Syllabus: mpsm 311 Electronic Projects for Artists II

Instructor: Dana Moser dmoser@massart.edu

This 3-credit course meets Mondays 1:30-6:30 in North 271 (Electronic Projects Lab)
(Additional course info is at: `http://www.curiousart.org/electronic2`)

Course Description:

(-Note: This is now a 2 semester long course. The Fall MPSM377 is followed in the Spring by MPSM311.) The purpose of this studio course is to provide skills and information that will be useful for artists who use electrical devices in their artworks. Examples will be shown to help students in incorporating/integrating electrical circuits and sensors in a variety of media including sculpture, installation and performance.
This, part 2 of the course, involves writing software (programming) microcontrollers and connecting them with custom multimedia software running on desktop computers. These may be used in sculptural installation, performance, robotics, wearable art, etc. Many examples will be shown. We will be using ATMega328 ICs (microcontrollers), -the same ones used in the popular "Arduino board", programmed in a special version of the C programming language.
The idea is to process information about environmental conditions such as light, temperature, sound and human gesture to respond with controllable switches, timers, motors and sound devices. This involves interfacing microcontrollers with programmable, interactive multimedia desktop software environments including Processing, MAX/MSP/Jitter and pd(PureData). No previous experience with programming is necessary. Pre-written examples will be provided that can be edited and used by students. Course materials, downloadable handouts and online resources to support the course are on the class website: `http://www.curiousart.org/electronic2`.

Course Objectives:

In addition to teaching students to write custom software to program hardware (microcontrollers) to communicate/interact with multimedia on desktop computers, an important theme of this course is interactivity. Many examples will be shown and created in class so that students will be able to use sensors to control the display and playback of multimedia (light, sound and video) using software they have written. The course will cover both personal, gestural human interactions as well as networked interactions using the Internet.

Course Materials:

All materials necessary for the successful completion of this course will be provided throughout the semester. However it is strongly recommended for students wanting to get into electronics that they procure their own components and tools, especially breadboards and diagnostic tools like a multimeter. As they are introduced throughout the semester, we will provide information about convenient and economical sources for these. Software necessary for the course is installed on the machines in the lab.

Departmental Goals:

Some of the SIM Departmental goals that this course addresses include:
- Learning how to articulate artistic goals and concepts and translate them into actualized projects.
- Acquiring hands-on skills in technology and interdisciplinary practice.
- Being exposed to the widest range of artistic mediums, ideas and practice.

Minimum requirements to receive credit for this course:

1. Attendance
   Please let the instructor know if you will have to miss a class. According to MassArt academic policy, credit cannot be given if there are more than 2 absences for a course.
2. Successful completion of all assigned software projects (described below)
3. Participation with in-class projects
4. Project Description (This is due 2 weeks before the final class.)
5. Completion of a final project of your own design (This is due on the final week of class.)

Course Assessment and Grading:

This is a pass/no credit course. If by mid-semester the pre-determined milestones for the course have not been reached the student will receive a mid-semester warning. If by the end of the semester the student has not completed at least 80% of the minimum course requirements, the student will receive a grade of NC. Faculty will assess the student's progress during in-person meetings, in-class project reviews, and email correspondence.

==========

Week-by-Week Description of the classes:

1. Course Introduction: Analog Electricity Review, Microcontroller Introduction

Introductions, and general description of the course.
Students will be grouped with lab partners for breadboarding circuits.
We will begin with a review of principles for working safely with electricity in artistic projects.
The review will include vocabulary for describing the behavior of circuits (voltage, current, impedance and power.)
In the second half of the class we will introduce microcontrollers and demonstrate the process of downloading and setting up the free programming **Integrated Development Environment** (**IDE**).

2. Microcontroller Programming Concepts: The Arduino and C

– [Software project 1] described: "Throw – Catch" data between sensor and desktop
Interfacing the Arduino with sensors (switches) is demonstrated
Core programming concepts will be reviewed and used in example programs:
-- libraries and preprocessor directives
-- variables and variable assignment
-- functions
-- conditional testing and looping
-- microcontroller input and output

3. Serial Data Input/Output and Introducing Processing

– Numbers vs. ASCII
– Issues with the Arduino and serial data
– Sensor interaction with Processing
In this class we introduce a desktop programming language environment called "**Processing**."

4. Continuing with Processing and Introducing Flow Control Programming

– Finishing [Software Project 1]
This class continues an example of data communication between the microcontroller and Processing software on the Desktop.
The last part of this class introduces "flow control programming" with **MAX/MSP/jitter** and **Pure Data** (**pd**).

5. Servo Motor project

This class we will demonstrate and build a circuit for controlling a servo motor with the microcontroller. This will include use of transistors in the construction of a **driver circuit.**
– We introduce the concept of "**interrupts**" in microcontroller program design.
– Serial data from Processing and flow control desktop software will be used to control the motor using the driver circuit.

6. Sensor Overview and Comparison of Software for Programming Multimedia

– A sensor overview covering devices useful for interacting with the microcontroller hardware
– Discuss/contrast/compare the desktop software used in this course: Processing, MAX and pd.
The discussion/presentation will cover the strengths and weaknesses of these multimedia programming environments with respect to sensor interactivity and various media such as sound and video playback.

7. Introduction to Data Visualization:

The topic of Data Visualization is introduced with several working examples shown to demonstrate techniques employed by artists.

8. Continuing with Data Visualization: Internet Interaction

Students will use working code examples to build an interface for interacting with data.
This will include examples that communicate with realtime Internet data.
Examples showing the use of **Application Programming Interfaces** (**API**s) wil be used.

9. Hacking Hardware: Game Controllers

Students will experiment in class with hacking game controllers including a generic Logitech device as well as the Microsoft Kinect. The methods we will use include using external sensors to communicate with game environments, as well as sending data from the controller to custom desktop software to control audio and video files.

10. OSC for networked interactions

The "Open Sound Control" protocol will be demonstrated in working code examples.

11. Final Project Descriptions Due

We will go over the individual final project descriptions and discuss their applications as well as any possible corrections/improvements to project construction.

12. Visiting Artist and In-Class Work Day

For this class, we will have a visiting artist. There will also be time in class for de-bugging and work toward completion of the respective final projects.

13. Final Projects Due

Final projects are due for this class. Students will present their final projects for discussion, feedback and documentation.

==========

GRADING

Two grading systems are used at the college; choose the one appropriate for your course.

1. Letter grades (A, A-, B+, B, B-, C+, C, D, F, Incomplete) are given in courses offered in:

- Animation
- Architecture
- Art Education
- Fashion Design
- Graphic Design
- History of Art
- Illustration
- Industrial Design
- Liberal Arts
- Master of Architecture
- Master of Arts in Teaching/Art Education
- Master of Science in Art Education

2. **Pass/No Credit/Incomplete grades are given in courses offered in:**

- Studio Foundation courses
- Film/Video
- Fine Arts 2D
- Fine Arts 3D
- Photography
- Studio for Interrelated Media
- Master of Fine Arts

1. Grades are defined as follows:

A – Exceptional work in all respects.
B – Above average work, distinguished in certain but not all respects.
C – Average. Individual departmental policies may set standards for the application of "C" grades toward progress in the major.
D – Below average work. This is the lowest passing grade; individual departments may set standards for the application of "D" grades toward progress in the major.
F – Failing work. No credit is given.

Pass – Work meeting all expectations for successful completion of the course.

NC – No Credit Work that does not meet the expectations of the course.

INC – Incomplete. A temporary designation indicating that at least 80% of the course requirements have been met and that the remaining course requirements are expected to be completed,and a permanent designation issued by the subsequent mid-semester. The student is responsible for having an Individual Grade Sheet completed by the appropriate faculty member and filed with the Registrar. If the student does not complete the course work, a non- passing grade will be issued.

Department Academic Progress

A student who earns a no credit in a major requirement or two no credits in major electives over two semesters is placed on probation. A student on probation who earns a no credit in a major requirement is subject to dismissal from the department.

Course Attendance

The college-wide policy permits no more than two absences per semester for a course that meets once a week prorated for classes that meet on a different schedule.

Plagiarism

Whenever your work incorporates someone else's research, images, words, or ideas, you must properly identify the source unless you can reasonably expect knowledgeable people to recognize it. Proper citation gives credit where it is due and enables your readers to locate sources and pursue lines of inquiry raised by your paper. Students who do not comply will be penalized. For further information, see the MassArt Student Handbook or consult with the Academic Resource Center.

Classroom Accommodations for Students with Disabilities

Massachusetts College of Art and Design is committed to fostering the academic, personal, and professional growth of our students. We are especially

committed to ensuring that students with documented disabilities, as defined under the Americans with Disabilities Amendments Act of 2008 (ADAAA), are provided equal access to all campus resources and opportunities. If you believe you have a disability that may warrant accommodations, I urge you to contact Ms. Erla Shehu (Erla.Shehu@massart.edu or 617-879-7692) in the Academic Resource Center (formerly the Learning Center), Tower 550. The Academic Resource Center provides access to a learning specialist, an academic coach and professional tutors.