must participate equally in group presentations.

Grading Criteria:

Criteria	**Description**	***%***
Attendance and Participation	• Attendance • Preparedness for class presentations, crits, and discussions • Embracing and learning from failure, taking risk	20%
Measure/Act I (Individual project)	• Design concept • Weekly progress and process • Technical resolution	40%

Measure/Act II (Group project)	• Design concept • Weekly progress and process • Technical resolution	40%

Attendance

It is important that you attend every class. Regular attendance is necessary to understand the material and successfully complete the assignments.

An absence is “excused” if you are sick and submit a doctor’s note, or have a serious issue that causes you to miss class, such as a family emergency. All other absences are “unexcused.” Students may have up to two unexcused absences per semester. Students with three or more unexcused absences will have their final grade reduced, and may fail the course.

If you know in advance that you will be absent for any reason, email the instructors to make arrangements to complete make-up work.

Policies and Academic Integrity

- If you require an accommodation for a disability, please let the instructor know as soon as possible. Some aspects of the course may be modified to facilitate your participation and progress.
- All students are held to the academic policies of the University.
- In this course we will work in a collaborative and open manner freely sharing information, ideas and resources. However, assignments and presentations that are indicated as individual efforts must adhere to a high standard of academic integrity. In any case, in any context, representing another’s work as your own is dishonest.
- Students who miss deadlines due to valid extenuating circumstances may submit the required work at a later date, as agreed upon with the instructor. University regulations limit such circumstances to serious personal illness and death in the immediate family. Unexcused late projects will not be accepted. Incomplete projects will be evaluated in relation to their degree of completion, and a student will be allowed to present such work only with instructor approval. Lectures and demonstrations cannot be repeated. There is no excuse for late submittals, late attendance at reviews or pin ups, due to printer or computer problems. You have to organize your output ahead of time or find other resources outside the college to complete your work on time. Late work will be accepted only at the discretion of the instructors and is subject to a 5% grade deduction for every 24 hours past the deadline.

Resources

The texts below will be on reserve in the Library. Required and suggested readings are noted in the Course Schedule. PDFs of readings will be posted to the course website.

Computing

- Samuel Greenguard, *The Internet of Things* (MIT Press, 2015)
- Malcolm McCollough, *Digital Ground: Architecture, Pervasive Computing, and Environmental Knowing* (MIT Press, 2005)

- Dan O'Sullivan and Tom Igoe, *Physical Computing: Sensing and Controlling the Physical World with Computers* (Thompson Publishing, 2004).
- Casey Reas and Ben Fry, *Processing: A Programming Handbook for Visual Designers* (MIT Press, 2014)

Architecture and Urban Design

- Stewart Brand, *How Buildings Learn: What Happens After They're Built* (Penguin Books, 1994).
- Mark Weiser, "The Computer of the 21st Century," *Scientific American*, September 1991. [link (Links to an external site.)]
- Kazys Varnelis, *Networked Publics* (MIT Press, 2012)
- Keller Easterling, The Internet in 4D (Links to an external site.)
- William H Whyte, *The Social Life of Small Urban Spaces* (The Conservation Foundation, 1980).

Design

- Anthony Dunne and Fiona Raby, *Speculative Everything: Design, Fiction and Social Dreaming* (MIT Press, 2013)
- Yvonne Rogers, Helen Sharp, and Jenny Preece, *Interaction Design: Beyond Human-Computer Interaction* (Wiley, 2011)
- Donald Norman, *The Design of Everyday Things* (Basic Books, 2002)
- Bill Moggridge, *Designing Interactions* (MIT Press, 2007)

Building Science and Sensory Perception

- James Gibson, "Affordances," in *The Ecological Approach to Visual Perception* (Routledge, 2014)
- Barbara Erwine, *Creating Sensory Spaces: The Architecture of the Invisible* (Routledge, 2016)

- Lisa Heschong, *Thermal Delight in Architecture* (MIT Press, 1979)
- Steven Szokolay, *Introduction to Architectural Science: The Basis of Sustainable Design* (Architectural Press, 2004)
- Fergus Nichol, Michael Humphreys, Susan Roaf, *Adaptive Thermal Comfort: Principles and Practice* (Routledge, 2012)
- Kiel Moe, *Thermally Active Surfaces in Architecture* (Princeton Architectural Press, 2010)

Critique

- Dan Hill, The City is My Home Screen [link (Links to an external site.)]
- We Built an 'Unbelievable' (but Legal) Facial Recognition Machine By Sahil Chinoy, NY Times, [link (Links to an external site.)]