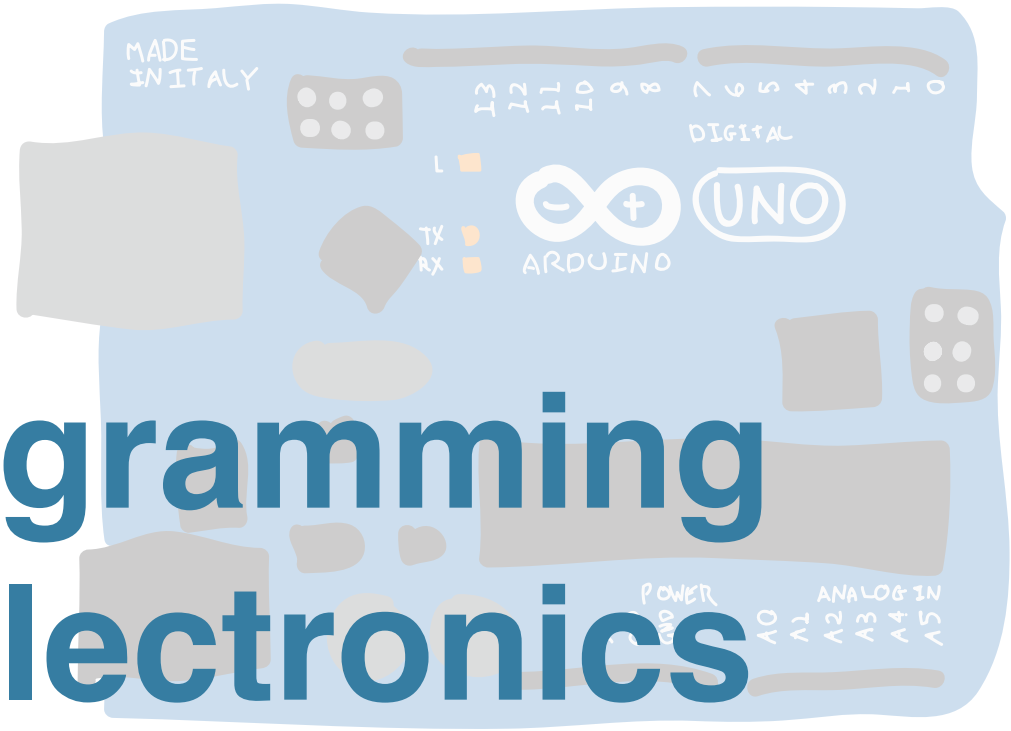

Programming & Electronics

California College of the Arts
SCIMA-200/212 Programming & Electronics
September 12 – December 12, 2016
Monday, 8am – 11am
SF Main Campus, Room 107 (Hybrid Lab)

Instructors: J.D. Zamfirescu-Pereira jzamfirescupereira@cca.edu
Michael Shiloh mshiloh@cca.edu

Office hours: every Monday, 3-4pm, in the Hybrid Lab

Goals

We'll explore programming, electronics, and mechanics by solving puzzles, building Processing sketches, and prototyping robots using the Arduino microcontroller platform.

Expect to have fun, and expect to be challenged. Expect to think in ways you might not be familiar or comfortable with, and expect to find yourself more capable than you thought.

We aim to introduce you to those areas of electronics and programming that are most useful to your work as an artist. We'll take a very hands-on approach to the material, but there will be theory too. You'll see what's easy, what's hard, and what's nearly (or completely) impossible.

By the end of the class, you will:

- 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 interactive graphical programs, simple electronic circuits, simple microcontroller programs, and simple mechanical systems.
- Understand simple programs and circuits designed by others, and be able to build on them.
- Know how to use basic programming and electronic tools, and know where to go for resources and for help.

Topics

We'll cover a number of topics, some depending on interest, including:

- Basic programming, including functions, conditions, loops, variables, arrays, classes, debugging, and stepping through code.
- 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
- State machines
- Binary numbers, arithmetic, logic
- Interfaces and communication
- Sensors, knobs, buttons
- Data collection and processing

Class Repository

http://github.com/zamfi/cca-programming-electronics-fall-2016

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 we can 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

- **Always bring your computer to class**. If you don't have a computer, check one out from the Media Center. You will need a computer to participate, and your grade will be negatively affected if you don't bring one.
- **Participate in class!** Ask questions, guess answers, propose topics, share interesting projects you've found, push the envelope, explore your interests, and teach us! 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. *As outlined in the*

CCA Student Handbook, attendance in class is mandatory and three or more unexcused absences will result in a failing grade.

- **Plan to spend 3-9 hours a week on homework.** 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, these are requirements.
- **You are responsible for checking your email** and the class repository for updates.

Access & Wellness Services

CCA says:

> Students with disabilities, including disabilities that are not clearly evident like chronic diseases or learning disabilities are encouraged to notify their instructor after class or during office hours. CCA will make reasonable accommodations for persons with documented disabilities. Students should contact Suzanne Raffeld, Director of Access and Wellness Services (email: sraffeld@cca.edu; phone: 510.594.3775), to answer any questions or for assistance. For more information, consult CCA's webpage at: http://www.cca.edu/students/resources/disability.

We want you to succeed in this class. Please make use of the Hybrid Lab coaches, the Learning Resource Center, and talk to me if you feel you are struggling with the material — We can help you do better in this class, but only if you come talk to me!

Class Format

Sessions will be a mix of lectures, guided labs, and independent work time. Homework will require research, analysis, and experimentation. Engineering always takes more time than you think — please make sure to give yourself enough time!

Tentative Course Outline

Weeks 1-7: Programming, Processing, electronics, Arduino, and simple mechanisms.

Week 8: Putting it all together & review.

Week 9: Midterm.

Weeks 10-15: Projects & advanced topics.

Grading

We will consider the various components of the class in roughly the following proportions:
40% Homework & Assignments
25% Midterm
25% In-Class Lab & Project Work
10% Attendance & Participation

Grading Rubric

A: Excellent. You've exhibited exemplary conceptual, technical and perceptual ability implementing projects. You've demonstrated a deft understanding of required readings, and ability to successfully communicate ideas and processes to others. All work is commented and clearly demonstrates understanding of each lesson.
B: Good. You've completed assignments, and demonstrated a grasp of

most of the main aspects of each lesson, but not all. You're able to communicate information, and step by step processes well. In projects, conceptual, perceptual, and technical skills are present.
C: Satisfactory. You've completed the assignments but may lack enthusiasm or drive to push the work into detailed display of comprehension. You have not demonstrated comprehensive knowledge of the application or programming environment.
D: Unsatisfactory. You have not completed the work as assigned. Substantial problems exist in your work.
F: Fail. You did not submit work, or work is below unsatisfactory level.

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 taking some time to explore projects you make want to work on in the future!

CCA Learning Outcomes

Students who successfully complete their SCIMA200 requirement will be able to:

1. demonstrate understanding of information presented in charts and graphs
2. identify recurrent patterns in mathematical or scientific data, and interpret those patterns' meanings accurately in relation to the specific context of the course

3. respond to specific findings/data in meaningful ways, e.g., by generating questions for further investigation or by proposing appropriate solutions to specific problems
    a) give priority to evidence in answering questions about scientific or mathematical occurrences
    b) formulate explanations for findings/data from appropriate scientific or mathematical evidence
    c) connect explanations to a body of scientific or mathematical knowledge
4. draw explicit connections between SCIMA courses and their creative work in their majors
5. articulate the importance of the learning they've done in their SCIMA coursework to their understanding of some sociocultural phenomenon beyond CCA