

Electronic Synthesizer Techniques, MTEC 474b

Course Syllabus Fall 2023

Instructor:

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Office Hours: Tuesday by appointment

Goal:

The goal of this course is that each student—upon successful completion—gains a theoretical and practical understanding of intermediate to advanced electronic synthesizer and sampling techniques. These will include a working knowledge of electronic synthesizers, effect processors, and the components of the synthesis process. To reach this goal, each student must accomplish the objectives described below.

Course Objectives:

- Using contemporary production techniques, demonstrate proficiency in fundamental concepts in sound theory by applying them to practical, real-world examples
- Create original presets, patches, and recorded audio sound sets using electronic synthesis, including subtractive, additive, physical modeling, frequency modulation, sample-based synthesis, sampling, wavetable, and granular
- Synthesize, process, and catalog sounds for personal music libraries
- Describe, explain, and demonstrate the process of making musical sounds with electronic synthesizers and various additional tools and technology
- Create and produce musical compositions and arrangements with synthesized and processed sounds

Requirement, Exams, and Grading Information:

Student assessment in MTEC 474b will consist of in-class participation, exercises, a mid-term, and a final project. Unless otherwise noted, all exercises are due one week from the date assigned. Students must attend class meetings and keep up with the weekly reading assignments before the next class session.

All assignments must be turned in to the DropBox class, accessed through Blackboard, and carefully follow file naming conventions, file management, and format guidelines.

Assignments must also be brought to class each week and available for in-class demonstrations and collaborative exercises

Required Class Texts:

Andrea Pejrolo and Scott B. Metcalfe. Creating Sounds from Scratch: A Practical Guide to Music Synthesis for Producers and Composers (1st Edition) (2017)

Ableton Live User Manual

Logic Pro X User Manual

Required Software:

Either **Ableton Live** or **Logic Pro X**

Logic Pro X comes with a 90-day demo - or can be purchased after that for \$199 - access through the Apple Education App Store

Ableton Live 11 Suit includes a 90-day demo - visit <http://ableton.com/en/trial>

After that, Ableton will offer a complimentary full-functioning demo for the duration of the semester to students in classes where Live Suite is the primary DAW

Screen Capture software (QuickTime Player, Screenium, or equivalent)

(Recommended)

Syntorial <https://www.syntorial.com/>

Hardware Requirements:

A computer capable of running Ableton Live Suit 11 or Logic Pro X

You must have headphones for every class! We strongly recommend the Sony MDR-7506 headphones or similar. They are the standard headphone for all MTEC and MUIN courses.

Bring your headphones to **EVERY MEETING** with a 1/4" adapter. Not having them will affect your ability to participate and, consequently, your participation score

Course Outline

Date	Class Topic
8/22	Workflow Strategies, Course Outline, Expectations
8/29	Tools, Texture, Timbre, Tonality
9/5	Additive Design - Sine Waves, Fundamentals and Overtones
9/12	Advanced Modulation Techniques and Effects Manipulation
9/19	Percussive Plucks and Resonating Arpeggiation
9/26	Drums & Bass with Modal Synthesis
10/3	In class student presentations and feedback Midterm projects Assignment: Midterm Project - Due Week 9
10/10	Evolving Pads and Experimental Ambience
10/17	Midterm Projects Due - In class Student Presentations & Feedback
10/24	Audio Manipulation Techniques
10/31	Creative Convolving
11/7	TBD - synthesis lesson based on in class discussion
11/14	TBD - synthesis lesson based on in class discussion
	In-class Final Project Work Session
	Final Project Due TBA - In class Student Presentations & Feedback

Requirements, Exams, and Grading Information

Assignments are due by the beginning of the following class period. Assignments turned in after the deadline will be marked late and penalized. Allow for slow Internet connections and server upload time to entirely upload your files before the deadline.

The Final Project must be submitted on time; final projects turned in after the deadline will receive a grade of zero.

Throughout the semester, questions regarding instructor expectations, assignments, grades, and anything else unclear should be addressed immediately

Notes

Each class will contain both theoretical and practical experiences. We will discuss in class the selection of the final material for the last lessons in the semester, with several synthesis possibilities, including FM, Sampling, and Granular Synthesis.

Grade Breakdown:

Participation 10%
Assignments 30%
Midterm Exam 25%
Final Exam 35%

Course Schedule

Week 1 **Workflow Strategies, Course Outline, Expectations**

Introduction
Policy and procedures
Preferences, settings and standards
Overview - software synths
 - Alchemy
 - Analog / Drift

Reading: *Creating Sounds from Scratch* - Chapter 1
Exercise 1: Subtractive presents; submit a music example

Week 2 **Tools, Texture, Timbre, Tonality**

Tools for the task: Considerations, Categories, Characteristics
Recognition - Ear training (simple and complex waveforms)
Experimenting with harmonics, partials, and overtones
Critical listening and ear training

Production techniques:
 Strategies for recreating sounds
 Reverse engineering patches and presets

Reading: *Creating Sounds from Scratch* Chapters 2 and 3
Exercise 2: Reconstructing sounds from audio examples

Week 3 **Additive Design - Sine Waves, Fundamentals and Overtones**

Characteristics of Additive Synthesis
Resynthesis, Cross Synthesis, and Spectral Synthesis

Production techniques: Alchemy
 Controlling harmonics: envelope, pitch, pan

Layering sources for evolving pads and sound effects
Combining additive and spectral synthesis
Reading: *Creating Sounds from Scratch* Chapter 6 (pp. 175-192)
Logic Pro X Instruments Reference Guide (Chapter: Alchemy)
Exercise 3: Sound design: Resynthesis, Spectral, Resynthesis + Spectral

Week 4 Advanced Modulation Techniques and Effects Manipulation

Filters and routing
Modulators - Alchemy
 LFO, AHDSR, MSEG, ModMap, Sequencer
Auxiliary and master effects

Production techniques: Alchemy
 Sound sculpting (Ethereal to Aggressive)
 Looped and tempo-synced sources

Reading: *Creating Sounds from Scratch* Chapter 6 (pp. 192-202)
Logic Pro X Instruments Reference Guide (Chapter: Alchemy)
Exercise 4: *Creating Sounds from Scratch* Chapter 6

Week 5 Percussive Plucks and Resonating Arpeggiation

Characteristics of Physical Modeling
Components: Resonator, Generator, Damper

Production techniques: Collision
 Percussive plucks for rhythms and melodies
 Arpeggiated sequences and syncopated ostinato phrases

Reading: *Creating Sounds from Scratch* Chapter 8
Exercise 5: *Creating Sounds from Scratch* Chapter 8

Week 6 Drums & Bass with Modal Synthesis

Production techniques: Sculpture
 Electric Bass Programming
 Synthesizing Drums and Percussion
Reading: Logic Pro X Instruments Reference Guide (Chapter: Sculpture)

Week 7 **In-class Student Presentations and Feedback**
Assignment: Midterm Project - Due Week 9

Week 8 **Evolving Pads and Experimental Ambience**

Characteristics of WaveTable Synthesis
WT position, intensity
Vector Synthesis
Lookup Tables
Modulating/Automating Lookup Tables
Creating WaveTables for Alchemy

Production techniques: WaveTable
 Evolving pads and leads
 Experimental effects and ambient

Reading: *Creating Sounds from Scratch* Chapter 9 (pp. 291-314)
Exercise 7: *Creating Sounds from Scratch* Chapter 9 (ex. 9.1, 9.2)

Week 9 **Midterm Projects Due**
Student Presentations of Midterms and Feedback

Week 10 **Audio Manipulation Techniques - Granular Synthesis**

Granular software synthesizers overview
Grain splitting
Separating pitch and time
Creative warping for sound design

Production techniques:
 Max for Live: Granulator II - Turning inharmonic sounds harmonic
 Alchemy - Granular preset creation

Reading: *Creating Sounds from Scratch* Chapter 9 (pp. 315-324)
Exercise 8: *Creating Sounds from Scratch* Chapter 9 (ex. 9.3, 9.4)

Week 11 **Creative Convolution**

Capturing Impulse Responses
Convolution hardware and software

Production techniques:

Texturizing through convolution
Amalgamating impulse responses

Week 12 TBA - Advanced Synthesis - Theory & Production

Week 13 TBA - Advanced Synthesis - Theory & Production

Week 14 In-class Final Project Work Session

**Week 15 Final Project Due
Student Presentations and Feedback**

Communication and Online Materials:

Please make it a habit to check your USC email. If you do not regularly use that account, ensure you have it forwarded to the account you use. Any emails I send to the class will use the USC email account. All course materials, including slides, audio examples, handouts, assignments, and class grades, will be available on Blackboard (<https://blackboard.usc.edu>). Be sure to check Blackboard if you have to miss a class. You are responsible for any materials presented and assignments made, even if you are not in class that day.

Sharing of course materials outside of the learning environment

USC has a policy that prohibits sharing synchronous and asynchronous course content outside of the learning environment. Please do not share or otherwise distribute class materials, music scores, or recordings produced by me or any students in the conduct of this course without permission.

SCampus Section 11.12(B)

Distribution or use of notes or recordings based on university classes or lectures without the express permission of the instructor for purposes other than individual or group study is a violation of the USC Student Conduct Code. This includes, but is not limited to, providing materials for distribution by services publishing class notes. This restriction on unauthorized use also applies to all information, which had been distributed to students or in any way had been displayed for use in relationship to the class, whether obtained in class, via email, on the Internet or via any other media. (See Section C.1 Class Notes Policy).

Zoom etiquette

If applicable, I expect you to demonstrate your presence and participation in class by being on camera in all Zoom sessions. If you will be unable to keep your camera on during the synchronous Zoom session, please get in touch with me before the class session to discuss.

USC technology rental program

We realize that attending classes online and completing coursework remotely requires access to technology that not all students possess. If you need resources to successfully participate in your classes, such as a laptop or internet hotspot, you may be eligible for the university's equipment rental program or other assistance. To apply, please [submit an application](#) on the Student Basic Needs portal.

USC Technology Support Links

[Zoom information for students](#)

[Blackboard help for students](#)

[Software available to USC Campus](#)

Academic Conduct

Plagiarism – presenting someone else's ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus in *Part B, Section 11, "Behavior Violating University Standards"* policy.usc.edu/scampus-part-b. Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on scientific misconduct, policy.usc.edu/scientific-misconduct.

Support Systems

Counseling and Mental Health - (213) 740-9355 – 24/7 on call

studenthealth.usc.edu/counseling

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

National Suicide Prevention Lifeline - 1 (800) 273-8255 – 24/7 on call

suicidepreventionlifeline.org

Free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week.

Relationship and Sexual Violence Prevention Services (RSVP) - (213)

740-9355(WELL), press "0" after hours – 24/7 on call

studenthealth.usc.edu/sexual-assault

Free and confidential therapy services, workshops, and training for situations related to gender-based harm.

Office of Equity and Diversity (OED) - (213) 740-5086 | Title IX – (213) 821-8298

equity.usc.edu, titleix.usc.edu

Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants.

Reporting Incidents of Bias or Harassment - (213) 740-5086 or (213) 821-8298
usc-advocate.symlicity.com/care_report

Avenue to report incidents of bias, hate crimes, and microaggressions to the Office of Equity and Diversity | Title IX for appropriate investigation, supportive measures, and response.

The Office of Disability Services and Programs - (213) 740-0776
dsp.usc.edu

Support and accommodations for students with disabilities. Services include assistance in providing readers/notetakers/interpreters, special accommodations for test taking needs, assistance with architectural barriers, assistive technology, and support for individual needs.

USC Campus Support and Intervention - (213) 821-4710
campussupport.usc.edu

Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

Diversity at USC - (213) 740-2101
diversity.usc.edu

Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

USC Emergency - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call
dps.usc.edu, emergency.usc.edu

Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

USC Department of Public Safety - UPC: (213) 740-6000, HSC: (323) 442-120 – 24/7 on call
dps.usc.edu

Non-emergency assistance or information.