Spring 2023 ECE 445 Team Contract

Instructions: The content of this document should be specific to your goals and needs. Ideas for the content of each section are provided as suggestions.

Project No. and Name	**Team 3 - WHEELED-LEGGED BALANCING ROBOT LEG**
Member Name, netID	Gabriel Gao, ngao4
Member Name, netID	Zehao Yuan, zehaoy2
Member Name, netID	Jerry Wang, runxuan6

ECE 445 is a project-based course. The course includes both team and individual grades. Project teammates generally all get the same grade for team assignments based on the expectation that all team members do their fair share of the work involved. The purpose of this contract is to lay out the tasks needed for the successful completion of the project and distribute them in a fair and efficient way to the team members. It will also discuss how the teammates will work together during the project and address any issues that come up. A contract that promotes good teamwork that leads to a successful project should:

- Acknowledge that each team member has commitments and responsibilities outside of ECE 445
- Encourage open communication about challenges that team members are facing, both in and out of ECE 445
- Give team members the benefit of the doubt and the opportunity to explain themselves when something goes wrong and resist jumping to judgment

Project Description:

This project is inspired by the limitations of conventional wheeled delivery robots in negotiating obstacles commonly found in urban terrains. To overcome these challenges, the project aims to develop a wheel-legged robot capable of traversing such areas with ease, starting with the creation of a dynamic, single robotic leg. This component, envisioned as an adaptive electric suspension system capable of supporting weight and adjusting to diverse terrains, will pave the way for developing a complete robot that could transform urban delivery systems.

Project Goals:

1. The leg motors should provide a 4 Nm continuous torque to let the overall structure stand on the support of the legs and be able to apply about 1-2.5lb loads on the top of the platform.

2. The robot should respond to the remote control within 300 ms and be able to execute pre-calculated trajectories in real time to demonstrate jumping and partial walking gaits.

3. The system's power management should ensure sustained and stable operation of all components for at least 15 minutes, with the ability to quickly shut down in 1s in emergencies, safeguarding both the robot and its environment.

Expectations (ground rules) for each member:

1. **Be Ready and Informed:** Each member should show up to meetings with a solid understanding of their responsibilities and the necessary background research.

2. **Maintain Open Dialogue:** Team members should actively communicate, sharing challenges and working together to brainstorm solutions.

3. **Timely Responses:** It's expected that each member responds to messages in a timely manner, promoting a fluid and effective project progression.

4. **Constructive Feedback:** Members are encouraged to foster a positive environment by offering and welcoming constructive criticism, aimed at refining the project and strengthening the team dynamic.

5. **Balancing Commitments:** Recognize and respect that all team members have obligations outside of ECE 445, and be considerate when planning project timelines and tasks.

6. **Working Together on Solutions:** If problems or disagreements arise, it's important to keep an open mind, try to understand each other's viewpoints, and work together to find solutions.

7. **Maintaining High Standards:** Each member is committed to delivering high-quality work, adhering to the team-agreed guidelines and standards.

Roles:

To optimize the progress toward the final product, the team has identified the individual strengths of each member and assigned roles accordingly. This strategy ensures that every aspect of the project benefits from the specific expertise of a team member, thus promising a well-rounded and proficient output. The roles are as follows:

Gabriel Gao (ngao4): Gabriel will lead the project's mathematical modeling portion. His role is to construct accurate models such as LQR that will help predict the robotic leg's behavior and performance under various conditions. Furthermore, Gabriel will participate actively in documentation, contributing insights derived from his modeling efforts.

Tony Yuan (zehaoy2): Tony will be responsible for CAD parts, designing the physical structure of the wheeled-legged robot and the test platform, and building it out. Tony will also share the documentation work, integrating detailed descriptions of the parts he develops.

Jerry Wang (runxuan6): Jerry will focus on PCB design and programming, which involves designing pcb of the robot and programming its functions. His contributions will ensure that the robot functions as intended, efficiently coordinating between various components. Jerry will equally divide his time for documentation work, bringing in details from his programming and design adventures.

Project Meeting Time(s):

Currently, TA has not scheduled team meeting time with us. Therefore, besides meeting with TA each week, we will meet on **Tuesday 4pm-6pm**, **Thursday 4pm - 6pm, Saturday 4pm-6pm.** If we need more time to discuss, we will use email to schedule another meeting time. If TA updates the official meeting time with us, we will change our schedule. If we

have free time besides this project, we will have the meeting to work on other aspects such as project research.

Agenda:

We will set the agenda together because each team member has different tasks. We should support each other when someone cannot solve the problem by themselves. We meet weekly for progress reports and we monitor each other's progress on tasks to ensure our project can stay on the right track. When a decision needs to be made, it must be approved by consensus between team members and the TA. We will keep records of our project process by using the Lab Notebook and each team member should work on their own Lab Notebook.

Process and penalties for dealing with team issues:

If any ground rule is broken, we will not penalize any members lightly. The reason is that our entire team should work together and discuss the cause of the issue, trying to understand different viewpoints and arriving at a resolution. If the issue persists and we find it difficult to resolve within our team, we should seek help from our TA and gain a neutral perspective. The TA can use his/her experience to provide insightful suggestions and potential solutions. We need to ensure that everyone has a chance to share their opinion, which allows the TA to make the best judgment regarding the situation. Eventually, we should come up with a viable solution and learn from our mistakes.

End-of-term agreement on using final peer assessment for grade adjustment:

We believe that this contract will hold our team accountable to its contents. Each of us will provide honest and effective feedback to other team members as we progress through the course. We will do our best to meet all the expectations and meet the ground rules as we develop our project. The first assessment will allow us to communicate openly and make necessary adjustments to enhance our teamwork, while the second assessment will be a valuable recognition of our hard work throughout the semester. We are confident that with the guidance of the contract and the structured peer assessments, we will build a collaborative environment where everyone is motivated to contribute their best efforts and stand by the values and goals outlined in the contract.

Signatures:

I affirm that I participated in generating this team charter and that I will abide by its contents to the best of my ability. Furthermore, I understand that failure to meet the expectations expressed here can lead to the stated consequences.

netID: ngao4 (**digital)Signature:** *Gabriel Gao* **Date:** 09/12/2023

netID: zehaoy2 **(digital) Signature:** *Zehao Yuan* **Date:** 09/12/2023

netID: runxuan6 **(digital) Signature:** *Jerry Wang* **Date:** 09/13/2023