Term Project
WORKING WITH THE RASPBERRY PI

The term project component of the course requires you to leverage the Raspberry Pi. The project involves multiple deliverables to ensure that you are making sustained progress on your term project throughout the semester.

Unlike other assignments in the course, this is a team effort. You are required to work in groups of 2-3 for this assignment. Solo projects and teams comprising 4 members are disallowed.

DUE DATE: The term project has three deliverables. TP-D1 does not have any points associated with it.

TP-D1 due 2/5/2025   [1 point]
TP-D2 due 3/26/2025   [2 points]
TP-D3 due 5/7/2025   [7 points]

Generative AI Use and Consequences
Use of AI tools such as ChatGPT, Claude, Github Co-Pilot, and/or their ilk to write or "improve" your code or written work at *any* stage is prohibited; this includes the ideation phase. It is your responsibility to ensure that you don't have the GitHub Co-Pilot extension installed in your IDE; assignment solutions generated by Co-Pilot aren't written by you. Turning in code or an essay written by generative AI tools will be treated as turning in work created by someone else, namely an act of plagiarism and/or cheating.

Ultimately, you will get out of the class what you put in. Simply copying and pasting code from generative AI tools is neither ethical nor does it contribute to your learning experience. There are multiple reasons why these generative AI tools are detrimental to your learning experience:

1. They rob you of the ability to think and learn the concepts for yourself. Solving problems is an essential step to gaining a solid understanding of the material.
2. You will struggle with the in-classroom quizzes and exams where you will not have access to these tools.
3. While we acknowledge that these tools are likely to become an important part of a software engineer's workflow in the future, you are much more likely to use these tools in an effective manner if you already have expertise in the relevant technical topics. Developing such expertise requires putting in the effort to learn these topics without the assistance of these tools.
4. These tools are prone to generating imperfect or even incorrect solutions, so trusting them blindly can lead to bad consequences.

1   Raspberry Pi and Models

The Raspberry Pi is a resource constrained, credit card-sized single-board computer designed and developed in the United Kingdom. All Raspberry Pis include a GPU, either a single-core ARM-compatible CPU or quad-core ARM-compatible CPU, and 1 GB or 512 MB or 256 MB RAM depending on the model. Some of the Raspberry Pi models that are currently available are listed in the table below.

We suggest using the Raspberry Pi 3 model B+ or the Raspberry Pi 4 Model B. You are free to use similarly capable Raspberry Pis.

1.1   Raspberry Pi Peripherals

The Raspberry Pi has peripherals like USB ports, GPIO pins, Full HDMI port, Ethernet port, 3.5 mm audio jack and composite video, Camera Interface (CSI), Display Interface (DSI), Micro SD card slot etc. The Raspberry Pi can be operated with any generic USB keyboard and mouse,and can be connected to monitor or display via Full HDMI.

Basic peripherals that you are required to have for this term project are the Micro SD Card and a power connector. If you are using an older Pi without built-in WiFi, you will also need to buy a USB Wi-Fi adapter. It is also possible to buy these all these peripherals as a package along with the Raspberry Pi.

1.2   Sellers of Raspberry Pis

Note: Several vendors (including Amazon) sell Raspberry Pis. Plan to order early; it often takes around one week for delivery.

2   Deliverables

2.1   TP-D1: Team composition and Placing an Order for the Pi

This deliverable involves you confirming two elements. First, you must identify the composition of your team. The team can involve 2-3 team members. Each team member also must include their e-mails along with their primary e-mail for academic communications; not responding to your team's e-mail communications in a timely fashion is unacceptable. Second, one of the team members must confirm that you have placed an order for the Raspberry Pi.

TP-D1 must be submitted as a PDF document using Canvas.

TP-D1 accounts for 1-point towards your cumulative grade.

2.2   TP-D2: Installing and Configuring an OS plus WiFi

This deliverable targets the installation of an OS on your Raspberry Pi. Please see https://www.raspberrypi.com/software/operating-systems/ for instructions to install the OS for the particular version of your Raspberry Pi. Please choose an appropriate version of Raspbian if you are using an older version of Raspberry Pi.

Next, set up your Raspberry Pi so that it is able to communicate with other computers using WiFi. Please include screenshots showing that you have installed the OS and enabled WiFi on your device.

TP-D2 must be submitted as a PDF document using Canvas.

TP-D2 accounts for 2-points towards your cumulative grade.

3   TP-D3: Project and Report [7 points]

As part of TP-D3 you will be doing a project of your choice and an accompanying report.

3.1   Project [5 points]

You are free to formulate any project with your Raspberry Pi. Two constraints are imposed on this project:

1. The Raspberry Pi must be the key enabler of the project.
2. There should be at least 3 components involved in the project. Your term project must involve ONE of the following:
    a. A single Raspberry Pi and 2 desktops   OR
    b. 2 Raspberry Pis and one regular desktop   OR
    c. 3 Raspberry Pis   OR
    d. A Raspberry Pi, a desktop, and a sensor   OR
    e. A Raspberry Pi and 2 sensors

What counts as a sensor? Cameras, audio sensors, microphones, infrared, motion detectors, etc.

You will not be graded for grammar.   Use of Generative AI tools such as ChatGPT, Grammarly, and their ilk at any phase of the report including ideation is **expressly prohibited**. Turning in code or an essay written by generative AI tools will be treated as turning in work created by someone else, namely an act of plagiarism and/or cheating.

3.2   Report [2 points]

You are required to submit a report describing your project. This report should be between 2500-3000 words excluding references. The report must include several elements, each of which will be a separate section. These include:
- Introduction
- Problem characterization
    - This is a technical description of the problem. Your audience is your peers so express it in a way that they can appreciate.
- Proposed solution and implementation strategy
    - Methodology
    - Include a description of the libraries that you have used and what you did on your own.
- Conclusions
- Bibliography

Use of Citations

Citations have a specific purpose, they: (1) relate to work that has been published elsewhere, (2) substantiate your claims, and (3) could be used by readers to dig a little deeper. Remember to number your references and list them in your bibliography in the order they are referenced throughout the paper. If an article is in your bibliography, it must cited in the main text. Citing at the right location indicates what your source is for a particular piece of information, and also demonstrates that you have read the article. Make sure that you cite all your references including Wikipedia and Online lecture notes that you may have perused. References that are not cited should not be in your bibliography.

Other Notes Regarding the Report

In your discussions, be aware of when you digress and the importance of tying it to the overall narrative. If you go off on too many tangents, the paper will tend to be dull, unorganized, and ambiguous.

If you are looking at your topic from the software prism, it might be worthwhile to see if the software choices were constrained or motivated by the underlying hardware. An article is much more compelling if it lays out the trade-off space. Identify the confines within which things happen. If a system has achieved a certain feature what are the other things (both hardware and software) that make this feature possible. Try to address both the advantages and disadvantages of support for specific features.

3.3   Things to submit:

The report must be submitted as a PDF document using Canvas. There is ONE submission per team. Every document must list ALL team members (including their full names and email addresses).

4   Grading

This assignment will account for a maximum of 10 points towards your cumulative course grade.

5   Late Policy

All assignments are due at 8:00 PM on the due date. There is a late penalty of 10% per-day for up to a maximum of 2 days.