A RECAP

WHAT IS SUBTRACTIVE SYNTHESIS?
Subtractive synthesis is a synthesis method where oscillators generate waveforms and then filter out frequencies over time to make the sound interesting and evolving.

OSCILLATORS
An oscillator is the waveform generator in almost all analog keyboard designs.
The simple waveforms:
Sine
Triangle
Saw
Square
Noise

A synthesizer can have many oscillators per voice but 2 or 3 is typical on an analog synth.
In synths, the oscillator abbreviation is VCO for Voltage Controlled Oscillator.

CROSS MODULATION
Cross modulation is a design where one oscillator can modulate another one. This is effective for generating overtones and sounds outside the fundamental frequency.

ENVELOPE
An envelope is a time-based controller used a lot in synthesizers.
ADSR is a typical envelope containing 4 points. Attack, Decay, Sustain and Release.
Some synthesizers have a Hold stage too.
Envelopes are typically used in the filter and amplifier to modify sound over time based on how you play the keyboard.

FILTER
The filter is an important part of any Subtractive Synthesis.
The filter is typically controlled by an ADSR envelope with an amount that controls its impact on the sound.
In synth, the abbreviation is: VCF for Voltage Controlled Filter

FILTER MODULATION
The filter can be controlled and modulated by an envelope amount for time-based changes.

AMPLIFIER
Amplifier or, the amp is the gain stage used in a lot of electrical instruments. Amp controls the volume and amp velocity. VCA stands for Voltage Controlled Amplifier.

LFO
Low-Frequency Oscillator or LFO is essentially the same as the sound generating oscillator but it has a much lower frequency and is applied to sounds generated by the VCO. Think of Dubstep Wobble Bass. It is typically used as a controller for modulating parameters to make a sound change over time. LFO is often used to pitch- or filter modulate the sound. Tremolo, Vibrato, and Auto pan is essentially done with an LFO.

WAVETABLE
A Wavetable is like a digital oscillator that generates complex waveforms instead of simple waveform Oscillators.
It is actually a list of samples (called a table) that can be morphed over time.

MODULATION
Modulation is a way to make the sound interesting over time.
Modulation uses a source to modulate a parameter.

Some modulation sources:

- Velocity
- Aftertouch
- LFO
- Envelope
- Mod Wheel
- Modulation Macros
- Functions
- MIDI continuous controls (CC)

A modulation source can modulate another source for complex modulation.

ARPEGGIATOR

The arpeggiator is a sequencer feature that trigger held notes one at a time in time with the tempo. It is a way to play chords on monophonic synthesizers and can create interesting patterns. Combined with modulation one can create interesting musical patterns.

HOW TO PROGRAM SYNTHESIZERS

Programming synthesizers is a lot easier when you know the basic modules of a generic synth. The term programming refers to setting parameters and no code actual language is needed.
There might be differences in your synths but still, they have the same overall components.

It is usually not that hard to learn but easier to program a new synth if you already know and program your own presets on a few synths.

Where to start?

The basic preset steps in how to program:

- Set the Oscillators
- Set the Envelopes
- Set the Filters
- Set the LFOs
- Modulate Oscillators and Filters with the Envelopes and/or LFOs

It takes a lot of practice to program a specific sound from the top of your head or from listening to other artists' music. A good understanding of the audio signal path and the components in runs through is always a help.