<center>**EEE 102 Introduction to Digital Circuit Design**</center>

<center>**Course Project Proposal**</center>

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Section: 2

<center>**Vending Machine**</center>

Objective:

The aim of this project is to design amd implement a working vending machine by using BASYS3 FPGA board and VHDL.

Methodology:

In this project, a simple vending machine will be made. It will look like a ramp with 3 different slots for products to roll. At the base of each slot, there will be a servo motor to control the product distribution. Each of these servos will be controlled by their corresponding ultrasonic sensors in front of them. The buyer will hold their hands in front of an ultrasonic sensor. If the sensor detects a hand, it will turn on the corresponding servo and give exactly one product. The vending machine will look like Figure.1 and have the external components in front of it.
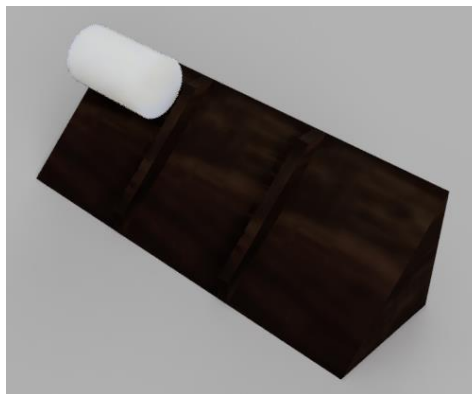

Figure.1 The rendering of the vending machine made by using Fusion360

A BASYS3 FPGA board will be utilised to control the distribution process. It will take data from the ultrasonic sensors and give the appropriate output to the servo motors. 3 of the switches on the BASYS3 board will be used to choose which slots will be available to service. The number of in-service slots will be displayed on the seven segment display. Also, the

working slots will be indicated by their corresponding LEDs on the BASYS3 board. Since the servo motors and the ultrasonic sensors require 5V DC, the voltage source on the lab will be utilised, too.

Here is the equipment list for the project:

- 3 ultrasonic sensors
- 3 servo motors
- A BASYS3 FPGA board
- Mini breadboards (easier to work together than placing everything on a bigger one)
- Jumper cables
- Plywood to construct the ramp
- Some objects to work as products

Progress Plan:

1. **First Demo:** In the first demo, I aim to finish building the ramp and mount all of the external components (servo motors and ultrasonic sensors) onto their places. The VHDL code of taking the data from the ultrasonic sensors will be written.

2. **Final Demo:** Everything written in "Methodology" will be implemented.