

Course Name: Digital Electronic Circuits

Course ID: 10636332

Topic: Final assignment

Date: 15th/12/2022

General rules:

- You can work in teams of two:
 - You can choose to work individually without a group of two.
 - If you are working in a group, then use any student ID from the group.
 - Each team member to submit his/her circuit/report/video/... to Moodle, the submission should be identical for both team members.
- No report is needed for this assignment: discussion is expected.
- The duration of this assignment is 10 days (25th/Dec/2021)
- 2.5% penalty for each delay day: maximum of 7 days late.

Option 1: Hardware based

- You are required to build an alarm system which detects high levels of specific input from one of the following sensors:
 - 0) Temperature
 - 1) Gas or fire
 - 2) Light
 - 3) Infrared sender/receiver
 - 4) Ultrasound
 - 5) Pressure/Touch
 - 6) Humidity
 - 7) Water Level Sensor
 - 8) Flex Sensor or Touch Sensor
 - 9) Sound Sensor or Movement (PIR) Sensor
- The last digit of your student ID will specify which sensor you work with.
- Convert the analog output of the sensor to a digital signal (if it is not automatically converted by an available module/output): H=alarm, L=no problem
- Connect the digital output to a 555 timer to generate a signal of 600Hz frequency which is then connected to a buzzer/speaker.
- You would need a 5V power supply for this project
 - You can use a 5V regulator connected to a battery (1x9 volt battery or 2x4.5 rechargeable batteries): <https://www.electronicshub.org/understanding-7805-ic-voltage-regulator/>
 - Use any other 5V source you might have.
- Submission:
 - 1-minute video demonstration of your working circuit, and explanation of how the circuit works (maximum 1 minute)
 - Or a small report explaining your work instead of the video.
 - Block/circuit diagram of your circuit using your favourite drawing tool: pen and paper, power point, CAD tool (tinkercad, KiCad, Proteus, multisim, ...etc)
 - Bonus if you show a working simulation...

Option 2: LTSPICE simulator based

- You are required to demonstrate a 10 bit voltage switched DAC discussed in lectures using LTSPICE.
- Assume digital voltage levels are 0V for LOW and 5V for HIGH.
- In the voltage switched R-2R DAC, use R to be the last three digits of your student ID + 1000. For example, if your student ID is 1189876543, then R value used will be $543+1000=1543$ ohm.
- Demonstrate your DAC circuit using a counter input from 0 – 1023 with increments every 1 microsecond.
- The final analog output voltage range should be between 0 and +5 Volts, hence you would need an inverting amplifier in the final stage of your circuit.
- You are free to choose any operational amplifier available in LTSPICE
- Submission:
 - 1-minute video demonstration of your working circuit, and explanation of how the circuit works (maximum 1 minute)
 - Or a small report explaining your work instead of the video.
 - You must submit the LTSPICE circuit files