

Electronic Synthesizer Techniques, MTEC 474b

Course Syllabus Spring 2020

Timo Preece:

E-mail: tpreece@usc.edu

Mailbox: TMC G118

Office: TBA

Office Hours: UPC Campus - TBA

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 exercises, a mid-term and a final project. Unless otherwise noted, all exercises are due one week from the date assigned. All assignments are to be turned in to the class folder on the music technology lab server and must carefully follow file naming conventions, file management and format guidelines.

The final project will consist of a musical sound design sequence, 3 to 4 minutes in length. Students will document their workflow and explain it in a, no longer than 7 minute, screen capture. In addition, students will submit a cataloged library of patches, device presets and impulses responses designed for their composition. Further instructions will be available at a later date.

Grading Summary

- | | |
|---------------------|-----------|
| 1. Participation | 10% |
| 2. Exercises | 35% total |
| 3. Mid-term Project | 10% |
| 4. Final Exam | 15% |
| 5. Final Project | 30% |

Class Texts

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

Dennis DeSantis, et al. *Live Reference Manual (Version 10)* **(Required)**

Apple Inc. *Logic Pro X Instruments Reference Guide*. <https://help.apple.com/logicpro-instruments/mac/10.2/>

Shepard, Brian. *Refining Sound*. Oxford Press (2013). (Recommended)

Supplementary Materials

1. Headphones (Sony, MD 7506 or the equivalent required)
2. USB Memory Stick and/or other external storage device
3. Screen Capture software (QuickTime Player, Screen Flow or equivalent)
4. Syntorial <https://www.syntorial.com/> (Recommended)

Communication

Please make it a habit to use/check your USC email account. Any emails I send to the class will use that account. In addition all course materials and class grades will be posted on BlackBoard (<http://blackboard.usc.edu>). For example, the course syllabus can be found under Syllabus and class notes under Content.

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.

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

Assignments are due by the beginning of the class period (3:59 PM) indicated in the course outline below. Assignments turned in after the deadline will be marked late and penalized 10% for that day as well as 10% for each additional day or portion of a day that they are late. 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.

Notes

*Each class will contain both theoretical and practical experiences. In general, I will present the day's subject material during the first part of the class then work on it for the remainder. 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: *Creating Sounds from Scratch* chapter 1

Audio/Video Examples: *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

 Backwards engineering patches and presets

Audio/Video Examples: *Creating Sounds from Scratch* chapter 2 and 3

Reading: *Creating Sounds from Scratch* chapter 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)

Audio Examples: *Creating Sounds from Scratch* chapter 6

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)

Audio Examples: *Creating Sounds from Scratch* chapter 6

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: Sculpture, NI Prism, Collision

Percussive plucks for rhythms and melodies

Arpeggiated sequences and syncopated ostinato phrases

Reading: *Creating Sounds from Scratch* chapter 8

Audio/Video Examples: *Creating Sounds from Scratch* chapter 8

Exercise 5: *Creating Sounds from Scratch* chapter 8

Week 6 Bass and Drums with Physical Modeling and Modal Synthesis

Production techniques:

Building an electric bass (NI Prism)

Synthesizing drums and percussion (Collision)

Reading: *Logic Pro X Instruments Reference Guide* (Chapter: Sculpture)

Exercise 6: TBD

- Week 7 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:
 Evolving pads and leads
 Experimental effects and ambience
Reading: *Creating Sounds from Scratch* chapter 9 (pp. 291-314)
Audio/Video Examples: *Creating Sounds from Scratch* chapter 9
Exercise 7: *Creating Sounds from Scratch* chapter 9 (ex. 9.1, 9.2)
 Mid-Term Project - Original Sequence (Due Week 8)
- Week 8 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)
Audio/Video Examples: *Creating Sounds from Scratch* chapter 9
Exercise 8: *Creating Sounds from Scratch* chapter 9 (ex. 9.3, 9.4)
- Week 9 Harnessing Feedback, Noise and Distortion**
Feedback in Frequency Modulation
Turning simple waves complex: Waveshaping
Bit reduction
Production techniques:
 Drum programming with bit reduction
 Waveshaping leads with Saturator
Reading: TBD
Final Project Discussion
Exercise 9: TBA
- Week 10 Creative Convolving**
Capturing impulse responses
Convolving hardware and software
Production techniques: Texturizing through convolution

Amalgamating impulse responses
Advanced modulation techniques
Reading: TBA
Exercise 10: Capture impulse responses and modify for personal sound libraries

Week 11 **Designing Custom Instruments and Effects**
Introduction to Object Oriented Programming
Building instruments and devices racks - Ableton Live
Parallel and serial effects routing
Max for Live Essentials
Exploring and implementing Max for Live devices
Production techniques:
 Designing creative instruments and effects
Reading: *Ableton Live Reference Manual* chapter 18, 25, 26
Exercise 11: TBA

Week 12 **Guest Lecture TBA**
Reading: TBA
Exercise 12: TBA

Week 13 **Individual and Small Group Hands-on Exercises**
Reading: TBA
Exercise 13: TBA

Week 14 Final Project Work Session

Week 15 Final Project Work Session

Week 16 Final Projects and Blackboard take home Final Exam due
(See BlackBoard - Assignments for due dates)

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/department/department-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.