

Senior Design Project Description – COE Department Project

Department Name	ETCM	Date Submitted	5/1/2018
Project Title	NASA Robotic Mining Competition (UNCC_ASTR3)	Planned Starting Semester	F 2018

Personnel

Typical teams will have 4-6 students, with engineering disciplines assigned based on the anticipated Scope of the Project. 250 hours are expected per person.

Complete the following table if this information is known, otherwise the Senior Design Committee will develop based on the project scope:

Discipline	Number	Discipline	Number
Mechanical	2	Electrical	2
Computer	2	Systems	1
Other ()			

Project Overview:

This competition is for university-level students to design and build a mining robot that can traverse the challenging simulated chaotic off-world terrain. The mining robot must then excavate the ice simulant (gravel) and return the excavated mass for deposit into the collector bin to simulate an off-world, in situ resource mining mission. The complexities of the challenge include the abrasive characteristics of the regolith simulant, the weight and size limitations of the mining robot and the ability to tele-operate it from a remote Mission Control Center.

This annual event brings more than 50 college teams, 500 students and their mining robots from across the country, to Kennedy Space Center. Since water ice is prevalent throughout the Red Planet, the Robotic Mining Competition challenge is to mine the precious icy regolith (gravel). This water ice will provide oxygen, water and fuel for future off-world colonists.

Project Requirements:

The 2018/19 UNCC team will modify the 2017/18 UNCC rover to meet the updated rules of the 2019 on-site mining rules, including improvements from lessons learned from the 2018 competition.

The on-site mining category will require teams to consider a number of design and operation factors such as dust tolerance and dust projection, communications, vehicle mass, energy/power requirements and autonomy. In addition to the on-site mining category, teams must also submit a systems engineering paper that explains their design approach. The teams also get extra points for



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giving a presentation about their design philosophy and the robot to judges while at the Kennedy Space Center. Points from both the mandatory and optional categories are used to determine the winner of the grand prize, the Joe Kosmo Award for Excellence.

On-Site Mining requires the teams to design and build a modified rover that can traverse the simulated Martian chaotic terrain. The robot must then excavate the icy regolith simulant (gravel) and return the excavated mass for deposit into the Collector Bin to simulate an off-world mining mission. The teams will have two, 10-minute competition runs to mine the icy regolith. The abrasive characteristics of the basaltic regolith simulant, the weight and size limitations of the mining robot and the ability to tele-operate it from a remote Mission Control Center are some of the additional factors in the competition.

Expected Deliverables/Results:

- *Modified version of UNCC 2017/18 rover*
- *System Engineering Paper*
- *Proof of Life Video*
- *Parts list*
- *Travel to competition – A travel team will be selected to travel to the competition in May 2019 at Kennedy Space Center. Selection will be based on contribution to the effort, as well as performance during the fall and spring semesters.*

Disposition of Deliverables at the End of the Project:

Anticipated hardware will be reused and refined for following year.

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

- Robotics
- Control systems
- Programming