The University of Illinois | College of Fine and Applied Arts | School of Music

MUS 499C: Intermediate Audio Coding with SuperCollider

Spring 2021 | Course Syllabus

Basic Information

Course: MUS 499C: Proseminar in Music
Section: Intermediate Audio Coding with SuperCollider
Credit: 2 undergraduate/graduate hours
Instructor: Dr. Eli Fieldsteel (he/him)

Course Description, Objectives, and Philosophy

This course is a continuation of creative techniques using the SuperCollider (SC) programming language, building upon content covered during the previous semester. SC is a free, open-source, cross-platform programming environment for real-time digital audio synthesis and algorithmic composition. SuperCollider is a member of a family of audio programming platforms that have been created and developed over the past few decades, which includes Csound, Max/MSP, Pure Data, Kyma, ChucK, RTcmix, Sonic Pi, TidalCycles, FoxDot, and many others. These platforms can be described as audio sandboxes; their objects, classes, and methods are specifically designed for sound applications, and exist within a highly flexible and modular environment. As a result, these types of programs offer considerably deeper potential for creative and experimental work compared to DAW software and other types of timeline/track-based software.

Why SuperCollider, then? In my opinion, SC offers a number of unique strengths among its siblings. Besides being free, open-source, and cross-platform, SC has a lean, powerful audio synthesis engine at its core, coupled with a client-server design, Open Sound Control (OSC) functionality, and an extensive library of Pattern classes for high-level musical expression, making it an exceptionally flexible and adaptable platform in many contexts. With practice and dedication, expressing musical intent through SC code becomes a fluid, rewarding, and liberating experience.

One of the envisioned advantages of live streaming the lecture content is that manual note-taking becomes less of a necessity (though still highly recommended), as it's possible to skip through the archived livestream videos as often as needed to recall and internalize concepts. This is particularly useful for a course that focuses on new and highly technical programming code. On stream, students can comment and ask questions in real-time using the chat, and share code quickly using services like pastebin.com. While watching archived lecture video, students can simultaneously run SC on their own computers to follow along, pausing and repeating sections of the video, if desired. In the past, I used face-to-face classroom time for programming exercises, giving students an opportunity to solve practical problems with direct access to the instructor for extra help. However, due to COVID-19, all homework assignments this semester will be administered online and completed remotely.

Generally speaking, computer programming and digital audio fluency are valuable skills across the contemporary job market. It is rarer and rarer to find jobs that require no programming skills whatsoever – or at least those in which an applicant with programming skills is considered less desirable than one without. While SC is distinct from more general languages like C++, Java, Python, etc., there are certain coding fundamentals that are shared among these platforms. Commercial and freelance digital multimedia projects frequently benefit from having a skilled programmer and/or creative sound designer on the team. This course is meant to improve abilities in computer programming and digital audio fluency, striving to help you become more nimble, adaptable, and competitive on the job market, and to help you understand these concepts on a deeper level.

After completing this course, it is my hope that you will not only become familiar with SC

and its capabilities, but also develop an ability to identify and solve common audio programming problems, more fully understand the fundamentals of computational thinking, and generally become more deeply acquainted with avenues for coding electronic, algorithmic, and/or interactive sound.

Required Materials

- Access to a computer running macOS, Windows, or Linux, with the latest version of SuperCollider installed. *NOTE: SC is currently unsupported on macOS 11 Big Sur.*
- Over-the-ear headphones or a pair of good quality monitoring loudspeakers. Earbuds are acceptable, but not recommended.
- A smartphone or tablet running iOS or Android (for downloading/using TouchOSC, $5)
- Access to a basic USB MIDI controller with some combination of keys, faders, buttons, and knobs. These are available for checkout through me, if needed.

SuperCollider Resources

While there is no textbook for this course, there are a variety of helpful learning resources online:

- Main page for SuperCollider: http://supercollider.github.io/ (includes download, wiki, tutorials, etc.)
- My ongoing SuperCollider Tutorial Series on YouTube: https://www.youtube.com/playlist?list=PLPYzvS8A_rTaNDweXe6PX4CXSGq4iEWYC – the video description for Tutorial 0 includes several links to resources
- The SC Forum: https://scsynth.org
- User-uploaded SC code examples: http://sccode.org/
- An archive of the SC-Users Mailing List, where you can search for answers to commonly asked questions: http://www.listarc.bham.ac.uk/marchives/sc-users/
- SuperCollider on Reddit: https://www.reddit.com/r/supercollider/
- The SuperCollider Book (MIT Press, 2011): https://mitpress.mit.edu/books/supercollider-book

It's difficult to overstate the importance of seeking help and asking questions when you find yourself struggling with course material, especially when dealing with the novel complexities of digital audio programming. In addition to the resources listed above, please consider:

- asking questions in the chat during livestream lectures
- dropping into during office hours or emailing me to arrange a one-on-one meeting – I am a huge SC nerd and am always excited to help, especially if it allows me to procrastinate on other stuff
- email me your code with as much information as possible, indicating how/where you are stuck, what error messages you are receiving, etc.

Pastebin

Pastebin (http://pastebin.com) is a free website designed to make it easy to share large amounts of text – particularly handy for sending big chunks of code back and forth. There may be situations during a livestream in which my code is working but yours isn't. Rather than pasting your code directly into the YouTube live chat (which will likely obliterate your spacing, indentations, and other formatting), instead:

1. go to pastebin.com
2. paste your code into the "New Paste" field
3. click "Create New Paste"
4. copy the shortlink in your browser's URL bar and paste it in the chat

And I'll be able to put your code onstream within seconds.

Course Schedule

This is a somewhat experimental topic schedule and is subject to change.

WEEK	DATE	TOPIC(S)
1	Jan 28	welcome back to SC: review of concepts, considerations and strategies for large-scale SC pieces
2	Feb 4	synthesis: FM, wavetable
3	Feb 11	synthesis: FM, wavetable
4	Feb 18	sampling: live audio, microphones, buffers, live loops
5	Feb 25	sampling: granular synthesis
6	Mar 4	the FFT and spectral processing techniques
7	Mar 11	effects: filters, delays, reverbs, and other custom effects
8	Mar 18	effects: filters, delays, reverbs, and other custom effects
9	Mar 25	an intermediate look at Patterns
10	Apr 1	custom external controllers and OSC
11	Apr 8	intro to live coding in SC
12	Apr 15	practicum: final projects in-progress, Q&A, various topics
13	Apr 22	practicum: final projects in-progress, Q&A, various topics
14	Apr 29	practicum: final projects in-progress, Q&A, various topics
	TBD	presentations of final creative projects (Zoom)

Lecture

Lecture will be livestreamed to my YouTube channel. In response to student feedback, live streams will be *unlisted* this semester, instead of *public*. This means only students who are officially enrolled will have access to the live stream and live. I will post the unlisted link to the course website approximately five minutes prior to each stream (Thursdays @ 2:55pm US Central time). In doing so, I'll be able to focus exclusively on questions from *you*, the actual students, while minimizing distractions.

Lecture videos will be publicly archived on my YouTube channel for re-watching. If you don't want your username and live chat to appear in the archived video, let me know—I can easily hide the live chat from the archived video.

Homework Assignments

Creative coding exercises will be assigned as homework, approximately on a recurring two-week basis. In contrast to the previous semester, these assignments will be more substantial and open-ended. Generally, I will ask you to code a short musical study focusing on a particular topic (e.g. granular synthesis, Fourier-based processing). You can discuss and share your work with other students for help and inspiration, but ultimately your submitted work must be your own.

Including comments in your code is not required, but comments can be especially helpful in

allowing me to understand your intent and your mistakes. If you submit code that fails to work properly, I will probably have an easier time identifying the problem and explaining the issue if you provide comments.

In grading your homework, I may insert my own comments in your code and send it back to you. Each of my comments will be preceded with the string "EMF:" To facilitate the process of reviewing my comments, you can perform a text search for this string, and then step through each match.

Final Creative Project

You will each propose and complete a final creative project using SC as a central component, and present it to the class. You can do this live over Zoom, or make a presentation video ahead of time to be shared over Zoom, or you can send your materials to me, and I can serve as presenter – it's flexible. A group presentation date is TBD and will be announced in a timely manner. Your final creative project may be a composition, a live performance, a software tool for enhancing the compositional process, a software environment for improvisation, a game with a musical component, or something else. If you are a composition student, I strongly encourage you to compose a piece, ideally one that would be performed in a proper venue someday and considered a part of your professional output. Final project proposals (a short written summary of your plan) will be due one week after the final creative project is formally assigned.

Absence Policy

Due to COVID-19, attendance and participation will not be factored into your final grade, nor are you required to produce documentation to verify unexcused absences. I recognize the complexities and uncertainty of our global situation, and that there are many reasons why you may need to miss one or more days of class, request an extension, etc. In exchange for my flexibility and understanding, I ask that you make a good faith effort to engage yourself in the course to the greatest extent possible. I appreciate being notified of absences in advance via email, although this is not required.

If I note multiple absences, I may follow up with an email and/or submit an Irregular Attendance report. This is done out of care and concern for your well-being, and is not grade-related nor punitive.

Grading

For the sake of simplicity, each individual item (homework, midterm, final project) is worth 100 points. At the end of the semester, your points in each category are totaled and scaled according to the following rubric. The sum of your scaled values determines your final grade (G).

75% Homework Assignments
25% Final Creative Project

$G \geq 93$: A	$73 \leq G < 77$: C
$90 \leq G < 93$: A-	$70 \leq G < 73$: C-
$87 \leq G < 90$: B+	$67 \leq G < 70$: D+
$83 \leq G < 87$: B	$63 \leq G < 67$: D
$80 \leq G < 83$: B-	$60 \leq G < 63$: D-
$77 \leq G < 80$: C+	$G < 60$: F

Homework assignments and the final project will be graded equally on creativity and technical quality. Minor errors will result in small point deductions (ca. 1-4 points), while more significant errors will result in more substantial deductions (ca. 5-10 points). A generalized rubric is as follows:

	Technical Quality:
50:	completely correct and error-free, code written very clearly

40-49: mostly correct/error free, largely functional code, very few minor errors, evidence of good effort
30-39: some minor/major mistakes, partially functional code, evidence of moderate effort
20-29: significant errors, responses minimally correct and/or non-functional, fair/poor effort
0-19: major issues throughout, sloppy/non-functional code, intent very unclear, minimal/no effort

Creativity:
50: outstanding effort, clear evidence of creativity and critical thinking, musically convincing
40-49: very good effort, notable evidence of creativity, few minor issues
30-39: acceptable effort, evidence of some creativity, some non-trivial issues
20-29: marginally adequate effort, dubious evidence of creativity
0-19: poor effort, little/no creativity or critical thinking, incomplete code, major issues/oversights

Late Assignment Submission

Grades will receive a penalty of 10% of the total assignment worth for each 24-hour period that has begun past the assignment deadline, capped at 50%. There is a grace period of up to 30 minutes past each submission deadline, and "lateness" will be determined by the timestamp on your assignment submission. In the case of late work, it is better to finish your work thoughtfully within these first 24 hours, rather than hastily throwing it together as fast as possible.

If you feel you need an extension on an assignment for any reason, you may request one via email, and it will be granted. Be mindful that work can pile up quickly if you request several extensions, so it is in your best interest to stay on top of original deadlines.

With the exception of the final creative projects, any assignments not submitted by 11:59pm on the university-scheduled last day of instruction (Wednesday, May 5th) will receive no credit.

Academic Integrity

Rules and regulations surrounding academic integrity remain unchanged. The Student Code will be applied in all cases of academic misconduct committed by students. Violation of the policies therein is grounds for a failing grade and/or removal from the course. I encourage you to review these policies online: https://studentcode.illinois.edu/article1/part4/1-401/

Statement of Diversity and Inclusion

The world is a complex place, in which music is often highly subjective and historically built around a small subset of privileged voices. I acknowledge that many of the reading excerpts and compositions in this course were written by white men. I make an earnest and ongoing effort to self-evaluate in order to better myself and my teaching practices, however, I acknowledge there may be overt and/or covert biases in the course materials due to the context in which they were created. Integrating a diverse set of experiences is important for a more comprehensive understanding of music. I encourage you to contact me via email if you have any concerns about these issues, or suggestions to improve the quality/diversity of the course materials. You can also submit anonymous feedback through a discussion board module on the course website.

Furthermore, I would like to create a learning environment for you that supports a diversity of thoughts, perspectives and experiences, and respects your individual identities (including race, gender, class, sexuality, religion, ability, etc.). To help

accomplish this:

- If you have a name and/or set of pronouns that differ from those that appear in your official records, please let me know.
- If you feel like your class performance is being impacted by your experiences outside of class, please feel welcome to discuss it with me. Remember that you can also submit anonymous feedback (which may lead to me making a general announcement to the class, if necessary to address your concerns). If you prefer to speak with someone outside of the course, there are many resources available through the Community of Care in the Office of the Dean of Students: https://odos.illinois.edu/community-of-care/
- I (like many) am continually learning about diverse identities & perspectives. If something was said in class (by anyone) that made you feel uncomfortable, please talk to me about it. Again, anonymous feedback is always an option.

Community of Care

As members of the Illinois community, we each have a responsibility to express care and concern for one another. If you come across a classmate whose behavior concerns you, whether in regards to their well-being or yours, we encourage you to refer this behavior to the Student Assistance Center (217-333-0050 or http://odos.illinois.edu/community-of-care/referral/). Based on your report, the staff in the Student Assistance Center reaches out to students to make sure they have the support they need to be healthy and safe.

Further, we understand the impact that struggles with mental health can have on your experience at Illinois. Significant stress, strained relationships, anxiety, excessive worry, alcohol/drug problems, a loss of motivation, or problems with eating and/or sleeping can all interfere with optimal academic performance. We encourage all students to reach out to talk with someone, and we want to make sure you are aware that you can access mental health support at the Counseling Center (https://counselingcenter.illinois.edu/) or McKinley Health Center (https://mckinley.illinois.edu/). For mental health emergencies, you can call 911 or walk in to the Counseling Center, no appointment needed.

Students with Disabilities

To obtain disability-related academic adjustments and/or auxiliary aids, students with disabilities must contact the course instructor and the as soon as possible. To ensure that disability-related concerns are properly addressed from the beginning, students with disabilities who require assistance to participate in this class should contact Disability Resources and Educational Services (DRES) and see the instructor as soon as possible. If you need accommodations for any sort of disability, please speak to me after class, or make an appointment to see me, or see me during my office hours. DRES provides students with academic accommodations, access, and support services. To contact DRES you may visit 1207 S. Oak St., Champaign, call 333-4603 (V/TDD), or e-mail disability@illinois.edu. http://www.disability.illinois.edu/.

Disruptive Behavior

Behavior that persistently or grossly interferes with classroom activities is considered disruptive behavior and may be subject to disciplinary action. Such behavior inhibits other students' ability to learn and an instructor's ability to teach. A student responsible for disruptive behavior may be required to leave class pending discussion and resolution of the problem and may be reported to the Office for Student Conflict Resolution for disciplinary action.

Emergency Response Recommendations

Emergency response recommendations can be found at the following website: http://police.illinois.edu/emergency-preparedness/. I encourage you to review this website and the campus building floor plans website within the first 10 days of class. http://police.illinois.edu/emergency-preparedness/building-emergency-action-plans/.

Family Educational Rights and Privacy Act (FERPA)

Any student who has suppressed their directory information pursuant to Family Educational Rights and Privacy Act (FERPA) should self-identify to the instructor to ensure protection of the privacy of their attendance in this course. See http://registrar.illinois.edu/ferpa for more information on FERPA.

Religious Observances

The Religious Observance Accommodation Request form is available at https://odos.illinois.edu/community-of-care/resources/students/religious-observances/. Submit the form to the instructor and to the Office of the Dean of Students (helpdean@illinois.edu) by the end of the second week of the course; in the case of exams or assignments scheduled after this period, students should submit the form to the instructor and to the Office of the Dean of Students as soon as possible.

Sexual Misconduct Reporting Obligation

The University of Illinois is committed to combating sexual misconduct. Faculty and staff members are required to report any instances of sexual misconduct to the University's Title IX and Disability Office. In turn, an individual with the Title IX and Disability Office will provide information about rights and options, including accommodations, support services, the campus disciplinary process, and law enforcement options.

A list of the designated University employees who, as counselors, confidential advisors, and medical professionals, do not have this reporting responsibility and can maintain confidentiality, can be found here: wecare.illinois.edu/resources/students/#confidential.

Other information about resources and reporting is available here: wecare.illinois.edu.