

## **Syllabus & Course Policies**

### DMS 315 - Physical Computing

State University of New York at Buffalo  
Department of Media Study  
Fall 2014

M, W 11:00am-12:50pm CFA 246

Instructor: Brian Larson Clark  
Office hours: Mondays 1:00-2:00pm (and by appointment), CFA 246  
Email: blclark2@buffalo.edu

Course Website: <http://media-study.com/fall14/physicalcomputing>

### **Course Description**

This course introduces basic concepts and techniques for designing, constructing, and programming objects, spaces and media that sense and respond to their physical surroundings. Moving beyond the interface paradigm of screen, keyboard and mouse, physical computing enables alternate models for interaction with (and through) computers that afford more subtle and complex relations between a range of human and non-human actors. Combining readings, presentations and discussions on the theory of computer enabled art forms with a series of hands-on technical workshops in computing methods and techniques, the course provides a critical context for emerging forms of experimental practice. Topics include fundamental ideas in computing (languages, representation of thought), embodied interaction (situated actions, responsive systems), practical aspects of hardware design (electricity, electronics, microprocessors, components, sensors and actuators), and functional programming (variables, datatypes, control structures, functions, objects, communication protocols).

No prior expertise in computing required. Curiosity about how things work is a must.

### **Required Texts**

All required text will be distributed as pdfs and will be available on the course website.

### **Recommended Texts**

Sullivan, Dan, and Tom Igoe. *Physical computing sensing and controlling the physical world with computers*. Boston: Thomson, 2004.

Mims, Forrest M.. *Getting started in electronics*. 3rd ed. Lincolnwood, Ill.: Master Publishing, 2003.

## **Disclaimer**

This syllabus is subject to revision by the instructor.

## **Office Hours**

Mondays 1:00-2:00, CFA 246. You are welcome to drop by during those hours or make an appointment to introduce yourself or discuss your work. If my regular office hours will not fit your schedule (If you have a class or work obligation during that time) talk to me or email me and we will work out an alternate time.

## **E-Mail**

Be sure to check your UB email account regularly. When sending me an email please always include DMS-315 within the subject line.

## **Course Website**

<http://media-study.com/fall14/physicalcomputing>

## **Course Work**

Unless otherwise specified, assignments and projects must be submitted by the beginning of class the day they are due. Late work will be penalized unless you have a reasonable excuse and make arrangements in advance. If you are having trouble turning in work due to circumstances beyond your control, please let me know.

## **Evaluation**

Grades will be calculated as follows:

20% classroom participation/performance

20% Lab Journal

15% Project 1

15% Project 2

30% Final Project

## **Grading Scale**

93-100	A
90-92	A-
87-89	B+
83-86	B
80-82	B-
77-79	C+
73-76	C
70-72	C-
69-65	D
64 or less	F

### **Academic Integrity**

In general, you may not turn in work for this course which you will also use for credit in another course. If you have questions about this policy, please discuss it with me.

### **Offensive Content**

In class we will examine a broad range of creative work. There may be selections with which some students will find offensive in content or tone. In such cases, students are permitted to leave the room without penalty, at their own discretion.

### **General Policies**

A. Students who require special accommodations because of diagnosed disability should bring relevant documentation to the instructor and/or to the Chair, who will oversee arrangements with assistance from the Office of Disabilities.

B. Student athletes must provide an official letter with the dates of their meets and travel days during the first weeks of classes. Make up quizzes and exams that fall during those days must be rescheduled with the instructor at least 3 days before departure. As a rule of thumb, we will administer make-ups and move work deadlines to the day before the student leaves town.

C. Students are expected to turn off and put away mobile phones, pagers, iPods, CD players. Computers are ok.

D. Students are not allowed to eat in the classroom. Please eat before or after class.

E. Students are expected to follow the guidelines for appropriate behavior outlined in the University Catalog. Disruptive behavior will not be tolerated.

F. If you need to depart early, do so quietly after having cleared it with your instructor at the beginning of the class.

G. The grade of incomplete will be given only to students who have some serious, well-documented medical condition or in cases of family tragedy, etc. and who have satisfied the attendance policy and are missing only one major assignment. No incomplete will be given to substitute for a poor or failing grade or for any other reasons. A written agreement must be drafted and signed by the instructor and the student. The instructor reserves the right to request completion of the incomplete prior to the 12 months set by the University.

H. Final grades are final. Once grades are submitted they will not be changed. Thus, students should refrain from cajoling instructors (via email, phone, in person, etc.) into changing the final grade, which goes against the University policy.

## **Attendance**

**You are expected to be here each day, on time and ready to go. You are expected to have completed any assigned reading and to participate in class discussions, critiques, and the work at hand. Participation in class will account for part of the course grade.**

- A. Regular attendance is required for the development of proficiency skills.
- B. Attendance means attentiveness, cooperation, and active participation in class.
- C. Students are responsible for the material covered and the homework assigned on the day/s they were absent
- D. In case of an ongoing problem, such as a personal crisis or chronic illness, the student should resign from the course and retake it when the circumstances allow for the fulfillment of the requirements.
- E. Tardiness: arriving after class has started may count as an absence or partial absence.
- F. Leaving the classroom for a considerable period of time will be considered an absence.

**It is a long semester and things come up, so you may miss class a total of three (3) times for any reason, but after that your final grade will be automatically reduced a half-letter grade for each additional absence.**

## **Class Work**

- A. Students are expected to do their own work on all assignments and course work.
- B. Academic dishonesty will result in a failing grade and disciplinary actions by the university. Examples of academic dishonesty are: copying the work from the Internet or a book, having someone else do the work for you, or cheating during an exam or quiz.
- C. Be prepared for class each day by having done the assigned readings, etc.
- D. Homework will be assigned during each class by the instructor.
- E. It is the student's responsibility to bring any questions on the homework to the attention of the instructor.
- F. Homework will be turning in to the instructor on the designated date.

## **Course Schedule & Assignments**

This is a tentative schedule. Expect it to change. Due dates and expectations will be announced in class.

### **WEEK 1**

8/25, 8/27

Introduction to course

Topic: Physical computing

Course website will be created

### **WEEK 2**

9/3 (No Class Monday, Labor Day)

First project introduced

Topics: Basic electronic components, reading schematics, using a multimeter, soldering

### **WEEK 3**

9/8, 9/10

Topic: Basic Electronics, continued

Reading: Dunne, Anthony. "The Electronic as Post-optimal Object", Hertzian Tales: Electronic Objects, Aesthetic Experience, and Critical Design

### **WEEK 4**

9/15, 9/17

Topics: Overview of microcontrollers, introduction to Arduino

Reading: Bush, Vannevar. "As We May Think", The Atlantic Monthly, July 1945

Topic: Working with sensors

### **WEEK 5**

9/22, 9/24

Topics: Actuator design, pulse width modulation (PWM), analog to digital conversion, working with servos and stepper motors

Reading: Galloway, Alex. "Physical Media", Protocol: How Control Exists after Decentralization.

**Assignment: First project due**

### **WEEK 6**

9/29, 10/1

Second project introduced

Topics: Data types, protocols, working with serial data

## **WEEK 7**

10/6, 10/8

Topic: Concepts in interaction design

Software: Processing

Dourish, Paul. "History of Interaction", Where The Action Is: The Foundations of Embodied Interaction

## **WEEK 8**

10/13, 10/15

Topic: Concept development tools, circuit design, flowcharts

## **WEEK 9**

10/20, 10/22

Topic: TBD

Braitenberg, Valentino. Selections from Vehicles: Experiments in Synthetic Psychology

## **WEEK 10**

10/27, 10/29

Topic: Hacking hardware, low-tech sensors and actuators

Possible Workshop: Circuit bending

**Assignment: Second project due**

## **WEEK 11**

11/3, 11/5

Topic: TBD

## **WEEK 12**

11/10, 11/12

Topic: Intro to Custom PCB Fabrication

Gerber files and printing your own PCBs

Software: Eagle CAD

## **WEEK 13**

11/17, 11/19

Topic: Open source

Final Project Review

## **WEEK 14**

11/24 (No Class Wednesday, Fall Break!)

Project tuning and documentation

## **WEEK 15**

12/1, 12/3

Project Exhibitions

**Assignment: FINAL PROJECTS DUE**

## **Useful Online Resources**

Acroname: [acroname.com](http://acroname.com)

Active Surplus Electronics: [activesurplus.com](http://activesurplus.com)

Adafruit Industries: [adafruit.com](http://adafruit.com)

Arduino: [arduino.cc](http://arduino.cc)

DigiKey Electronics: [digiket.com](http://digiket.com)

Hack A Day: [hackaday.com](http://hackaday.com)

Instructables: [instructables.com](http://instructables.com)

Inventables: [inventables.com](http://inventables.com)

Make Magazine: [makezine.com](http://makezine.com)

Mouser Electronics: [mouser.com](http://mouser.com)

Octopart: [octopart.com](http://octopart.com)

Openbuilds: [openbuilds.com](http://openbuilds.com)

Processing: [processing.org](http://processing.org)

Pure Data: [puredata.info](http://puredata.info)

Solarbotics: [solarbotics.com](http://solarbotics.com)

SparkFun Electronics: [sparkfun.com](http://sparkfun.com)

Stack Exchange: [stackexchange.com](http://stackexchange.com)

Radioshack: [radioshack.com](http://radioshack.com)

Thomas Kim: [youtube.com/user/yeosujjang](http://youtube.com/user/yeosujjang)

Tom Igoe's Physical Computing Resources: [tigoe.net/pcomp/resources](http://tigoe.net/pcomp/resources)