

Electronic Synthesizer Techniques, MTEC 474b

Course Syllabus Spring 2021

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Course Goals

It is the goal of this course that each student—upon successful completion—gains a theoretical and practical understanding of intermediate 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 successfully accomplish the objectives described below.

Course Objectives

- Using contemporary production techniques, demonstrate proficiency of 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, 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

Requirements, 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.

It's extremely important that students keep up with the weekly reading assignments and exercises before the next class session.

All assignments are to be turned in to the class DropBox, accessed through Blackboard, and must 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)

Dennis DeSantis, et al. [Live Reference Manual \(Version 10\)](#)

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Apple Inc. [Logic Pro X Instruments Reference Guide](#)
[Shepard, Brian. Refining Sound](#) (2013). (Recommended)

Required Software

APPLE LOGIC PRO X (10.6 or higher)
Apple Pro Apps for Education: \$199
Includes Logic, Final Cut Pro, Compressor, Main Stage and more
Web link: [Apple EDU Store](#)

ABLETON LIVE 11 SUITE

Ableton will offer *complimentary full functioning free demos for the duration of the semester* to students in classes where Live Suite is the primary DAW

Download Trial Version: <https://www.ableton.com/en/trial/>

If you need to extend your 90-day trial after it expires, log onto your USC account and follow the link in this document: [Ableton Student Offerings.pdf](#)

Ableton Live Suite Edu purchase price: \$449 (\$74.83 for 6-months)
Web link: [Ableton EDU Shop](#)

Screen Capture software (QuickTime Player, Screen Flow or equivalent)
Syntorial <https://www.syntorial.com/> (Recommended)

Required Hardware

Reference headphones (Sony, MD 7506 or the equivalent required)
Apple computer capable of running Ableton Live 10 and Logic Pro X

*****You'll need to bring your own headphones to EVERY MEETING with a 1/4" adapter. We do not loan out either of these items and not having them will affect your ability to participate and consequently your participation score*****

Communication

Please make it a daily habit to use/check your USC E-mail account. Any E-mails I send to the class will use that account. *****Please add "MTEC 474b" in the subject header of all emails***** This will help me to organize all the emails that I receive and respond to you more quickly. Additionally, all course materials and class grades will be posted on [BlackBoard](#).

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Grading Summary

Participation	30%
Assignments	25%
Mid-term Project	20%
Final Project	25%

Grading Scale:

92 – 100 = A	90 – <92 = A-	88 – <90 = B+
82 – <88 = B	80 – <82 = B-	78 – <80 = C+
72 – <78 = C	70 – <72 = C-	68 – <70 = D+
62 – <68 = D	60 – <62 = D-	<60 = F

In general **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 so that your files are completely uploaded before the deadline.

The Final Project may not be submitted late. Final projects not turned in by the deadline will receive a grade of zero.

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

Notes

Each class will contain both theoretical and practical experiences. Should the needs of the class so dictate, I reserve the right to change the course outline. You will be notified of any substantive schedule changes.

Schedule

Week 1	Workflow Strategies, Course Outline, Expectations
	Introduction
	Policy and procedures
	Preferences, settings and standards
	Overview - software synths
	Reading: <i>Creating Sounds from Scratch</i> chapter 1
	Exercise 1: Subtractive presents, Submit a music example
Week 2	MLK Holiday

- Week 3 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
 Backwards engineering patches and presets
Reading: *Creating Sounds from Scratch* chapter 2 and 3
Exercise 2: Reconstructing sounds from audio examples
- Week 4 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 5 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
Assignment: Mid-Term Project - Original Sequence (Due Week 9)
- Week 6 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 7 Presidents Day Holiday

Week 8 Bass and Drums with Physical Modeling and Modal Synthesis

Production techniques: Sculpture
 Building an electric bass
 Synthesizing drums and percussion
Reading: *Logic Pro X Instruments Reference Guide* (Chapter: Sculpture)

Week 9 Evolving Pads and Experimental Ambience

Characteristics of WaveTable synthesis
WT position, intensity
Vector Synthesis
Lookup Table
Modulating/Automating Lookup Tables
Creating WaveTables for Alchemy
Production techniques: WaveTable
 Evolving pads and leads
 Experimental effects and ambience
Reading: *Creating Sounds from Scratch* chapter 9 (pp. 291-314)
Exercise 7: *Creating Sounds from Scratch* chapter 9 (ex. 9.1, 9.2)

March 14 Spring Recess

Week 10 In class student presentations and feedback mid-term projects

Assignment: Final Project - Due Week 13

Week 11 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)

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Week 12 Creative Convolving

Capturing impulse responses

Convolving hardware and software

Production techniques: Texturizing through convolution

Amalgamating impulse responses

Advanced modulation techniques

Exercise 10: Capture impulse responses and modify for personal sound libraries

Week 13 TBA

Week 14 In-class Final Project Work Session

Week 15 Final Project In Class Presentations and Feedback

Disabilities

Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to me (or to TA) as early in the semester as possible. DSP is located in STU 301 and is open 8:30 a.m.-5:00 p.m. Monday through Friday. The phone number for DSP is 213/740-0776.

Synchronous Session Recording Notice

As required by USC, the synchronous sessions for this course will be recorded and provided to all students asynchronously. This policy does not apply to individual lessons.

Sharing of course materials outside of the learning environment

USC has a policy that prohibits sharing of any 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 expressed 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

I expect you to demonstrate your presence and participation in class by your being on camera in all Zoom sessions. If you will be unable to keep your camera on during the synchronous Zoom session, please contact me prior to 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](#)

Statement on Academic Conduct and Support Systems

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 Section 11, Behavior Violating University Standards <https://scampus.usc.edu/1100-behavior-violating-university-standards-and-appropriate-sanctions/>. Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on scientific misconduct, <http://policy.usc.edu/scientific-misconduct/>.

Discrimination, sexual assault, and harassment are not tolerated by the university. You are encouraged to report any incidents to the Office of Equity and Diversity <http://equity.usc.edu/> or to the Department of Public Safety <http://capsnet.usc.edu/departments/departments-public-safety/online-forms/contact-us>. This is important for the safety whole USC community. Another member of the university community – such as a friend, classmate, advisor, or faculty member – can help initiate the report, or can initiate the report on behalf of another person. The Center for Women and Men <http://www.usc.edu/student-affairs/cwm> provides 24/7 confidential support, and the sexual assault resource center webpage sarc@usc.edu describes reporting options and other resources.

Support Systems

A number of USC's schools provide support for students who need help with scholarly writing. Check with your advisor or program staff to find out more. Students whose primary language is not English should check with the American Language Institute <http://dornsife.usc.edu/ali>, which sponsors courses and workshops specifically for international graduate students. The Office of Disability Services and Programs http://sait.usc.edu/academicsupport/centerprograms/dsp/home_index.html provides certification for students with disabilities and helps arrange the relevant accommodations. If an officially declared emergency makes travel to campus infeasible, USC Emergency Information <http://emergency.usc.edu/> will provide safety and other updates, including ways in which instruction will be continued by means of blackboard, teleconferencing, and other technology.