

## **Art 102 F 2014 | Digital Media Tool Box: Sound Synthesis and Computer Music**

Time: T/Th 1:00-2:50pm

Location: ARTS 2220 | eStudio

Instructor: Ryan McGee <[ryan@mat.ucsb.edu](mailto:ryan@mat.ucsb.edu)>

Class Homepage: <http://www.ryanmcgee.com/Art102>

### **Prerequisites**

Art 22 (or instructors consent). HTML experience is required. The class is a beginning programming class, with no prior programming experience expected apart from what is covered in Art 22 and 7D. If you have more experience with programming there is still a lot to learn and explore both conceptually and technically.

### **Class Content**

The class will focus on the development and integration of sound and music software for new media projects through the exploration of freely available programming languages and software libraries. Students will propose, design, and program an audio-visual, music, or sound-based software project as an artwork for the web or new media installation.

No prior music or programming experience is required, though students are expected to have a strong technological grounding in digital media. You will learn basic programming skills that can be applied towards learning and using other computer languages for a wide range of purposes. The class requires a focused and dedicated interest in the concepts and techniques dealt with. The class will be demanding and students have to work independently on solving programming problems and researching ideas. The first half of the class will be focused on readings and programming exercises while the last half will be focused on the research and development of a final project.

Topics and software tools include:

- Digital Audio Fundamentals
- Sound Synthesis Techniques and Sound Design
- Computer Music Composition and Sequencing
- Sonification
- Interactive Sound Art
- Visual Music
- Programming Fundamentals in JavaScript
- General Programming Concepts for Artists
- Gibber (<http://gibber.mat.ucsb.edu>)
- Web Audio JavaScript API

### **Assignments:**

- 3 Programming Exercises
- Readings for in-class discussion (provided online or distributed in class)
- Final Project (including extensive research, proof of concept exercises, proposal etc.)

### **Grading**

- 30% programming exercises
- 50% Final Project
- 20% attendance and participation

In addition the class grade is mitigated by attendance. If you miss more than 2 classes, your grade will be lowered. You cannot pass the class if you miss 6 or more classes. To help you progress through the class, projects and assignments must be turned in on the due date. Late assignments will not be accepted.

## Tentative Schedule

### Week 1

(10/2) Introduction. Define course goals, content, and expectations. History of the Fields: Computer Music, Sound Art, Visual Music, and Sonification. Overview of Digital Audio Fundamentals: sampling, time and frequency domains.

### Week 2

(10/7) Introduction to Programming: overview of programming languages and development environments for audio and new media. Introduction to Gibber, a JavaScript-based multimedia live-coding environment for the web.

(10/9) Programming Fundamentals in JavaScript: variables, arrays, conditionals, loops, functions, objects.

Readings (available online):

- “The 5 Basic Concepts of Any Programming Language”
- Chapters 1-3 of the Gibber Manual

Programming Assignment #1 (Due 10/14)

- Complete Audio Basics Part 1 and 2 Gibber tutorials
- List at least two topics from the readings or tutorials that were unclear (we will discuss these next class).

### Week 3

(10/14) Sound synthesis techniques: additive, subtractive, modulation, sampling, envelopes, Review Assignment #1

(10/16) Sound sequencing, basic music theory, interactivity, and effects

Readings

- Young Person's Guide to the Principles of Music Synthesis (online)
- Gibber Tutorials: Chords and Arpeggios, Rhythm, Scales, and Simple Composition

Programming Assignment #2 (Due 10/23)

- Create a 1-2 minute sound composition or instrument in Gibber.
- What synthesis techniques did you use and what are the controls?
- How is your piece sequenced and what rules define the composition?

### Week 4

(10/21) WebAudio JavaScript API: AudioContexts and AudioNodes, connecting to HTML 5

(10/23) Assignment #2 presentations, sound visualization/analysis and the FFT, graphics in Gibber

Readings

- WebAudio API Reference (review and learn how to interpret an API reference)
- Gibber 2D and 3D Tutorials

Programming Assignment #3 (Due 10/30)

- Create a 1-2 minute audio-visual composition or instrument in Gibber or WebAudio/HTML 5.
- How do the sounds and visuals correlate to each other?

### Week 5

(10/28) Sculpting sounds with the IFFT, advanced audio effects, mixing, and sound granulation

(10/30) Assignment #2 Presentations, WebAudio modules for analysis, mixing, and sampling

Readings

- Background research for your final project proposal.
- Keep a list of your references.

Final Project Proposal (due 11/13)

2-3 page project proposal containing the following sections: Abstract, Background, Goals, and Implementation (details to be given in assignment)

### Week 6

(11/4) Sonification: audification, model-based, and parameter mapping techniques for representing data with sound

(11/6) Site-specific sound installation and design, spatialization, and audience interactivity

Continue shaping and revising your final project proposal. Are you creating a composition, instrument, or installation? How could you use data sonification to control your work? Ideally, how will your work be experienced by others – on the web or at a venue? How could your work scale up or down to either?

**Week 7**

(11/11) Veteran's Day Holiday

(11/13) Presentation and discussion of final project proposals.

Homework:

Integrate feedback from discussion into your final project description.

**Week 8**

(11/18 and 11/20) Topics depending on final project needs and student interest. May include audio and multimedia development examples in Max/MSP, Processing/Minim, WebAudio/HTML 5, or other tools/APIs

Homework:

Obtain any necessary APIs for your final project and start prototyping.

**Week 9**

(11/25) Guest Lecture by Reza Ali: sound visualization artist for Deadmaus, Ok Go, and Bonaroo Festival. Discussion of techniques and tools used in professional interactive art installations.

Homework:

Work on final projects and bring programming questions to class.

(11/27) Thanksgiving Holiday

**Week 10**

(12/2 and 12/4) Collaborative code debugging and final project workshop: bring at least one problem to class – this will count towards your participation grade.

**Week 11** (“Deadweek”)

(12/9) Open Lab – additional office hours during class

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**Final Presentations:** Date TBD