Introduction to Smart Textiles Techniques Workshop (FB 287.01, Fall 2013)

Class Details

Location: Station 101
Time: Monday, 4:00 pm - 8:00 pm
Instructor: Sam Sheffield
Office: BR312 (Hours by appointment)
Email: ssheffield@mica.edu
Class Website: http://samsheffield.com/itsttwf13

Course Description

The "Introduction to Smart Textile Techniques" workshop will begin to equip students with the tools they will need for future work in, and exploration of, the Smart Textiles and Wearable Technology field. The course will cover basics of programming (using the Arduino environment), circuit development (hard and soft circuits) and mechatronics (motor and mechanism integration as well as some foundational fabrication techniques). Students are strongly encouraged to take this 1.5 credit workshop while taking either FB 387: Smart Textiles, FB 361: Wash and Wear Electronics, or FB 425: International Collaboration/Wearable Technology.

Course Goals

"The real voyage of discovery consists not in seeking new landscapes but in having new eyes" - Marcel Proust
This workshop is intended to introduce you to techniques and concepts which can be applied to prototyping wearable electronics. To accomplish this, we will spend the next six weeks engaging in a hands-on exploration of basic electronics, programming, and the Arduino; all from within the context of the creative arts.

Learning Objectives

Upon completion of this course, you will...

- demonstrate an understanding of key concepts in basic electronics.
- be able to write and interpret programs for the Arduino which are capable of utilizing both input and output.
- have developed core vocabulary which will enable you to seek help and participate in Arduino-related discussions online.
- be capable of prototyping electronic circuits which can be adapted to wearable applications.
- have experience adding external libraries of code to use sophisticated sensors and motors in your work.

Important Dates

- Last day to drop class (no transcript record): Oct. 1st
- Last day of class: Oct. 14th

Required Materials

- Laptop with Arduino software installed
- Arduino kit (Checked out from Tool Crib on first day of class)
- Small storage container with dividers (for storing electronic components)

Resources

- Arduino website (http://arduino.cc)
- Getting Started with Arduino by Massimo Banzi (available as a paperback or ebook)
- Open Softwear book (older BETA draft available online http://goo.gl/oTHzcb)

Grading

This workshop is PASS/FAIL, which can be interpreted in the following ways:

- PASS: Come to class, make an effort, document your work, and smile.
- FAIL: Don't come to class, don't make any noticeable effort, don't documentation your work, or have a bad attitude.

Attendance

- You are responsible for the material covered in your absence.
- More than 2 unexcused absences will result in a failing grade.
- If you are more than an hour late, without prior notification of an excusable reason, it will be considered an absence.

Punctuality

Class begins promptly at 4:00 pm.

Given our limited time together over the next six weeks, it is essential that you be here on time. Being late is disruptive and can result in you quickly falling behind. Also, please return in a timely manner from any breaks taken during class time.

Classwork and Participation

In class, you are expected to work on exercises or assignments. This is to provide you with in-class time for discussion, troubleshooting, getting/giving help, or whatever else you may need.

This workshop is intended to be a peer learning environment. I not only encourage you to, but expect you, to support and talk to one another during class.

Homework

During class, you will begin experimenting with concepts and materials. For homework, I would like you to continue pushing these further and document where you end up with it. The goal will be up to you.

Using your own temperament and comfort level as a guide, this might mean simply achieving a technical goal which demonstrates the concepts we covered in class. If you have a pretty good handle on things in class, however, I'd encourage you to choose a more challenging goal to pursue outside of class.

Lastly, don't worry too much about mistakes or if things don't work as planned. Earnest failures in an academic setting demonstrate great courage. Without failure there is no discovery.

Presentations

Every other week you will be responsible for bringing in your homework to quickly discuss with the class. Don't worry, this is not a formal critique. On these days, I would like for you to arrive 15 minutes early to class to set everything up.

Documentation

You are responsible for providing documentation for all of your homework. Submit it to me in a folder with your name on it. A good way to do this is with a Dropbox account, on a thumb drive, or with AirDrop on recent Macs. Just be sure that I have a copy before the class session has finished.

Documentation includes all of the following:

- 2 photos of your work or 1 brief video
- A copy of the source code (your .ino file)

Backing Up Your Work

It is your responsible for backing up and archiving your work. Be sure to save often and make multiple copies. Dropbox is a great tool for backing up your work.

Getting Help

“Anyone who has never made a mistake has never tried anything new.” - Albert Einstein

This semester we will likely cover a lot of materials which are completely new to many of you. Please keep in mind that acquiring any new skill can be slow and difficult process. It is important that you let me know as soon as possible if you are ever unclear or confused about something.

Last Minute Help

I'm deeply invested in everyone's success in this course, so I would like to help you as much as necessary. However, it is important that you contact me as soon as possible. Do not be surprised if a request for help received late on Sunday night or early on Monday morning goes unanswered.

Please do not wait until the last minute to start homework.

Americans with Disabilities Act

Any student who may need an accommodation based on the potential impact of a disability should contact the Learning Resource Center at 410-225-2416, in Bunting 458, to establish eligibility and coordinate reasonable accommodations.

Environmental Health and Safety (EHS)

It is the responsibility of faculty and students to follow health and safety guidelines relevant to their individual activities, processes, and to review MICA’s Emergency Action Plan and attend EHS training. It is each faculty member’s responsibility to coordinate with the EHS Office to ensure that all risks associated with their class activities are identified and to assure that their respective classroom procedures mirror the EHS and Academic Department guidelines. Each of these policies and procedures must be followed by all students and faculty. Most importantly, faculty are to act in accordance with all safety compliance, state and federal, as employees of this college and are expected to act as examples of how to create art in a way to minimize risk, and reduce harm to themselves and the environment. Faculty must identify and require appropriate personal protective equipment for each art making process, for each student, in all of their classes, when applicable. Students are required to purchase personal protection equipment appropriate for their major. Those students who do not have the proper personal protection equipment will not be permitted to attend class until safe measures and personal protection are in place.

Plagiarism

Each discipline within the arts has specific and appropriate means for students to cite or acknowledge sources and the ideas and material of others used in their own work. Students have the responsibility to become familiar with such processes and to carefully follow their use in developing original work.

Policy

MICA will not tolerate plagiarism, which is defined as claiming authorship of, or using someone else's ideas or work without proper acknowledgment. Without proper attribution, a student may NOT replicate another's work, paraphrase another's ideas, or appropriate images in a manner that violates the specific rules against plagiarism in the student's department. In addition, students may not submit the same work for credit in more than one course without the explicit approval of the all of the instructors of the courses involved.

Consequences

When an instructor has evidence that a student has plagiarized work submitted for course credit, the instructor will confront the student and impose penalties that may include failing the course. In the case of a serious violation or repeated infractions from the same student, the instructor will report the infractions to the department chair. Depending on the circumstances of the case, the department chair may then report the student to the Office of Academic Affairs, which may choose to impose further penalties, including suspension or expulsion.

Class Schedule (subject to change)

Week 1:

- Introduction to class
- Check out Arduino kits
- Constructing your first circuit

Week 2:

- Introduction to Arduino hardware and software
- Uploading code to the Arduino
- Extending the Arduino with a breadboard
- Digital output

Week 3:

- Presentations (Group A)
- Digital input
- Pulldown resistors
- Conditional logic and counting
- Buttons and switches

Week 4:

- Presentations (Group B)
- Analog input
- Pots, photocells, and DIY lie detectors
- Analog output
- Fading LEDs and vibrating motors
- Serial output

Week 5:

- Presentations (Group A)
- Advanced input and output
- Servo and DC motors
- Working with code libraries
- Sensors

Week 6:

- Presentations (Group B)
- Cutting the cord (powering your circuits)
- Arduino Lilypad vs Arduino
- Translating hard circuits to soft circuits
- Return Arduino kits