![THE WILLIAM STATES LEE COLLEGE OF ENGINEERING]

UNC Charlotte – Lee College of Engineering Senior Design Program
<u>Company Information</u>

Company Name	Mechanical Engineering.	Date Submitted	*11/22/2021*
Project Title	Design and Test path tracking and obstacle avoidance algorithms on a semi-automated vehicle **(UNCC_ME_PATH)**	**Planned Starting Semester**	Spring 2022

Personnel

Typical teams will have 4-6 students, with engineering disciplines assigned based on the anticipated Scope of the Project.

Please provide your estimate of staffing in the below table. The Senior Design Committee will adjust as appropriate based on scope and discipline skills:

Discipline	Number	Discipline	Number
Mechanical	3	Electrical	1
Computer	1	Systems	
Other ( )	-		

Project Overview and Requirements:

Unmanned ground vehicles (UGVs) hold promises for increasing mission performance and guaranteeing personnel safety. This project aims to develop and test path following and obstacle avoidance algorithms on a semi-automated vehicle. To this end, the students are required to develop a set of codes that can read the data from onboard sensors such as lidar, camera, and GPS to determine the position of the vehicle and the relative position of the vehicle with respect to a static obstacle. Additionally, the students shall develop a steering controller and test on a motorized steering wheel. In particular, using this controller, the motorized steering wheel shall follow the desired steering trajectory. The students shall also use models of vehicles such as bicycle models to determine steering control commands for path following and obstacle avoidance applications knowing the position of the vehicle with respect to the road and obstacles. Finally, the students shall combine this controller and algorithms to generate a unified path following and obstacle avoidance controller for a semi-automated vehicle. Specifically, using the data gathered by the sensor, the steering control command shall be determined. This command will then be passed through the steering controller to maneuver the vehicle. Here, the human operator only controls the speed of a vehicle but the automation controls the steering command. The test bed for this project is a golf cart with a motorized steering wheel.

Expected Deliverables/Results:

Deliverables include:
- Programs/codes that read the data from on-board Lidar, GPS, and Camera sensors
- Programs/code to for steering control. (the motorized steering shall follow a desired steering angle)
- A path following and obstacle avoidance algorithms that uses the data from the on-board sensors and control the steering wheel
- All codes shall be implementable on Ardunio
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List here any specific skills, requirements, specific courses, knowledge needed or suggested (If none please state none):
- Familiarity with Mechatronics, sensors, programming in Arduino, electronics, Matlab programming