UNC CHARLOTTE
The WILLIAM STATES LEE COLLEGE *of* ENGINEERING

Senior Design Project Description – COE Department Project

Department Name	UNCC COE	**Date Submitted**	4/1/19
Project Title	**Formula SAE Competition Team FSAE_F19**	**Planned Starting Semester**	F 2019

Personnel:
Mechanical (Motorsports) 6-10. Students from other disciplines encouraged to participate but with priority given to Motorsports Students.

Faculty Mentor:
Charles Jenckes
Shop Contacts: Luke Woroniecki

Project Overview:
The UNCC FSAE Senior design team will be tasked to serve as a "contract engineering" firm for the formula SAE club team. Ultimate project scope will be under the direction of the club and with the oversight of the project mentor.

The FSAE project requires the design and construction of a rules compliant vehicle as described by the SAE. More or less focus may be put on individual subsystems depending on the club's needs. Vehicle dynamics and structural strengths will be tested and analyzed. Strong use of analysis and CAD software will be used to create and test parts and systems for the vehicle. Emphasis will also be placed on physically building and producing the vehicle and subsystems. This will include but will not be limited to use of manual mills and lathes, CNC machines, and welders. The goal will be to produce a vehicle and an engineering package to be presented and tested at the yearly Formula SAE Michigan competition.

What is Formula SAE? *From Wikipedia:*
The concept behind Formula SAE is that a fictional manufacturing company has contracted a student design team to develop a small Formula-style race car. The prototype race car is to be evaluated for its potential as a production item. The target marketing group for the race car is the non-professional weekend autocross racer. Each student team designs, builds and tests a prototype based on a series of rules, whose purpose is both ensuring on-track safety (the cars are driven by the students themselves) and promoting clever problem solving.

The prototype race car is judged in a number of different events. The points schedule for most Formula SAE events is:

Design Event 150
Cost & Manufacturing Analysis Event 100
Presentation Event 75
Acceleration Event 75
Skidpad Event 75
Autocross Event 100

Fuel Economy Event	100
Endurance Event	325
Total Points Possible	1,000

In addition to these events, various sponsors of the competition provide awards for superior design accomplishments. For example, best use of E-85 ethanol fuel, innovative use of electronics, recyclability, crash worthiness, analytical approach to design, and overall dynamic performance are some of the awards available. At the beginning of the competition, the vehicle is checked for rule compliance during the Technical Inspection. Its braking ability, rollover stability and noise levels are checked before the vehicle is allowed to compete in the dynamic events (Skidpad, Autocross, Acceleration, and Endurance).

Formula SAE encompasses all aspects of a business including research, design, manufacturing, testing, developing, marketing, management, and fund raising.

Expected Deliverables/Results:

The ultimate deliverable is a rule compliant, race capable vehicle with the supporting design documentation.

1. All SD course deliverables
2. All competition deliverables as specified by SAE on time.
3. Applicable FEA on designs.
4. Applicable Engineering development notes per each designed part
5. Initial calculations, assumptions and design decisions recorded
6. System detailed drawings
7. System assembly drawings and procedure
8. Detailed cost report for all designed parts and systems
9. System / subsystem testing plan
10. Financial/sales plan
11. Outreach plan
12. Vehicle test procedure and checklist
13. Finished, working vehicle
14. Transition Plan for knowledge retention for future groups and competitions.

Disposition of Deliverables at the End of the Project:

Hardware, software and equipment will be maintained by the team and the mentor for the duration of the project. At the completion of the project, all equipment, hardware and documentation will be turned over to the mentor and maintained by the Kulwicki Motorsports lab for following teams planning and use. Team tool box will be inventoried and organized, toolbox key turned in.

List here any specific skills, requirements, knowledge needed or suggested (If none please state none):

Formula SAE is a penultimate Senior college design/build project that will require usage of all prior coursework and experience.

Student should have an interest in one or more of the following:
Part design, Vehicle Dynamics, CAD software, CAM Software, CNC and Manual Machining, Fabrication skills, Welding, Structure Analysis, Racing Vehicles, Engines and Test Equipment, Engineering testing.
Knowledge of the following desired
CAD - Solidworks
Matlab , Mathcad
Optimum K/G
ANSYS or other
Microsoft Project
Microsoft Word
Mechanical understanding
Fabrication Skills (steel\aluminum)
General knowledge of the Kulwicki Lab and available tools and equipment
Sports Marketing