

ECE-411 Product Design Specification

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Executive Summary / Concept of Operations

The waveform generator will generate signals such as a pulse waveform, triangle waveform, and sine waveform. Frequency and amplitude modulation of the waveforms will also be controlled by the user. A signal generator is a useful device for testing circuits that require an AC waveform and are commonly used by professionals, students, and hobbyists. The basic function generator has an output port which allows for the attachment of a BNC to alligator cable, with one alligator clip outputting the desired AC waveform to a circuit and the other clip being ground.

Brief Market Analysis

Intended Customer: Students and hobbyists.

Competition: Weewooday Signal Generator Kit DIY (8.99\$) and Onyehn XR2206 High Precision Function Signal Generator DIY Kit (9.99\$).

Our product is different because our product will be already made. Most of our competitors will have a cheaper product because the signal generator isn't manufactured and you will need to solder it together. A lot of our customers don't have access to these resources and don't have the experience to build a waveform generator. We will provide a very user friendly interface that allows the user to use a signal generator straight out of the box.

Price of the product: 24.99\$, because the most expensive component is the microcontroller, which will be the Arduino nano. This microcontroller costs around \$6. The rest of the circuit contains basic components such as resistors, capacitors and op-amps, which should be pretty cheap.

Requirements

Must

- The product must be portable.
- The project must be able to output a waveform exactly how the user specifies.
- The product must have an On/Off Switch.
- The product must be able to display at least 3 waveforms.

Should

- The product should not be too expensive.

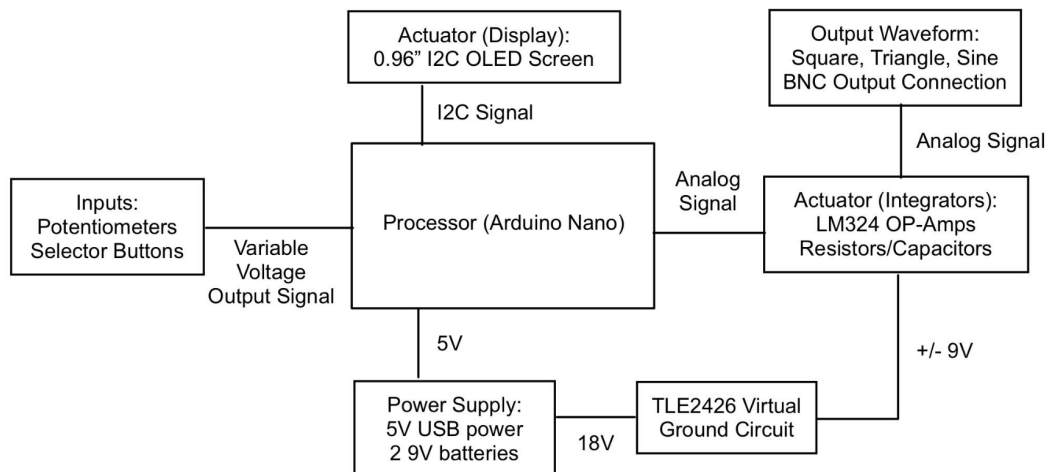
- The product should have an accessible port for power.
- The product should be user friendly.
- The product should be power efficient.
- The product should have power protection systems.

May

- The project may have wave characteristics displayed.
- The product may be enclosed in a housing.

System Architecture

(Team 9) Level 1 Block Diagram



Design Specification

- **Sensor:** Tactile switches for selecting waveform type and potentiometers for selecting frequency and amplitude of waveforms.
- **Processor:** Arduino Nano, using Arduino IDE.
- **Actuator:** Op-amp integrators (LM324) and 0.96" I2C OLED screen.
- **Power:** Two 9V alkaline batteries for op-amp rails and 5V USB power for Arduino Nano.
- **Mechanical Design:** Circuitry laid out on a PCB and wooden or 3D printed housing for circuitry.
- **Development Environment:** GitHub, code and issues section.