COMPUTER ENGINEERING DEPARTMENT

Graduation Project Proposal Form

CMPE 405 /CMSE 405 /BLGM 405

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| Instructor Name: | H. Kömürcügil |
| Project Title: | Design of a Digital Signal Generator |
| Number of team members: | 2 |
| Semester & Year: | 2023-2024 Fall |
| Type of Project (HW/SW): | HW and SW |

# Project proposal should be in accordance with ABET requirements, which are stated as: “The curriculum must include a culminating major engineering design experience that 1) incorporates appropriate engineering standards and multiple constraints, and 2) is based on the knowledge and skills acquired in earlier course work.”

# 1. Project Overview

Describe the project here. What will students do? What will students learn?

A digital signal generator is a device which generates various signals (waveforms) with adjustable amplitude and frequecy. The signal to be generated can be selected by the user. The amplitude and frequency of the signal can be set to the desired values by the user. Digital signals are widely used in many areas in which high precision and accuracy are required. In this project, students will write the necessary code to generate the desired digital signals by means of a low-cost microprocessor. As such, they will learn how to use and develop various programs for a low-cost microprocessor which produces digital signals.

**2. Detailed specification of the project**

Give a clear and reasonably complete specification of the project with inputs, outputs, target users, and required functionality.

# 4. Standards that should be used in the project

None

# 5. Constraints

# Any constraints that must be observed on the final product or during the development stages.

The amplitude, frequency and spectrum of the generated signals should comply with the desired values.

# 6. Tasks to be completed by students

# Stages and tasks that must be completed by the students in the development of the project.

1. Review the basics of signals and systems.
2. Choose a cheap 8-bit/16-bit microprocessor preferably with digital/analog converter and learn how to program the microprocessor.
3. Write a code for each fundamental waveform (square waveform, triangular waveform, sinusoidal waveform, and so on). The code can be written by any programming language supported by the selected microprocessor.
4. Test the generated waveforms by using a digital oscilloscope available in the electronics laboratory.
5. Test the spectrum of each waveform by using the fast Fourier transform (FFT) feature of the oscilloscope.

# 7. Tools Required/Expected to be used in the development of the project

Low-cost microprocessor, DC source, Oscilloscope, and Matlab

# 8. Resources Required (HW/SW/Data, etc.)

Low-cost microprocessor together with its programmer, DC source, Oscilloscope, and Matlab

# Complete list of Project Deliverables Expected at the End of Project Completion

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| --- | --- |
| Deliverable | Description |
| Digital Signal Generator | The complete HW of the digital signal generator with the developed software |
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(add more rows as needed)

# 10. Other related information

Hints and ideas that will help students in the development of the project. These may include pointers to similar projects, resources such as books, web sites etc.

1. Thomas L. Floyd and David M. Buchla, Electronics Fundamentals: Circuits, Devices, and Applications*, 8*th Edition*,* Prentice Hall, 2010.
2. John B. Peatman, Embedded Design with the PIC18F452 Microcontroller, Prentice Hall, 2003.