



**Department Project Information**

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|------------------------|-------------------------------------|----------------------------------|------------|
| <b>Department Name</b> | MEES                                | <b>Date Submitted</b>            | 04/19/2023 |
| <b>Project Title</b>   | NASA Student Launch<br>(USLI COMP9) | <b>Planned Starting Semester</b> | Fall 2023  |

**Senior Design Project Description**

**Personnel**

Typical teams will have 4-6 students, with engineering disciplines assigned based on the anticipated Scope of the Project. Assume 10 hours per week per student.

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

| <b>Discipline</b> | <b>Number</b> | <b>Discipline</b> | <b>Number</b> |
|-------------------|---------------|-------------------|---------------|
| Mechanical        | 7             | Electrical        | 2             |
| Computer          | 2             | Systems           |               |
|                   |               |                   |               |

**Project Overview:**

As described by the NASA SLI handbook, “The NASA University Student Launch Initiative (USLI) involves students in designing, building, and testing reusable rockets with associated scientific payloads. This unique hands-on experience allows students to demonstrate proof-of concept for their designs and gives previously abstract concepts tangibility. The project also requires community outreach throughout the project as well as preparing written documentation and oral presentations to NASA engineers and staff.

This project requires the design and construction of a re-useable dual deployment rocket capable of carrying a designated payload to a designated altitude. The payload(s) will have a scientific value relevant to NASA’s mission, which may include performing a task and taking measurements. Several half scale launches and a minimum of two full scale launches will be conducted prior to competition in April, which is held in Huntsville AL. The team will be separated into two or more sub groups: Payload Team, Launch Vehicle Team, Recovery Team etc. The team deliverables are scheduled based on the NASA design timeline which will require the team members to typically work on the project >30 hrs per week, to include fall, winter and spring breaks.

**Project Requirements:**

All students on the team are required to participate in on and off campus outreach and fundraising



events. All team members must be available to conduct flight testing on weekends and over school breaks as well as travel to competition in April. The team members will be required to take the laboratory safety tests to access the university machine shops and labs.

**Expected Deliverables/Results:**

Deliverables include:

1. All senior design course deliverables
2. All competition deliverables as specified by NASA
3. System Block Diagram
4. System Math Model, including stress analysis and dynamic performance
5. Payload concept ideation sketches
6. System detailed drawings
7. System assembly drawings and procedure
8. System transport configuration drawings
9. System / subsystem testing plan
10. Financial plan
11. Outreach plan
12. System preflight procedure and checklist
13. System launch procedure and checklist
14. Flyable Hardware (subscale and full scale launch vehicle and payloads)
15. Transition Plan for knowledge retention for Tier 2 competition.
16. Title I Outreach (40% of Progress Evaluation grade): The team is required to conduct a minimum of two outreach events at Title I schools in Fall 2023, and participate in at least two other outreach events conducted by other UNC Charlotte student organizations/teams at Title I schools in Fall 2023. The specific requirements for Spring 2023 will be announced in late Fall.

**Disposition of Deliverables at the End of the Project:**

The product can be displayed at the last Expo and then handed over to the mentor.

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

Student should have an interest in one or more of the following:

Fluids, Compressible Flow, Instrumentation and Controls, Wireless Communication, Circuit Design, Dynamic Systems, Flight Dynamics, Carbon Fiber Construction, Rocketry Design and Construction,

Knowledge of the following software:

CAD - Pro/e and/or Solidworks

Matlab , Mathcad

Labview

C programming (for microcontrollers)



**INDUSTRIAL SOLUTIONS  
LABORATORY**

Java programming (for GUI)  
Microsoft Project  
Microsoft Word  
Latex  
RockSim