

Course Information

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Simulated Lunar Sample Return Analogue Mission, SPACE 9010

Instructor Information

Course Coordinator: TBD

Instructors: Various Faculty and Special Guest Lectures

Course Syllabus, Schedule, Delivery Mode

Simulated missions carried out in terrestrial analogue environments are critical for ensuring the success of future lunar missions. In this Capstone Project, students will simulate and end-to-end robotic sample return mission to the Moon. This course will feature a series of training modules and culminate in a 2-week simulated mission. All students will take on different roles in the mission control teams, which will be split in Science and Planning teams.

Objectives:

At the end of this course students will be able to:

- Describe the roles and responsibilities of a mission control team
- Understand the various components of a successful space exploration mission
- Discuss the efficiency of remote science operations including the use of pre-planned strategic traverses
- Evaluate the utility of real-time automated data analysis approaches for lunar missions
- Identify the most suitable mission control operations structure for lunar science operations
- Demonstrate effective communication, project management, and teamwork skills
- Identify

Schedule

Week 1

- Project management: Students will gain key skills in resourcing, scheduling, field logistics, compliance with budgets, and of participating in a large interdisciplinary project.

Weeks 2 – 3

- Science instrumentation: This mission will utilize a variety of instrumentation in the field. Training on these instruments will be provided to all student. This is essential for both the field team and the mission control team since the entire team will need a thorough understanding of the capabilities of the instruments in order to successfully implement the

analogue mission. This type of hands-on training will also greatly benefit the students as experience working with instrumentation is required for many industries.

Weeks 4 – 5

- Data Collection: This mission will collect data using a range of techniques. Students will learn a variety of field techniques including the collection of notes and descriptions of geological units, use of satellite imagery, and sample collection. Students will be trained in the use of field-rugged tablets and in proper sampling protocols.

Weeks 6 – 7

- Data Analysis: Prior to fieldwork students will utilize ArcGIS to compile and then analyse satellite imagery of the LEAD deployment region in order to select sites of interest and conduct preliminary morphometric analysis and mapping. For students not familiar with ArcGIS, a series of hands-on tutorials will be provided. During the deployment, a huge amount of data will be generated, data which will be made available, organized and structured in a geodatabase for individual and group use. Students will be trained to use the following software: ArcGIS for GIS and localization as well as for pre-mission site characterization; ENVI for analysis and processing the UV-VIS-NIR data; iOGAS and SciApps Utility software packages for processing and analyzing LIBS data; and Apogy for planning rover traverse routes. The implementation of autonomous data analysis is a key aspect of the operations objective.

Weeks 8 – 9

- Execution of the simulated mission.

Week 10 – 12

- Data synthesis, report writing, final presentations.