UNC Charlotte – Lee College of Engineering Senior Design Program
Company Information

Company Name	ME - Motorsports	Date Submitted	04/12/2019
Project Title	Aerodynamic Development and Dynamic Prediction of a short track race Vehicle **UNCC_AERO**	Planned Starting Semester	Fall 2019

Funding:

What is the source of funds that will be used to cover all of the direct costs of this project? Self, Grant, Department?? ___NCMARC_____

Is this source of funds already secured?   Yes __X____   No _____

Technical Contact(s)*

	Technical Contact 1	Technical Contact 2	Technical Contact 3
Name	Mesbah Uddin		
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*We would like to have more than one technical contact, so there is a back-up in case of travel, sickness, job re-assignment, etc.

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	0
Computer	0	Systems	0
Other ( )	0		

Project Overview and Requirements:

This is actually an ongoing research project where two students are currently working on and have completed a significant volume of initial work. The project consists of designing an aerodynamic modification package for a short track autocross vehicle which is raced locally. The supplied race-car geometry will be analyzed using CFD testing procedure and have a full aero package CAD modeled and tested. The second part of the project will consist of developing a vehicle simulation tool for autocross which will predict the lap time improvements due to the aerodynamic changes. This will present a unique challenge since autocross tracks change from event to event. This vehicle dynamics simulation tool will be developed using MatLab vehicle dynamics library.

The project was envisioned to write a technical paper for the SAE 2020 World Congress and ultimately, submit a journal version of the paper to the SAE Journal of Passenger Vehicles. A significant progress in the project has been made to date by the two students involved. The CAD of the race-car is cleaned, prepped, and initial simulations were carried out. The scope of the senior design project is to design optimized aero packages for various tracks, using CFD simulations, and then use the Matlab based vehicle dynamics simulation to be developed by the students to predict lap time improvements for various tracks. We are expecting to submit an Abstract for the SAE 2020 Conference by 07/31/2019.

This project will lead to the Masters Theses research of the two currently involved students.

Expected Deliverables/Results:

Deliverables include:
- A full design report of all aerodynamic changes made to the vehicle and their effect on the flow features and quantities of interest. This will also include recommendations as how these aerodynamic devices should be manufactured based on their loading predicted by CFD
- A lap time prediction software able to estimate the lap time improvements made by aerodynamic changes. This software will also include the ability to predict lap times on tracks which have never had previous data gathered.

List here any specific skills, requirements, specific courses, knowledge needed or suggested (If none please state none):
- Knowledge of vehicle aerodynamics and road vehicle dynamics. Students must have completed either or both of MEGR 3242 (Applied Road Vehicle Aerodynamics) and MEGR 3211 (Road Vehicle Dynamics) with a grade of B or better; otherwise, a prior approval from the sponsor is required.
- Proficiency in MatLab is mandatory
- Knowledge in CFD is also preferred by not required; experience with STAR-CCM+ is preferred.

Students for early entrywith experience for preselection: Carrie Cohlmia and Charles Patrick Bounds