



DMASS | The Project

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Negative Feedback
Product Development Department
Prototype 1 Engineering Document

The Project

Our initial prototype was developed as the final project for EN-I (Introductory Engineering). The goal of the project was to create an analogue synthesizer that built on the concepts learned from the simple synth built early in the class. We wanted to create a synthesizer that had the capabilities of digital devices and the sonic qualities of analogue ones. We developed the synth with a micro-controller that deals with keypresses and generates control signals to create sounds and adjust other parameters. The project leveraged all the tools we gained from EN-I, the coding experience learned in the second half of the course, the circuit building skills learned in the first half, and the audio concepts throughout. The project was a fantastic learning experience. It built our confidence and skill in designing electronics and combining them with mechanical systems.

The Course

Two of the greatest assets to our EN-I class, Music and the Art of Engineering, were its hands-on nature and its flexibility. The course allowed us to actually implement our designs rather than just learn concepts on paper. The result of this novel approach is that we were able to produce a complex, innovative, and thought-provoking final project. The class wasn't one-size-fits-all. Final projects ranged from reverb simulation to colorful musically generated software art. This allowed each student to express their own interest through the lens of music and engineering. We are both really passionate about analogue electronics, music, and design, which lead us to create a polished electronics project. Professor Hopwood was an excellent guide. He helped us overcome our numerous challenges and encouraged us along the way.

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The Design

DMASS—our synthesizer— is composed of three subsystems. The first of these is a microcontroller that receives input from the keyboard, processes that input, and sends commands to the voltage controlled oscillator (VCO). Next, the VCO begins to oscillate at the desired frequency. The VCO is actually composed of two identical circuits that can be detuned or played separately for musical effect. If enabled, the VCO can feedback an attenuated signal to the microcontroller to correct for any error in the output frequency. DMASS is designed to be modular; though we didn't develop other modules besides the core sound generation circuitry. Modules can be slotted into the device via edge connectors or bypassed to further enhance or process the audio. Finally, an output stage amplifies the sound to unbalanced line level.

Thank You

Let us know if there's anything else you need!

