Ve373 Microprocessor Based System Design
Final Project

INTRODUCTION

This is a self-proposed course project. In this project, you will specify, design, and implement a microprocessor based system which may range from a traditional embedded application to an implementation of conceptual technologies.

SAFETY (partially copied from EECS 373 of UM)

Several safety issues must be considered when thinking about your project.
- **Spinning Devices**: High speed spinning mechanics must be contained so that in the event that they fail they do not throw debris. This can cause eye injury and we must be very careful. You will also be required to wear safety glasses when operating this equipment.
- **Consumable Foods**: Food oriented projects that involve beverages or food have to avoid contact with toxic substances like lead based solder or toxic adhesives.
- **Projectiles**: Projects involving projectiles must use soft materials and restrict velocities. Some form of containment might be required.
- **Heat**: Projects involving heat may require some form of insulation or isolation. High heat levels that can cause combustion will not be allowed.
- **High Voltage**: Projects requiring voltages like the line current from AC outlets must use special isolation devices available in lab.
- **Lasers**: Project using lasers must provide containment or shielding to prevent light from reflecting and potentially entering anyone's eyes.
- **Mechanical Tools**: This is not a mechanical engineering course, thus mechanical parts of a project don't have to be perfect. If hand tools must be used, the tool instructions must be followed exactly. Students are not allowed to have access to the machine shop without sufficient training and supervision.

Note: You may not proceed with project components that involve safety issues until they are approved by the instructor.

PROJECT REQUIREMENTS

Basic Requirement

You must use the PIC32 Starter Kit as the processing core of your project unless otherwise approved in writing by the instructor. Your project should demonstrate your basic laboratory skills with following MCU peripherals:
1. Timer
2. Interrupts (at least two sources)

Your project should use at least 3 of the following primary MCU peripherals:
1. PWM
2. ADC
3. Serial communication module
4. DMA
Please demonstrate why you need this module and how you configure this module.

Difficulty Component Requirement

Implement an application specific embedded system challenges your experimental skills and knowledge of the course concepts, especially when you have to tackle some unknowns that are not discussed in the course. Your effort will be rewarded according to the difficulty of your project based on the graders' discretion. The difficulty component requirement is scored from 0% to 30% of the final project grade. The grading criteria are as follows:

- Easy: 0% - 3%
  Simple variation or extension of the lab exercise does NOT earn difficulty value.
- Moderately Difficult: 4% - 13%
  Projects are extension of labs with more than 100 full points, and require additional effort on completing the front end or back end of the embedded system.
- Difficult: 14% - 23%
  Projects are real-life applications, and may involve serious effort on creating driving circuitry for sensors and actuators.
- Very Difficult: 24% - 30%
  Projects involving custom printed circuit boards, complex control of sensors, actuators, and mechanical components; multiprocessor applications; graphics displays on screen of PC; networking and web applications by using Ethernet module, and etc.

Above are just some general examples in grading of this part of the project. The grader has the final judgment on the satisfaction level of difficulty requirement.

Project Proposal Requirement

You must provide a written project proposal and present the proposal to the rest of the class. The proposal should contain:
1. High-level description of your application as well as the project objectives
2. Functional block diagram
3. Component level diagram
4. Preliminary component list
5. Preliminary project timeline

Changing project is allowed with 10% deduction of the project grade as a penalty.

Project Completion and Demonstration Requirement

Your system may be composed of several sub-modules. Working sub-modules only earn partial credits on this requirement. A working integrated system as described in your project proposal is required to earn full credits on this part of the project. The project should be demonstrated to the instructor or the TAs by the specified deadline. Successful demonstration is the best evidence of a completed project.

Project Report and Video Requirement

A written report is required for this project. The project may be an elaborated version of the Project Proposal with refined timeline and detailed design. The report must have a **one-page** introduction of your overall design including the top-level block diagram and a picture of your designed system. The report must include the test plan that you followed to test your system, as well as the test results.

The source code should also be included in the appendix of the report. The peer evaluation form should be submitted individually.

Peer evaluation form:

Name	Percentage of contribution (sum to 100%)	Responsibilities
(yourself)		
(your lab partner)		
(your lab partner)		

A video clip demonstrating your working project must be submitted together with the project report. The video clip should NOT be longer than 3 minutes.

PROJECT IDEAS

Innovative ideas solving the problems in your daily lives are highly encouraged and will be rewarded. Video clips of some projects from last semester may be found on Canvas. The following link has a lot of project ideas from other students that you can use as a reference: https://people.ece.cornell.edu/land/courses/ece4760/FinalProjects/

GRADING POLICY

IMPORTANT DATES

Item	Deadline
Project Proposal	June 27, 2023
Project Middle Presentation	July 13, 2023
Project Demonstration	July 27, 2023
Final Report	Before 11:59pm, August 6, 2023

BUDGET

Each team will be reimbursed for expenses on this term project for up to 500 RMB, providing the official receipts are submitted.