Micro-mouse Project Description

EE3088F 2024

General Instructions

This document contains the project description for both the power and sensing subsystems. Please read this document carefully and make sure that you understand all the project requirements. There are four assessments linked to the project:

1. The *Gerber Files* submission (Friday, 8 March 2024 at 23:55 on Amathuba)
2. The *Interim Design Report* (Sunday, 14 April 2024 at 23:55 on Gradescope)
3. The *Lab demonstration* (Wednesday, 8 May 2024 during lab session in White Lab)
4. The *Final Report* (Friday, 17 May 2024 at 23:55 on Gradescope)

A special note is that the assessment is **individual.** You are each expected to submit the Gerber files, reports and attend the lab demonstration for your respective subsystems.

Group work

The project is setup to be a paired group project with completely individual assessments and marking structures. For the duration of the semester, you will be working in pairs of your choice (please remember to sign up). In your pairs, you must decide who will be responsible for each subsystem. Please note that you will be responsible for the subsystem throughout the entire semester for all assignments.

Working in groups is a necessary skill you need to develop, and we encourage you to collaborate with other students. However, it is often the case that some team members do not fully participate in the course and often rely on others to do the work for them. To try and deter this behaviour, we have changed the assessment strategy this year. Although you are working in pairs, each **individual student is required to submit each assignment and will receive an individual mark.** To clarify, if you are responsible for the sensing subsystem, you will complete and submit all the sensor subsystem assignments.

We encourage you to communicate and collaborate with your teammate throughout the course, it will likely take you farther than if you go alone.

General notes

1. One of the core skills of an engineer is the ability to ask more questions and communicate with the client to ensure that you deliver the correct product. If you do not understand something, do some research and if you still do not understand then ask – suffering in silence is a mistake.
2. All changes to this document will be communicated via an announcement. Please keep track of these communications and download the latest version so that you do not miss out on key changes.
3. During the lab sessions tutors will be available to help you. However, you will need to do some work outside of these hours if you wish to make good use of the time with tutors.
4. Again, this is all an **individual** assessment. Each person will need to **submit each assignment** for their subsystem.
5. ***All reports must be written in LaTeX.***

Project Overview

The project for 2024 is building some subassemblies for your very own (simplified) micro-mouse.

What is a micro-mouse?

In short, it is a maze-solving robot. Watching the Veritasium video will give you a clearer understanding of what a micro-mouse is. It is important to note that your micro-mouse will likely (almost certainly) be much slower than the ones featured in the video. Nonetheless, let the video serve as inspiration for your project.

What is your project?

In this course you will be focusing on the design of the micro-mouse's hardware (with some minor software components).

The complexity of this project is in meeting the requirements while still adhering to the STRICT budget. The project has been compartmentalized into four modules: the processor, motherboard, sensor, and power. The processor and motherboard modules have been designed and will be given to you. **Your project involves designing and manufacturing the sensor and power modules.**

More information about each module is provided in the table below.

Module	**Description**
The motherboard	The motherboard is responsible for connecting all the PCBs together. It is the base board that all other modules will slot onto. ▪ It has two 2x19 pin connectors for the processor board. ▪ It has two 2 pin motor connection points for the motors. ▪ It has a **2x14** pin connector for the sensor board. ▪ It has a **2x8** pin connector for the power board.
The processor	The processor board is an **STM32L476**, a significant upgrade in performance compared to the 2nd year STM32F051. It is a 100-pin package and has 78 output pins that are available to use. Most of these have already been dictated by the required interconnections between supplementary modules.
The power	This module will be responsible for powering the entire system. **You will need to design and manufacture this module** to fit the requirements detailed in this document. The basic idea is

	▪ It needs to run the motors and charge a 1S1P 18650 battery. ▪ It will need to fit onto the pin headers on the motherboard. ▪ It will need to be an appropriate size for the robot.
The sensor	This module will be responsible for detecting/sensing objects. **You will need to design and manufacture this module** to fit the requirements detailed in this document. The basic idea is ▪ It needs to detect objects. ▪ It will need to fit onto the pin headers on the motherboard. ▪ It will need to be an appropriate size for the robot.

To be successful, you will need to understand how your component fits into the greater picture and what you would need to do on your module to meet the requirements.