

Digital Development Workshop

IDX 526 · Spring 2018 · Beeps and Bloops

Zach Pino (zach.pino@id.iit.edu)

Tuesdays 6:00pm to 9:00pm @ IIT ID Studio

Course Overview

This course teaches current and emerging electronics and programmatic prototyping tools, so that students are able to fluently develop their ideas into interactive and responsive outcomes. Digital Development challenges students to explore how a combined knowledge of design research methods, contemporary technologies, and engineering prototyping tools can contribute to better and more informed designed outcomes. Each semester, the course takes on a specific topic and a new set of technologies, allowing students to retake the course and acquire new skills and exposure to other technological prototyping tools.

Audio recording and sonic feedback is a powerful and flexible tool for designers of products, experiences, interfaces, and services. This course will empower students to create objects that generate and interact with sound and voice -- with no musical experience or talent required. Throughout these experimentations with sound, students will build up their competencies in coding principles and best practices. Structured as an introduction to the Arduino prototyping ecosystem, this course will focus on sensors and electronics components that generate and interact with sound including microphones, speakers, buzzers, percussive motors, and air pumps. The fundamentals of digital music theory and generation will be covered alongside contemporary tools for human voice recognition, processing, and synthesis so that students can incorporate user vocal feedback in their designs. In addition, time will be spent exploring how programmatic examination and visualization of sound samples can lead to meaningful, and otherwise invisible, insights.

The rich history of design and technology's intersections with music will be discussed and tapped for inspiration, with existing analog and digital musical instruments serving as foundations upon which to tinker with Arduino-powered tools. Students will also examine the designed and musical works of contemporary digital musicians and musical instrument companies, in order to better predict the speculative future trajectories of computer-aided musicianship.

Format

Each class meeting will be divided into an interactive tutorial focusing on a specific programming, theory, or electronics topic. On occasion, in class time will be used for building and coding time in which students will be presented with an assigned real-world challenge for their designs to meet.

On several occasions, outside of classtime trips will be required for visiting musical instrument retailers, watching films, and attending concerts.

Office Hours

Room 672 or 6th Floor Studio *Tech Bench*

Dedicated Thursdays 1pm – 5pm

Other times are available by email appointment.

Outcomes

Students will complete many small experiments, with both electronics and computer code. A final individual project will be developed and prototyped through the second half of the semester from a set of briefs. It will likely be a technology demonstration, rather than a portfolio piece, though this will vary amongst students.

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Learning Objectives

- ▶ Gain fluency with the Arduino prototyping platforms
- ▶ Find and implement open source code and libraries
- ▶ Write well-structured code in Arduino-Flavored C++
- ▶ Develop perseverance through confronting technological limitations and failures
- ▶ Demonstrate a high-level understanding of musical theory, composition, and the physical properties of sound and auditory/acoustical phenomena
- ▶ Implement a wide variety of analog and digital sensors and synthesize the results into a computational understanding of the world
- ▶ Use mathematical, computational, and physics principles to address design problems

Course Outline

1. Microcontroller Basics : Photoresistor Theremin
2. Fundamentals of Electricity : Keyboard
3. Lists and Rhythm : Sequencer
4. PWM, Harmony, and Polyphony : Harmonic Keyboard
5. Playback : Open Source iPod
6. Recording with Microphones and Sensors : Journalist Audio Logger
7. Desktop Input : MIDI and Adobe Audition
8. Body and Motion Input : DJ Fashion
9. Miniaturization and Listening : Headphones
10. Data Logging : Music Visualizer
11. Designed Disobedience : Pirate Radio Tuner and Sampler
12. Project Worktime
13. Project Worktime
14. Recital

Likely Discussion Topics

Arduino Boards
Particle Photon / Electron
Raspberry Pi 3 / Zero
Arduino-Flavored C
SVG Data Visualization
Electronics Principles + Soldering
Analog and Digital Sensors
Sound Capture and Generation
MIDI Interfaces
Physics of Soundwaves and Acoustics
Data Logging and Visualization
Harmonics, Rhythm, Resonance
Musical Instrument Design
Complex Interface Design
Audio Logging
Wearable Tech and Garment/Bodily Adornment

Requirements

- ▶ Command of Adobe Illustrator, InDesign, and Photoshop or equivalents
- ▶ Willingness to prototype many ideas quickly
- ▶ Comfortability with working in teams and providing honest critique
- ▶ Laptop with course-required software including the Particle CLI and Adobe Audition
- ▶ Hardware kit and parts purchases

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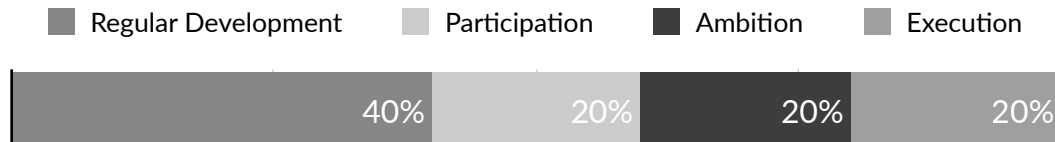
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Expectations

- ▶ Minimum 8 hours weekly of outside-of-class idea development and practice time
- ▶ Weekly uploads of code and images for review
- ▶ Final brief deliverables will vary from project to project, but will include a video, project documentation, commented code, and reflections on outcomes.

Grading

Students will be evaluated on the scope and ambition of their iteration and exploration, participation and collaborative enthusiasm, week-to-week experiments, and the clarity and legibility of their visualized ideas.



Regular Development: Completion of weekly assignments, consistent new research, frequent experimentation, and prompt reaction to in-class feedback

Participation: Contribution to classroom discussion, online communication, and critique

Ambition: Novelty, complexity, and overall enthusiasm expressed throughout the class

Execution: Aesthetic qualities, refinement, and rigor demonstrated in all works