



Department Project Information

Department Name	<i>ETCM</i>	Date Submitted	<i>04/10/2026</i>
Project Title	<i>NASA Lunabotics Challenge 2027 (UNCC_ETCM -LUNA COMP 8)</i>	Planned Starting Semester	<i>Fall 2026</i>

Senior Design Project Description

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	4	Electrical	3
Computer	1	Systems	1
Other ()			

Project Overview:

NASA's 2027 Lunabotics Challenge tasks university teams with the full-lifecycle development of autonomous lunar excavators. This isn't just a build-and-run competition; it's a rigorous engineering project requiring robots to navigate high-fidelity lunar terrain, manage power constraints, and execute precise regolith extraction. By solving these excavation challenges, the team contributes directly to In-Situ Resource Utilization (ISRU) strategies—the foundation for sustainable lunar habitats and life-support systems.

Project Requirements:



Lunabotics has four main aspects:

- 1) Mining: Teams compete with their autonomous rovers in a simulated lunar environment at Kennedy Space Center. Lunabotics rovers compete using BP-1 simulant because it is the most mechanically similar substance to lunar regolith – from roving to digging to mitigating dust.
- 2) Presentation and Demonstration: Lunabotics teams must effectively demonstrate their robot's functionality and communicate their design process, performance goals, safety plan, and design innovations to a panel of NASA & Commercial subject matter experts (SMEs).
- 3) Systems Engineering: All teams are required to submit a thorough systems engineering paper to compete. The paper is judged on project management, design philosophy, CONOPS, schedule, system hierarchy, requirements, technical and cost budgets, trade studies and conducting major reviews like SRR, PDR and CDR. (This is in place of a similar Senior Design required document).
- 4) Outreach: An important and required component of Lunabotics. Teams inspire others to learn about robotics and have engaged an audience of over 1-million in the past 14 years!

UNC Charlotte has been a participant in the competition for over 15 years. The focus of this project will be significantly modifying the physical design of the existing Charlotte Rover (by approximately 50%) to align with the Artemis lunar exploration program; effectively, this means optimizing the subsystems of the current rover. A key requirement this year will be making the rover operate fully autonomously; current autonomous control code will need to be modified and enhanced.

Expected Deliverables/Results:

- Rover to compete in the event at Kennedy Space Center in May
- NASA deliverables:
 - Project Management Plan
 - Systems Engineering Paper
 - Presentation to NASA engineers
- Standard Senior Design assignments

Disposition of Deliverables at the End of the Project:

Hardware developed is the property of the mentors and Department.

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

- Robotics / Automation / Machine Learning
- Machine design
- Control systems
- Programming
- CAD
- Machining