INTERACTIVE INSTALLATIONS

DETAILS

Instructor	Prof Jeff Thompson
Email	jeff.thompson@stevens.edu
Office/hours	Morton 208, Mon/Wed 10am-12pm
Meeting times	Tuesdays 9am–12.50pm
Location	Visual Arts & Technology Studio
Course materials	https://github.com/jeffThompson/PhysicalComputing

COURSE DESCRIPTION

This semester, we will explore electronics, code, sculpture and fabrication to build interactive projects. You'll learn to use the popular, open-source Arduino platform, allowing you to get input from the world into your computer (buttons, knobs, sensors) and let your computer interact with the world (LEDs, motors, speakers). You'll also learn basic CAD for laser-cutting and 3D printing, how to use woodshop tools, and to design and solder electronic circuits. Along the way, we'll consider the interfaces and objects used historically to connect people with computers, we'll build speculative and exploratory projects, and work to refine those projects from rough prototype to finished work.

HOMEWORK

Homework in this class is meant to be exploratory, a way to expand on the experiences and ideas in class. Each project will be carried out over several weeks of iteration, prototyping, and refinement. You're encouraged to take wide-ranging interpretation of assignments: consider ways that you can complete the project that are creatively and intellectually exciting for you, not fulfilling the basic requirements. (That said, some assignments will have restrictions on them – these kinds of constraints can spur creativity, so embrace them!)

Unlike tests, projects require considerable engagement and thoughtful work on your own, and you should be working each week on projects. All assignments are due by the start of class and should be turned in on Canvas – late projects will be marked down 10 points for each week they are late. Details of projects will be available on the class GitHub page, including details about how to turn in specific projects, what's to be included, etc.

You will have 24/7 access to the Lab and Studio and use of the Fab Lab during open hours for printing, equipment checkout, and to use the digital fabrication equipment. Please note! While every effort is made to make sure the Fab Lab is available, please don't wait until the last minute to print or cut something.

ATTENDANCE

Because this class will cover so much technical material, and because our process of experimentation and critique is collaborative, attendance is mandatory. You are allowed two absences per semester to use at your discretion – each additional absence will result in your final grade being lowered by ½-letter. Late arrivals will be marked tardy, with 3 tardies equaling one absence. The only exception is severe illness – if this is the case, please let me know as soon as possible and provide a doctor's note documenting your illness.

GRADING

The goal of all assignments is for you to think and make. Everyone comes from a different background and experience, so I'll be looking for improvement, curiosity, engagement, and a willingness to experiment. A grading rubric will be provided with each assignment to help you understand what is expected and how you did.

To get a C (an average grade) you should:

- Put time into your projects each week
- Complete everything on time
- Participate in critiques and discussions

For a B or an A, you should additionally:

- Take risks and try things enthusiastically
- Show improvement over the course of the semester, especially things that don't come easily to you
- Be an active and unsolicited participant in critiques and discussions
- Take assignments beyond their minimum requirements

Final grades will be determined as follows:

- Homework: 60%
- Class participation: 25%
- Final project: 15%

LEARNING ACCOMMODATIONS

The goal of this class is for everyone to succeed. Stevens and the VA&T program are dedicated to providing appropriate accommodations to students with documented disabilities. The Office of Disability Services (ODS) works with undergraduate and graduate students with learning disabilities, attention deficit-hyperactivity disorders, physical disabilities, sensory impairments, psychiatric disorders, and other such disabilities in order to help students achieve their academic and personal potential. They facilitate equal access to the educational programs and opportunities offered at Stevens and coordinate reasonable accommodations for eligible students. These services are designed to encourage independence and self-advocacy with support from the ODS staff. The ODS staff will facilitate the provision of accommodations on a case-by-case basis.

If you have any questions about learning accommodations, please don't hesitate to talk with me during or outside of class.

PRONOUNS

As this course includes lots of interaction between students, it's important for us to create an environment of inclusion and mutual respect. This includes the ability for all students to have their chosen gender pronouns and chosen name affirmed. If the class roster does not align with your name and/or pronouns, please inform me of the necessary changes.

INCLUSION STATEMENT

Stevens and the VA&T program believe that diversity and inclusiveness are essential to excellence in academic discourse and creativity. In this class, the perspective of people of all races, ethnicities, gender expressions and gender identities, religions, sexual orientations, disabilities, socioeconomic backgrounds, and nationalities will be respected and viewed as a resource and benefit throughout the semester. Suggestions to further diversify class materials and assignments are encouraged. If any course meetings conflict with your religious events, please do not hesitate to reach out to me to make alternative arrangements.

REQUIRED MATERIALS

Every effort has been made to reduce the cost of materials, but since we're going to be making real stuff (ie not in the computer), it will require purchases throughout the semester. You can certainly find ways to scrounge, recycle, and use non-traditional materials too.

The full list of required and optional parts is here:
https://github.com/jeffThompson/PhysicalComputing/blob/master/PartsList.xlsx?raw=true

PRIORITY #1! You need the following for next week, so please order today to make sure it arrives in time:

- Arduino Uno or Sparkfun Redboard or Adafruit Metro. There are lots of knockoff boards, which you can use but at your own risk. You can get an Arduino from a variety of vendors, but it must arrive on time for class next week.
  - Amazon: https://amzn.to/2QQcKro
  - Sparkfun (Uno): https://bit.ly/1gABL5E
  - Sparkfun (Redbard): https://bit.ly/2ncCG7c
  - Adafruit (Metro): https://bit.ly/2MdSFK0

  Please **do not** buy an Arduino Pro, Pro Mini, Mega, or other variety! They're great for some projects but may require additional hardware and will make doing your classwork much harder.

- USB cable for your Arduino board, also for next week! You might already have one lying around (a standard printer cable works on most PCs/older Macs) but please ensure you get the right kind.

- Initial parts from the list on the course website: pushbuttons, LEDs, breadboard, and jumper wires. The other parts can be ordered later, but you'll need everything by mid-February.

- Laptop capable of running class projects and code, power charger, and reliable internet connection – bring every week, please!

- Sketchbook for taking notes and drawing ideas, plus drawing/writing implements – bring every week, too! You'll be asked to do regular drawings in preparation for assignments.

By mid-February:

- Rest of the parts from the list on the course website. These must arrive on time, so please give yourself plenty of time. (Some parts are optional, so you can select what's interesting to you and try things out.)

- Metrocard to get into NYC to see show at Fridman Gallery, plus as necessary to pick up supplies and materials.

Ongoing:

- Materials, art supplies, and tools as needed for specific projects. This may include additional parts/sensors, materials for laser-cutting, 3D printing services in the Fab Lab, wood, nuts/bolts/etc from the hardware store, and tools that you may not have.

Optional:
Not required but having these tools may help if you don't already have them. See the parts list for suggestions, though many of these could also be bought at the hardware store or Home Depot.

- Wire stripper
- Diagonal cutter
- Soldering iron (a cheap one is ok)
- Lead-free solder
- Basic hand tools (screwdrivers, utility knife, ruler, etc)

COURSE CALENDAR

WEEK 1 **INTRODUCTIONS**
In-class: Syllabus, intro, materials to order
Homework: Ideation drawings, install Arduino drivers if necessary
Reading: Programming primer

WEEK 2 **LED + BUTTONS #1**
Feedback: Small-group feedback on ideation drawings
Demos: Arduino IDE, `println()`, uploading sketches, digital pins, pin setup, `HIGH/LOW`, `delay()`, PWM, button input, input pullup, basic control structures
Homework: Refined sketches and breadboard prototype

WEEK 3 **CLASS VISIT TO FRIDMAN GALLERY**
In-class: Visit John Driscoll's *Slight Perturbations* show
Homework: Continue working on project prototype

WEEK 4 **LED + BUTTONS #2**
Feedback: Small-group feedback on prototypes
Demos: Variables, `if/else`, button state change, soldering basics, CAD design in Illustrator, laser-cutter demo
Homework: Finish *LED + Buttons* project, be sure your other parts arrive by the next class!

FEB 19 **Monday schedule, no class!**

WEEK 5 **LED + BUTTONS DUE / ANALOG SENSORS #1**
Critique: Group crit of LED + Button projects
In-class: Documenting projects with video
Demos: Reading analog sensors, basic voltage dividers, mapping values to another range
Homework: Ideation drawings for project

WEEK 6 **ANALOG SENSORS #2**
Demos: More voltage dividers, Ohm's law, sensor calibration, intro to the bandsaw, sander, and chopsaw
In-class: Work day
Homework: Working prototype of project

WEEK 7 **ANALOG SENSORS #3**
Feedback: Small-group feedback on prototypes
Demos: Sound and video generation, sending messages to other software
In-class: Work day
Homework: Finish *Analog Sensors* project

MAR 19 **Spring break, no class!**

WEEK 8 **ANALOG SENSORS DUE / PASSAGE OF TIME #1**
Critique: Group crit of *Analog Sensor* projects
Demos: DC motors, driver circuits, servo motors, basic 3D modeling for printing, using the Makerbot
In-class: Model a 3D-printable bracket for your motor
Homework: Print your bracket in the Fab Lab, ideation drawings and breadboard prototype

WEEK 9 **PASSAGE OF TIME #2**
Demos: Stepper motors, end-stops
Homework: Finish *Passage of Time* project

WEEK 10 **PASSAGE OF TIME DUE / FINAL PROJECT #1**
Critique: Group crit of *Passage of Time* projects
Demos: Controlling things with relays
Homework: Ideation drawings and final project proposal

WEEK 11 **FINAL PROJECT #2**
Feedback: Presentation of final project ideas
Demos: Circuit design in EagleCAD
In-class: Work day
Homework: Breadboard prototype and refined proposal

WEEK 12 **FINAL PROJECT #3**
Feedback: Small-group feedback on prototypes
In-class: Work day, demos as needed
Homework: Working prototype

WEEK 13 **FINAL PROJECT #4**
Feedback: Small-group feedback on prototypes
In-class: Work day, demos as needed
Homework: Finish *Final Project*

WEEK 14 **FINAL PROJECT DUE**
Critique: Group crit of *Final Projects*
Homework: Record documentation of your project

EXAM **DOCUMENTATION DUE**
Online: Turn in documentation of your finished project