ECSE 4235 Fall 2025

Final Project

Phone APP RP4 Motor Control (PARMCO)

Assignments

Only one person from each team needs to submit an assignment (with the exception of the final reflection writeup at the very end). Whatever is the most recent will be graded.

The major project for the class is 30% of the overall class grade. The project grading is made up of 3 check points and the final report/results.

- Check point 1. (5%) See due date on ELC

- Check point 2. (15%) See due date on ELC.

- Check point 3. (20%) See due date on ELC.

- Final Report and function check. (60%) See due date on ELC.

Final Project Overview and Objectives

The final project in ECSE 4235 is your opportunity to work on a small embedded system that crosses multiple hardware domains, the PARMCO.

You will use AI, and only AI, to develop the code for the project and to develop the Github Design site for the project. You may use AI, your own effort, or a combination of both for the documentation.

The only completely human generated content will be your writeup reflecting on the results, the experience, critiquing (pro/con) using AI, and thoughts on the project.

The objectives for your project are to:

1) Provide meaningful experience to the development process using AI in software, systems, documentation, and hardware.
2) Provide experience designing and implementing an embedded system spanning multiple platforms, software environments, and areas.
3) Provide an impactful, real design project to demonstrate your skills to yourself and others
4) Allow you to have fun and expand what you can do.

The Project

Description: You and your partner, using AI, will develop the PARMCO system. The app will communicate over Bluetooth to your RP4. The RP4 will control a DC motor which will provide RPM information back to the user. The PARMCO system must be standalone. It must not depend on access to AI to run. It must not depend on the internet to run.

Control from the phone: Create a user-friendly interface that will allow control of the motor. At a minimum, you must include: 1) Rotation (clockwise or counterclockwise), 2) Speed faster/slower, 3) Stop/Start, 4) Desired RPM with input value of the desired RPM, 5) A selector for manual or automatic mode. Manual: you control the speed using Speed (2, above). Automatic: the app attempts to control the speed using the desired vs actual RPM. Warning, this is feedback so be careful. You and the AI may want to put some feedback control 😊 6) Actual RPM from the motor communicated to the user. Be creative with your app interface. You may include additional items as you desire above the minimum.

Connection to the RP4. The phone must request a Bluetooth connection and link to the RP4. The app must include this step and control the interaction between the app and the RP4. The Bluetooth connection should be remembered both on the phone and the RP4. The connection should be able to establish as new when needed (If I "forget" the connection from the phone, the phone and RP4 must be able to reestablish and remember a connection.)

RP4 control: The RP4 must link with the phone app. The RP4 must not depend on any interaction outside of the phone app except for power-on which means the RP4 must boot and run the code. The RP4 will control the motor based on phone app inputs. The RP4 will provide RPM information back to the phone app. The RP4 will start in a known "quiet" state (motor is off) and waiting for communication.

The motor: Setup the circuit to work with the RP4 based on instructions generated and documented by AI. This must also include a "how it works" analysis section. The motor must be controlled with a Mosfet driver. You may use the components provided to you. You may request additional, but these must be approved. Do not use the documentation from 4230. This must be created from AI.

Github Site: Using AI, you and your partner will each create a Github or other website displaying, describing, documenting your project. **Think about this as something you could link to on your resume.**

Warning about AI:

You must confirm results. You've probably heard about AI hallucinations. I've seen very incorrect results when asking AI to solve circuit problems. Make sure you save instances so that you can go back to known good states.

You should interact with AI like you are discussing with a Colleague. Make sure it understands your background and level of instruction. Don't just use it as an answer source. You will not have good results. You must use it a sounding board for ideas, identifying ways of doing things, and then use this in instructing it on the work product (coding, documenting, Github, etc...). When programming the phone app and getting it working using the phone's IDE, the AI can instruct you on the how and steps doing this as well. I've done this on Android.

Deliverables/Dates

There are four graded components with the project. They are intended to build on one another, and in conjunction with feedback, are intended to help you refine your project as it develops. Effective communication is critical to ensuring you can be advised on your project and that you have a successful project. Therefore, a large portion of your final project grade is tied to your work in these assignments.

Follow the instructions for each checkpoint on ELC with respect to due date/time and what is posted on ELC. In general, the human written documents will be on ELC. The AI generated specifications and descriptive documents in pdf format will be on ELC.

Project Technical Requirements

Here are the minimum requirements:

- Must be written in C with assembly, or assembly for the RP4 section.
- Must be written in the appropriate software/IDE for the phone APP section.
- Will include appropriate documentation and Github Design site as part of the requirements.
- AI is your author for all code, hardware specs, and "site" work.
- Complete the project requirements described below.

Check point 1 (5% of the project grade)

This is a formal view of how you will approach and develop the project, and the starting point for the project.

Document your strategy (human written):

1) Team members.
2) What phone will you be using. If you are using an iPhone, you must have the appropriate support resources like an Apple computer, for example.
3) What AI will you be using. Note, you can use more than one.
4) How will you document your interactions with AI for the project (this must be done). This includes how you will save this information.
5) How will you and your partner divide work and schedule?
6) Submit a pdf document for these items. This is not AI generated. Be professional with documents.

Get your Motor started

1) Use AI to complete preliminary Motor schematic/instructions/parts list for how to assemble the circuit. You may want to consider giving it a list of parts that you have or want to use.
2) Submit documentation from the AI generated content in a separate pdf document. Also include this information in a separate repository on the class Github.
3) The documentation must include a schematic for this checkpoint and, eventually (see below), a "how it works" analysis.

Check point 2 (15% of the project grade)

You have completed the following. These can be operated in stand-alone mode. That is, they don't have to all be working together at this point.

1) A simple user interface on the phone is completed. The user can make selections, and something happens. The color can change on a circle, for example.
2) Bluetooth connection from Phone to RP4 is enabled through the app.
3) RP4 controls the motor through keyboard command. The Keyboard command is just to get something working. Duplicate the main commands: direction, speed, on/off. This is all AI written, of course.
4) Motor schematic completed which includes the RPM sensor and description from AI, of course.   This should include a drawn schematic (AI draws the schematic), instructions, descriptions, a parts list, and how it works based on analytical results.
5) Provide appropriate files/documentation (AI generated) on a separate repository on the class Github. These include documentation for the software. **A note on software: if your AI grabs/uses a library from somewhere, this must be included in the AI generated documentation (attribution, how it works, why needed, etc…).**

Your human written documentation must include:

1) Progress of your AI interaction. For each of these, describe how you confirmed the final result from the AI is good.
2) A well-organized structure
3) PDF format and an editable version (Word doc, for example).

Check point 3 (20% of the project grade)

You have the following completed

1) The user APP must control the motor with all the commands except for automatic with feedback. Yes, RPM reporting should work. This is full interaction from the app to the motor. No other input is allowed.
2) You have the start of your Github or website. Be creative.
3) Provide appropriate files/documentation (AI generated) on a separate repository on the class Github. These include documentation for the software.

Your human written documentation must include:

1) Progress of your AI interaction
2) A well-organized structure
3) PDF format and an editable version (doc, for example).

Project completion (60% of the project grade)

Your final project is completed along with the writeup and Github/web site.

All interactions work from the app to the motor. The Github/web site is complete. Be prepared to demonstrate and allow others to use your PARMCO. You will need to uninstall the application from the phone, reinstall, and show that it works appropriately.

Provide appropriate files/documentation (AI generated) on a separate repository on the class Github. These include documentation for the software.

The final writeup:

Your human written documentation must include:

1) Progress of your AI interaction
2) A well-organized structure
3) Include your group's experience with the project/AI. Reflect on the results, the experience, and the PROS/CONS of using AI.
4) What were your most formative learnings. These can be good experiences, bad experiences, surprises, "wow" moments, or maybe nothing at all?
5) PDF format and an editable version (doc, for example).
6) Attribution of references that were NOT the AI.

Individually:

Write an individual reflection on the semester including the project.

1) What worked well in the class
2) What didn't work so well and offer suggestions.
3) What did you do on the final project? What did your partner do? Be specific.
4) Do you have other ideas/comments/suggestions?

FAQS

What does "AI is your author" mean?

- You may only use AI to generate code for your project which includes the phone app, the RP4, the Github repository or website. See note above on AI using libraries.
- "Can I edit obvious problems". NO. Instruct the AI on what is wrong and perhaps how to approach fixing it.
- "Can I use AI for the documentation?" Yes, for the documentation of the AI delivered content, it is required. For your "human written" documentation, you may use AI as support. Make sure you give attribution for this.
- "What AI can I use?" Any you would like to use.
- "What do I have to show/document for AI interaction?" Enough to replicate/explain/demonstrate the work. This can include iterations of code,

communication with the AI, flow charts, or other appropriate means. Perhaps AI can help document this from the AI's perspective as well.

- "How do I show/document this?" I do not want hundreds of pages of interactions. Decide on a method to document this. AI allows you to save interactions. Clearly label the files associated with the interactions and/or code iterations. Use your class repository (not the project Github) as a location to store the information. In your writeups, you may use snippets to demonstrate/show/provide examples of what you are describing/documenting. In general, I should be able to see how you traveled the path to your destination.
- "Can I use other sites for resources (YouTube, Reddit), etc...?" Yes, but this cannot be the source of the final answer. Whatever you learn must be used as instruction/input/interaction with the AI to affect the AI's results. **You must also give attribution for this!**

What is Collaboration?

Along with AI, you may utilize your classmates. As usual, conversations about concepts and ideas are great. Conversations about copying exact wording of AI inputs are not great.

How will this be graded?

I have high standards and expectations for you. I will evaluate each team member's performance separately and will be influenced by your level of effort.

I will create a rubric for each checkpoint and post on ELC. Some things will be hard and fast. Some things will be relative to how each group performs. There are parts of this project that are qualitative: the Github or website, the user interface on the phone, and other areas for creativity. Creativity often correlates with work effort.

The AI results are part of the grade. It is the project output, after all. You were the AI's mentor/instructor/coach/customer; therefore, its results reflect your interactions with it.

The grade is also affected by how you worked with your partner and what portion of work you contributed to your project. Also note failure to adhere to deadlines will impact grades.

If I can see that you "helped out" the AI, it will impact your grade negatively.

Incompletes will not be given. I will assign a final grade based on whatever progress you've made by the time of the final report submission. Late Check point items are 10%/day penalty. Nothing will be accepted after the last instructional day of the semester.