



New Directions in Computing:

Audio Plugin Software Engineering

COMS 3997: Spring 2021

Instructor Info



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Office Hrs: TBA



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Course Info —



Prereq: COMS 3157



Monday



75 min Lecture, 1x/week



Virtual



Capped at 15 students

Overview

In this course, we explore how audio plugins are made, from conception to deployment. Audio plugins are a critical component of modular digital audio production and Digital Audio Workstations (DAWs). Our focus will be on the modern audio plugin format of VST3, though the lessons we learn will apply to the development of many audio applications. We will cover the software engineering “best practices” that are employed for audio plugin development (and software engineering projects more generally). In addition to frameworks for handling digital audio, we will cover techniques such as version control, continuous integration, testing, and software protection and licensing. We will additionally gain hands-on experience with the UI/UX design and prototyping process for audio plugins. This course assumes a basic familiarity with audio DSP concepts, such as delays, filters, and additive synthesis. This course also assumes a basic familiarity with C++ concepts.

Grading Scheme

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|-----|---|
| 10% | Participation |
| 15% | Audio Plugin project with JUCE (individual) |
| 15% | Audio Plugin project with C++ (individual) |
| 20% | In-class presentation |
| 30% | Final Project (group) |

Learning Outcomes

- Ability to organize and manage software development infrastructure
- An understanding of the tools and technologies used in the audio industry for plugin development
- A conceptual framework for the thought, design, and development processes that go into the creation of commercial software products.
- Hands-on experience with state-of-the-art software engineering techniques

Material

Recommended Text

Curtis Roads and John Strawn. The computer music tutorial. MIT press, 1996.

Andy Farnell. Designing Sound. MIT Press, 2010.

Puckette, M. S. (2007). The theory and techniques of electronic music. Singapore, Singapore: World Scientific Publishing Company.

Late Policy

Any late assignment (that is submitted before the due date) will be docked 10% of total possible points on that assignment, up to two weeks after original due date, at which point no credit will be awarded. This policy does not apply to the final project, which cannot be accepted after the due date except in exceptional circumstances.

Class Attendance Policy

Beyond the 10% of your grade that is allocated to participation as stated above, you are expected to attend every class period. Excessive absences will require consultation.

Class Laptop Policy

Some classes will require the use of laptops. If using a laptop in class is not possible for any student, we will pair program. In class meetings that do not explicitly note the need for a laptop, all digital assistants (laptops, phones, smart watches, AR glasses, etc) should be stored for the entirety of class.

FAQs

? Will I learn how to use a DAW?

! No, this course will focus the technology underlying DAWs, but only touch on their use as a musical tool.

? Will we spend time producing music in the class?

! We will dedicate no more time to the use of audio plugins than is necessary for understanding their development process.

? Do I need to have a strong background in music?

! No, but you should have a background in audio DSP.

? Can I make a career from developing audio plugins.

! Possibly. To be safe, this course will teach you software engineering foundations that will be useful both the development of audio plugins, as well as program code in general.

Honor Code

You are expected to hold yourself to the highest standard of academic integrity and honesty, as reflected in the Barnard Honor Code. Approved by the student body in 1912 and updated in 2016, the Code states:

We, the students of Barnard College, resolve to uphold the honor of the College by engaging with integrity in all of our academic pursuits. We affirm that academic integrity is the honorable creation and presentation of our own work. We acknowledge that it is our responsibility to seek clarification of proper forms of collaboration and use of academic resources in all assignments or exams. We consider academic integrity to include the proper use and care for all print, electronic, or other academic resources. We will respect the rights of others to engage in pursuit of learning in order to uphold our commitment to honor. We pledge to do all that is in our power to create a spirit of honesty and honor for its own sake.

Wellness Statement

It is important for undergraduates to recognize and identify the different pressures, burdens, and stressors you may be facing, whether personal, emotional, physical, financial, mental, or academic. We as a community urge you to make yourself—your own health, sanity, and wellness—your priority throughout this term and your career here. Sleep, exercise, and eating well can all be a part of a healthy regimen to cope with stress. Resources exist to support you in several sectors of your life, and we encourage you to make use of them. Should you have any questions about navigating these resources, please visit these sites:

- <http://barnard.edu/primarycare>
- <https://barnard.edu/about-counseling>
- <http://barnard.edu/wellwoman/about>
- Stressbusters Support Network

Center for Accessibility Resources & Disability Services

If you believe you may encounter barriers to the academic environment due to a documented disability or emerging health challenges, please feel free to contact me and/or the Center for Accessibility Resources & Disability Services (CARDS). Any student with approved academic accommodations is encouraged to contact me during office hours or via email. If you have questions regarding registering a disability or receiving accommodations for the semester, please contact CARDS at (212) 854-4634, cards@barnard.edu, or learn more at barnard.edu/disabilityservices. CARDS is located in 101 Altschul Hall.

Affordable Access to Course Texts & Materials

All students deserve to be able to study and make use of course texts and materials regardless of cost. Barnard librarians have partnered with students, faculty, and staff to find ways to increase student access to textbooks. By the first day of advance registration for each term, faculty will have provided information about required texts for each course on CourseWorks (including ISBN or author, title, publisher, copyright date, and price), which can be viewed by students. A number of cost-free or low-cost methods for accessing some types of course texts are detailed on the Barnard Library Textbook Affordability guide (library.barnard.edu/textbook-affordability). Undergraduate students who identify as first-generation and/or low-income students may check out items from the FLIP lending libraries in the Barnard Library (library.barnard.edu/flip) and in Butler Library for an entire semester. Students may also consult with their professors, the Dean of Studies, and the Financial Aid Office about additional affordable alternatives for having access to course texts. Visit the guide and talk to your professors and your librarian for more details.

Class Schedule

MODULE 1: Audio Plugin Basics with JUCE

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|--------|---|
| Week 1 | Intro to DAWs and Audio Plugins |
| Week 2 | Audio Plugins with JUCE, Pt 1 |
| Week 3 | Version Control, Continuous Integration, and Unit Tests |
| Week 4 | Audio Plugins with JUCE, Pt 2 |

MODULE 2: Advanced Audio Plugin Dev with C++

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|--------|----------------------------------|
| Week 5 | Audio Plugins with C++, Pt 1 |
| Week 6 | Market analysis and need-finding |
| Week 7 | Audio Plugins with C++, Pt 2 |
| Week 8 | Audio Plugins UI Design |
| Week 9 | Audio Plugins with C++, Pt 3 |

MODULE 3: Audio Plugin Software Lifecycle

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|---------|--|
| Week 10 | Prototyping and User Testing with WebAudio |
| Week 11 | Deploying Executables, Rights Protections, and Open Source |
| Week 12 | Interfacing your Plugin with others |
| Week 13 | Final Project Presentations |
| | Final Project Due |

Disclaimer

This syllabus, the nature and number of projects, readings, topics, etc, are subject to change either by necessity or design. Any changes will be reflected in a new syllabus and/or announced in class and on Canvas.