Interaction Design: Electronics And Semantics (IDEAS – CCTP617)
Fall - 2016

Wednesdays 11:00am – 1:30pm in the CCT Studio
Class website: https://blogs.commons.georgetown.edu/cctp-617-fall2016/

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    Office Hours: Wed 10am Car Barn 311E or by appointment

Summary
Hacking, making, modding, DIY; these terms all describe the ways that consumers use technology to empower themselves by transforming the material world. Whether you are an entrepreneur looking to create a new product, an everyday consumer who wants to personalize your life with interactive artifacts, or a creative spirit who wants to learn how to express yourself through physical media, knowing how to combine physical and virtual objects and spaces in meaningful ways is an essential communication skill in the 21st century. Interaction Design: Electronics And Semantics (IDEAS) will teach you how to create and test working prototypes of electronic artifacts and how to articulate the ways these artifacts are understood and made meaningful in a cultural context. Through lectures on basic electronics, readings on creativity and design, and hands-on exercises in hi- and low-fidelity prototyping techniques, this class will give you the foundation you need to begin creating physically interactive artifacts in fields like wearable computing, toy design, new media art, robotics, the internet of things and many more. After mastering tutorials and exercises students will learn to use an iterative design process to create two interactive projects during the semester.

Class sessions will typically consist of short lectures on relevant topics in electronics and interaction design followed by hands-on in-class lab assignments. Although no prior programming experience is required, and programming techniques will be taught, this course will involve some programming in the Arduino environment.

Instructional Continuity: Should there be a disruption in regularly scheduled meetings the instructor will determine how best to reintegrate missed coursework. Students will be asked for input and preferences when making this determination.

Honor Statement
All students are expected to be familiar with and will be held to the Georgetown University Honor Policy outlined in: https://honorcouncil.georgetown.edu

Course Goals
By the end of the semester, students should have the following skills:
- The ability to design and prototype an electronic artifact
- The ability to formulate good questions
- The knowledge, skills and confidence to learn how to identify and acquire new skills as required by future projects.

Student Expectations
Responsibilities for the class include completing all homework assignments and completing projects. Students will be expected to post project documentation to the blog. Students will be expected to help each other learn both inside and outside of the classroom.

Attendance and participation in this class are required and attendance policies will be enforced. ANY unexcused absence will drop your grade one level (A becomes A- or B+ becomes B). Any excused absence requires at least TWO WEEKS NOTICE (excepting emergencies) in writing explaining why you will miss the class and how you will make up the work you miss. There will be a 5 minute grace period at the beginning of class for tardiness. If you are more than 5 minutes late you will be marked as such. If you are late twice it will count as an absence. If you are more than 20 minutes late you will be marked absent.

ALL labs, posts, and projects MUST be completed and submitted by the due date to receive credit, **late assignments will not be accepted. NO EXCEPTIONS.**

Course Blog
The course website will have a digital copy of the syllabus as well as links to homeworks, demos, tutorials, and downloads for your assignments. This will be the most up-to-date resource for the class.

Every Project MUST be documented on the course blog in a way that makes it reproducible by someone else. Every project page must be a tutorial.

LABS
There are 6 lab assignments (0-5) each designed to teach you a fundamental technical skill. These are assigned and worked on in class, if they are not completed during class **they must be completed before the next class begins**. Once the lab assignment is completed you must post a picture, video, or write-up on the course blog to get credit. Documentation is essential in this field and so it is essential in this class.

Projects
Two projects are required for this course: one individual, one group.

Projects must include the following:
- Design Plans – this is some form of description for your project that communicates why you made it and how it works. It can be any combination of slides, write-ups, schematics, etc.
- Electronics – Every project must have some electronic component that you built yourself and functions as intended. Electronics that do not function correctly will not be graded.
- Housing – every project must have an external housing that contains the electronics and provides the affordances to the user (we will discuss exactly what this means). These should have a reasonable level of polish consistent with a prototype, not a final product. However, they should function as intended and demonstrate basic principles well enough to support valid critique.

Project 1: You will need to correctly wire a 556 timer to create a functioning ATARI Punk Console audio synthesizer. You must then create a housing for this console that let's a user interact with it. Cardboard will be the required prototyping material, plus any additional materials the student decides on.

Project 2: Building on the skills learned from labs and project 1, Project 2 is a free-form project of students' own design. Students can work in teams of up to 4 people or iterate on project 1 as an individual. There are only 3 rules for this project:
1. It must be approved by the instructor
2. It must include software and hardware
3. It must have the 3 parts of a project described above

Projects will be graded based on the amount of work they entail, the complexity of the design, the level of documentation and the level of final polish.
All project documentation must be posted to the blog. All group members MUST complete a 360-degree evaluation of the performance and workload of the other members in the group. A form will be distributed.

Grading Breakdown
TOTAL 100 pts
Labs: 30pts – 6 at 5pts each
APC project (individual): 30pts
Project 2: 40pts

Weekly Schedule

<u>Week 1: 9/7/16</u> - Introduction
Examples of projects
Visit to Maker Hub
Homework: obtain tools (See list below)
Homework: Learn about Circuits. Some of these tutorials have experiments, you should read and understand these, but you don't have to do them unless you want to; although, they *can* be helpful.
1. https://learn.sparkfun.com/tutorials/what-is-electricity
2. https://learn.sparkfun.com/tutorials/voltage-current-resistance-and-ohms-law
3. https://learn.sparkfun.com/tutorials/what-is-a-circuit
4. https://learn.sparkfun.com/tutorials/series-and-parallel-circuits
5. https://learn.sparkfun.com/tutorials/resistors
6. https://learn.sparkfun.com/tutorials/capacitors (just the easy parts)
7. https://learn.sparkfun.com/tutorials/how-to-read-a-schematic
8. http://www.instructables.com/id/HOW-TO-READ-CIRCUIT-DIAGRAMS

<u>Week 2: 9/14/16</u> – Components, Circuits and Multimeters
Concepts and components in electric circuits, electricity
LAB1: Toy Takeapart – Describe and Diagram a Toy
Homework: Basic Electronics Skills
1. https://learn.sparkfun.com/tutorials/how-to-use-a-breadboard
2. https://learn.sparkfun.com/tutorials/how-to-solder---through-hole-soldering
3. https://learn.sparkfun.com/tutorials/how-to-use-a-multimeter
4. https://learn.sparkfun.com/tutorials/light-emitting-diodes-leds

<u>Week 3: 9/21/16</u> – Soldering and Breadboarding
LAB2: Grab some resistors from the bin in the studio and solder together 3 current limited LEDs (like the ones from the tutorial on Ohm's Law in week 1). Try to use multiple low resistance resistors in series to get the right total resistance. Measure with a multimeter. Then connect them to a breadboard and light them up. Post your results and intermediate steps to the blog.

Homework: Learn about the 555/556 timer and Atari Punk Console
1. https://learn.sparkfun.com/tutorials/integrated-circuits
2. http://www.dummies.com/how-to/content/electronics-components-how-the-555-timer-chip-work.html
3. https://www.youtube.com/watch?v=Oi3dmSMpjsU

4. http://www.diyaudiocircuits.com/tutorials/atari-punk-console-how-it-works/

Week 4: 9/28/16 – The APC
LAB5: Make the APC
Homework: draft a design document (2 slides - sketch and description) that depicts and explains what you will turn your APC into. How will you house it? What will it be used for?

Week 5: 10/5/16 – Project 1
Pitch your project to the class. Begin working.

Week 6: 10/12/16 – Workday – Desk Critique

Week 7: 10/19/16 – **Project Demos DUE!!**

Homework: Read about Arduino:
1. https://learn.sparkfun.com/tutorials/what-is-an-arduino
2. http://arduino.cc/en/Guide/Introduction
Install the Arduino IDE: http://arduino.cc/en/main/software
Work through the examples and descriptions
http://arduino.cc/en/Tutorial/Foundations

Week 8: 10/26/16 – Arduino Basics
LAB6 – Arduino exercises: Blink, DigitalReadSerial, AnalogReadSerial, Fade, AnalogReadVoltage, Debounce, ButtonStateChange, PitchFollower, AnalogInOutSerial

Week 9 11/2/16 – Project Pitches
Week 10: 11/9/16 – Workday
Week 11: 11/16/16 – Initial Prototype Due
Week 12: 11/23/16 – Workday
Week 13: 11/30/16 – Workday – Desk Critiques
Week 14: 12/7/16 – Final Prototype Due

PARTS LIST
We have many consumable parts in the studio for you to use, however these should be a last resort not a first choice. Here is a list of parts that we require you have for this class.

A breadboard: https://www.sparkfun.com/products/12615
An Arduino UNO: https://www.sparkfun.com/products/11021

A 12V or 9V power supply: https://www.sparkfun.com/products/298
Jumper Wires: https://www.sparkfun.com/products/124

A kit like this contains many of these items:
https://www.sparkfun.com/products/8373

Depending on your project you will likely need to purchase additional items as the need arises, some of these we may have in the studio and you are welcome to use these. Other parts will need to be purchased, so budget accordingly. If there are concerns about the cost of components see Prof. Barba.