/RESOURCES:

Thanks again for coming to Synth Salon!

Email any questions to: info@synth-salon.com

Links to synth resources and more:

Slides form the Synth 1 class
This Moog styled browser based synth and this more featureful one are straightforward and is similar to the minilogue we used in class.

Ableton has a great interactive site called learning synths.

Roland 50 Studio is a fantastic site that allows you to make sequences with many of their great instruments from the past, including the 808 and 606 which we had a version of at Synth Salon.

AudioKit Synth One is a free and very featureful app for iOS

VCV Rack is the virtual modular synth we used in the modular classes. You can also try Cardinal which has a free plugin.

This folder contains the VCV patches we made in MODULAR 2 + slides from that workshops. It also has the first few weeks of John-Mike's ACC modular synth class notes and example files. His ACC class also has a growing list of Modular Musicians and a brief history of modular

Devices used and mentioned in the classes:

Synths:
Korg Minilogue
Moog Grandmother

Modular:
Teenage Engineering POM-400
Moog Mother-32
Korg SQ-1

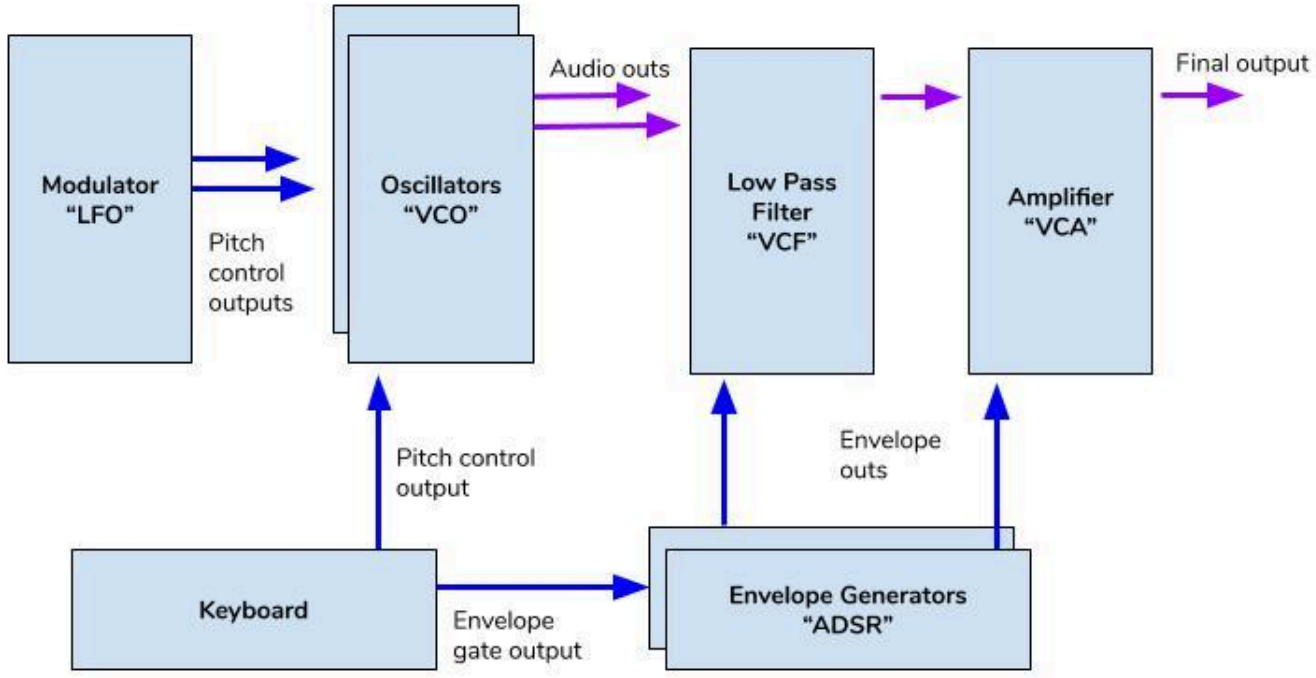
Drum Machines:
Roland TR-06
Roland TR-08
Arturia Drum Brute
Bleep Labs Prototype

Synth basics and vocab

Here's a free [Moog styled browser based synth] that you can use to follow along with this guide but any basic subtractive synth will do. This one only runs in chrome and is a little touchy unfortunately. The best way to get it to run seems to be opening a new incognito window and paste the link there. You do not need to install it.

This is a monophonic synth meaning that only one note is played at a time. You can use your computer keyboard or click the on screen piano keys but it will also receive MIDI information.

Here's what's going on inside of it:



The oscillators make the sound. They are always going no matter what the other modules are doing.

The sound passes through the filter then into the amp.
The pitch of the oscillators are controlled by the keyboard.
The keyboard also puts out a gate signal. When a key is held down the gate is on or opened.
The envelope generator gets this gate signal and when it's opened it starts to output the attack of the envelope. When closed it begins the release. The amplifier is basically turned all the way down unless it's getting a signal from the envelope generator.

Oscillators
On the left side of the web synth we have 3 oscillators. An oscillator is just something that changes regularly. We can hear it directly or we can hear it affecting a variable of another device.

MOD is a low frequency oscillator, an LFO, with the tremolo knobs changing how much it alters the pitch of OSC1 and OSC2.

OSC1 and OSC2 are the oscillators you hear.
You can select from different waveforms, detune them (12 o'clock on the knob means that osc is playing the note you hit on the keyboard in tune), and change their volumes with the MIX knobs.
Interval changes the pitch range aka octave. The smaller the number the higher the pitch. (This nomenclature of "feet" is left over from old organs and is seen sometimes on synths).

Different waveforms give different harmonics which are all the little frequencies that make a sound unique. A sine wave has no harmonics so it's just one clear tone. A triangle wave has a few more and saw and square wave have many more.
Different analog oscillators have slightly different shapes with different harmonics but most produce these simple geometric waveforms. Digital oscillators can produce any signal we program for them to step through.

Detuning the oscillators can give very interesting effects. Though both oscillators are controlled by the keyboard at the same time and go through the single filter together, you can change the relative tuning of one or both so it's anywhere from several notes off of the intended pitch or just a few cents.

This example synth has two oscillators but it can only play one note from the keyboard at a time, making it monophonic. A polyphonic keyboard, like the Minilogue we used in the workshops can play four notes at once and each voice, the collection of oscillators, filters, amps, and envelopes, has two oscillators each.

Keyboard - Triggers and Gate
A keyboard puts out a gate signal when the key is held down. When the key is pressed a high level is sent out. When no key is pressed, a low low is sent. It's simply on and off.
This on off signal is used to start the envelope generator and also holds it at the sustain level. Once the key is released the release part of the envelope begins.
Like a lot of the terms here trigger and gate can get mixed up and are sometimes used interchangeably but they are different. A gate is a signal that turns on and off when a note from a keyboard or sequencer or anything is held "on" and a trigger is a signal that happens at a set length when engaged. If you send a trigger to an ADSR envelope it won't work as expected since there is very little "on" time. A gate sigan can be used to trigger things, though.

The keyboard also sends data to the oscillators to control what note they are playing.

A sequencer could also be used in place of or in addition to the keyboard. We can think of it as a player piano putting out note and gate data.

An arpeggiator is a device that takes note data in and outputs a small sequence that is based on one or more notes.

Filter

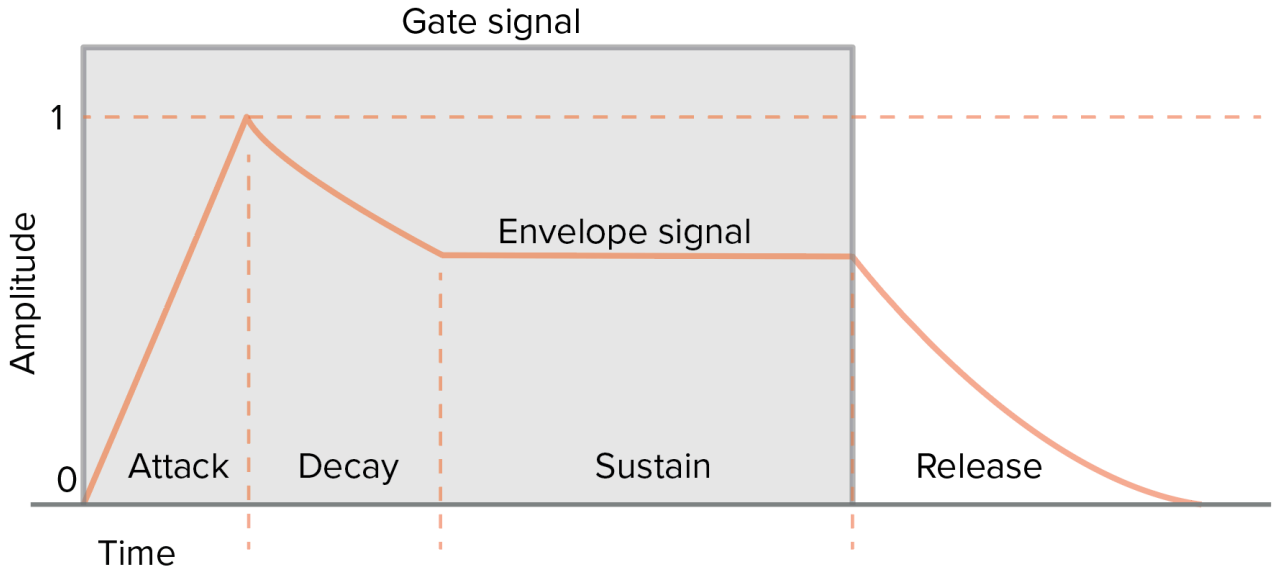
The oscillators are mixed together and then go through a lowpass filter. Only frequencies lower than the cutoff can get through. This means we can remove harmonics.
Cutoff changes the frequency of the cutoff. All the way to the left would be almost no sound would get through, all the way to the right and the filter is not removing anything.
This filter follows the keyboard meaning that the cutoff frequency moves automatically with whatever key is pressed so each note is filtered the same amount. Otherwise a high note would not be heard at all.

Q aka resonance is the amount of feedback. It produces a pretty distinctive ‘70s synth sound.
All the way to the right means you will have another sine wave created at the cutoff frequency.

MOD adjusts the amount that the LFO aka modulator is moving the the cutoff control
ENV adjusts the amount that the filter envelope is affecting the cutoff.

Envelopes

Unlike an oscillator that creates a constant signal, an envelope only produces an output based on an incoming gate signal. This envelope signal is used to modulate other variables and does not produce sound on its own.
The most simple envelope is the on/off of the key or button making sound. When it’s down the envelope tells the amplifier to turn up. When the key is up, the amp turns off.



After the filter the sound passed through an amplifier that is controlled by the volume envelope.
The filter envelope just goes to the filter.
The two separate envelopes both start when you press a key and release when you let go.
Attack - time it takes to get to full volume (aka amplitude) after the envelope is triggered(in this case when the key is pressed)
Decay - amount of time it takes to drop to the sustain amplitude after the attack is finished
Sustain - amplitude to stay at after the decay is done and while the note is still being pressed.
Release - amount of time it takes for the amplitude to drop to 0 after the note/trigger is released.

Master section
These are all “outside” of the synth. They are effects that the final output is run through and don’t interact with any of the synths modules.
Drive - One Moog signature is their drive which is a type of distortion. It adds more harmonics to the sound without increasing the overall volume too much.
Reverb - This adds space to the sound, making it less dry and sterile.
Volume - The final volume level
MIDI in - MIDI is a way synths of all kinds can interact. Here you can select a midi device to use as a keyboard.
KBD OCT - changes the octave of the onscreen keyboard and the computer’s keys

Control voltage
When it gets down to it any synthesizer, analog or digital, modular or keyboard based, is sending data between its different parts. Control voltage is this data.
In an analog synth it’s literally voltage. It can be any voltage between the boundaries that it can read. In a eurorack modular this is around -5 to +10 volts. This is why we call them VCA, VCO, VCF. Voltage controlled Filter, amplifier, and oscillator.
The method for playing exact frequencies with analog synths is Volt/octave.

On a patchable modular synth all of these ins and outs are exposed. On a keyboard type synth there might be a couple ins and outs but for the most part it’s all hard wired with some switches or knobs or computer interface to control what is patched to what.

Teenage Engineering K.O. II EP-133 Cheat Sheet

Teenage Engineering K.O.II EP-133 Architecture breakdown

16-step drum patterns used in DRUM MACHINES 1