# Introduction

The project is to create an accurate, low distortion signal generator for sine, square and triangle waveforms, alongside a frequency meter for the same. This will be implemented using an ARM processor carrier board from ST Microelectronics (STM32F407VGT6) fitted with various peripherals.

The project will be split into two parts, software and hardware. From the combination of these two parts, the maximum possible frequency range for the waveforms needs to be achieved, and again for the frequency meter using the lowest power achievable. The input signal to the frequency meter on the board is provided by the hardware and displays the frequency on the LCD display. Further work on the product may include using the LCD screen, I2C connector, USB connector, and Direct Digital Synthesis (DDS) using a AD9850 chip to generate accurate pulse and arbitrary functions.

Environment consideration…

Input protection, output impedance, power supplies

Power consumption – minimisation of power

Component list, housing, form factor

# Specification

## Level 2 Requirements

* Generate a sine wave from 0.01Hz to ?HZ with a maximum amplitude of +/- 12V.
* Generate a square wave from 0.01Hz to ?Hz with a maximum amplitude of +/- 12V.
* Generate a triangle wave from 0.01Hz to ?Hz with a maximum amplitude of +/- 12V.
* Measure the frequency of sine, square and triangle waves from 0.01Hz to ?Hz with a minimum signal of 0.1V rms.
* Control the amplitude of sine, square and triangle waves by sending control signals to a digital potentiometer, which will control the gain of the amplifier circuit.
* Create a pulse generator from ?Hz to ?Hz with a maximum amplitude of +12V.
* Measure the duty cycle for digital waveforms.
* Vary the duty cycle for digital waveforms.
* Amplitude modulate an input signal by using a sine wave to send control signals to a digital potentiometer, which will control the gain of the amplifier circuit.
* Frequency modulate an input signal by feeding it into the ADC and using the resulting values to vary the frequency of the output signal, based on a sine wave with a fixed frequency.

## Further Requirements

* Generate square waves using DDS on the AD9850 chip.
* Generate sine waves using DDS on the AD9850 chip.
* Create a random noise generator using the internal PR sequence generator.

# Software Design/Implementation

## Tasks so Far

After following a few brief example programs provided as part of lab script 1 [REF ME], we started the wave generation section.

To start with we generated a square wave with a 50:50 duty cycle, by outputting a high for 5 milliseconds followed by a low for 5 milliseconds on GPIO pin PA0. This gave a nice clean square wave which we viewed on the oscilloscope, and measured the frequency and period. The theoretical period was 10 milliseconds giving a 100Hz frequency, however when measured on the oscilloscope the period was 32 milliseconds and the frequency at 31.25Hz. Consequently this method of setting the frequency is very poor in terms of accuracy, and therefore unsuitable given our specification.

## Tasks Still to Complete

# Hardware Design/Implementation

## Tasks so Far

## Tasks Still to Complete

# Gannt Chart