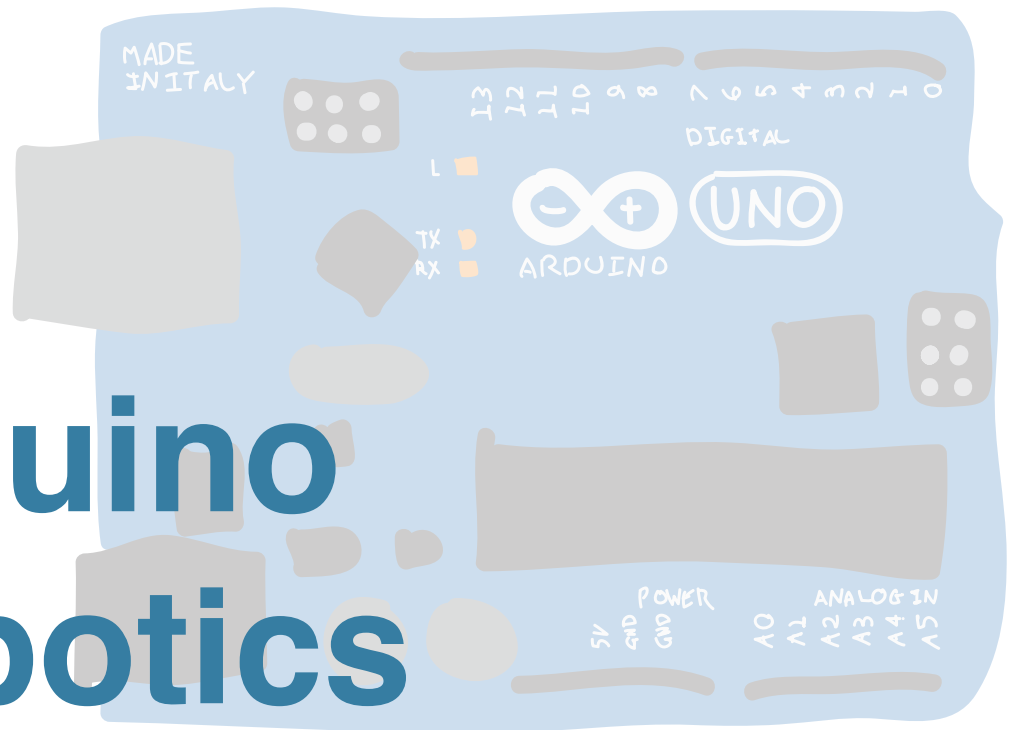# Arduino Robotics

California College of the Arts
SCIMA-200 Arduino Robotics
June 2, 2014 – July 7, 2014
Monday, Wednesday, Thursday, 10am – 1pm
Main SF Building, Room 107 (Hybrid Lab)

Instructor: J.D. Zamfirescu — zamfire@gmail.com
Office hours: Wednesday 1pm-2pm in the lab

Goals

We'll explore electronics and programming by prototyping a robot using the Arduino microcontroller platform. About half the class time will be devoted to a project. It's a requirement that you explore and experiment with topics that interest you.

The general aim is to inspire you and introduce you to those areas of electronics and programming that are most useful to your life and your work as an artist. We'll take a very hands-on approach to the material, and you'll

see what's possible, what's easy, what's hard, and what's impossible or close to it. You'll begin to develop the skills and tools necessary to incorporate electronics and interactivity into your own work.

By the end of the class, you'll:
• Have the experience and confidence needed to conceive of a project and break it down into smaller components you can build.
• Know how to describe, design, test, build, and debug simple electronic circuits and simple microcontroller programs.
• Understand simple circuits and programs designed by others, and be able to build on them.
• Use basic electronic tools and know where to go for resources and for help.

Topics

We'll cover a number of topics, depending on interest, including:
• Basic electronics, including circuits, schematic diagrams, concepts like voltage, current, resistance, serial and parallel circuits, signals, digital vs. analog, power, etc.

• Diodes and transistors
• Motors, steppers, servos
• Digital logic & microcontrollers
• Programming
• State machines

• Non-blocking timers
• Binary numbers, arithmetic, logic
• Interfaces and communication
• Sensors, knobs, buttons
• Data collection and processing

Class Repository

http://github.com/zamfi/cca-arduino-summer-2014

The class repository will be used to assign homework and reading assignments, and will contain useful code, libraries, and links to other resources. Github allows you to receive email updates when a repository changes — take advantage of this feature!

Required Textbook

No textbook is required, but there are many good online references and a few good books out there I will recommend — it might be useful to get a book as a reference.

Prerequisites

- Basic algebra. You should be comfortable with simple equations, manipulating numbers, fractions, solving for variables, and the engineering prefixes (micro, milli, kilo, mega, etc.)
- Some understanding of geometry will also be helpful.

Requirements and Expectations

- I expect you to participate in class! Ask questions, guess answers, propose topics, share interesting projects you've found, push the envelope, explore your interests, and teach us! The class will be much more fun when I'm learning along with you. There are no stupid questions; admitting when you don't know something should be a point of pride. Chances are you're not the only one with a question, just the bravest one.

- Plan to spend 3 hours a week on homework and projects. If you don't have a solid foundation in math you may need more time. Plan ahead!

- Submit your homework on time. Show your work in homework and exams to receive full credit. Write clearly and legibly. Attend class, and don't be late. These are not requests, they are requirements.

- You are responsible for checking your email and the class repository for updates.

Class Format

Sessions will be a mix of lectures, guided labs, and independent project time. Projects will require research, analysis, and experimentation. Making something novel takes more time than you think — please make sure to give yourself enough time!

Course Outline

Week 1: Getting started, basic electronics, basic programming.

Week 2: Sensors, motors, intermediate programming.

Week 3: Midterm; final project work.

Week 4: Final projects; presentations & critique.

Grading

I will consider the various components of the class in roughly the following proportions:

30% Project

30% Homework

15% Lab Work

15% Midterm

10% Attendance & Participation

Words of Advice

Exploration is a key part of this class. You'll get more out of your work if you give yourself extra time and have patience. Sometimes you'll hit a dead end and have to start over — don't despair, it happens to everyone, but give yourself extra time just in case.

This class should be both fun and intense. It's most fun when you enjoy what you're working on, so make a point of exploring the possible projects you can work on and pick one that you're excited by!