

**Recap of the Inaugural Semester of *Operating in the Lunar Environment*.** A. C. Ekblaw<sup>1</sup> and S. P. Auffinger<sup>2</sup>, <sup>1</sup>Director, MIT Space Exploration Initiative, 77 Mass. Ave., E14-574A, Cambridge, MA 02139-4307 USA. <sup>2</sup>Mission Integrator, MIT Space Exploration Initiative, 77 Mass. Ave., E14-574A, Cambridge, MA 02139-4307 USA. (Contact: [akblaw@mit.edu](mailto:akblaw@mit.edu), [seanauff@mit.edu](mailto:seanauff@mit.edu))

**Introduction:** In Spring 2021, the MIT Space Exploration Initiative and MIT AeroAstro hosted the first edition of the course: *Operating in the Lunar Environment*, bolstered by NASA's announcement of the Artemis program to return to the Moon with the first Man and next Woman, leading to a renewed focus across the space industry on lunar exploration. Over the next decade, NASA will be pursuing partnerships across industry and academia to plan a series of precursor robotic missions, hoping to uncover new insights into the challenges and opportunities associated with operating on the lunar surface. Eventually, the goal is to establish a continued and sustainable human presence, making use of local resources such as lunar volatiles and reserves of water-ice discovered in the lunar polar regions.

**Pedagogical Approach:** The course aimed to expose students to the technological, scientific, political, and economic challenges associated with lunar exploration, while offering opportunities to gain direct, hands-on experience with developing lunar hardware. Instructors Professor Jeffrey Hoffman from MIT AeroAstro, and MIT Space Exploration Initiative Founder and Director Ariel Ekblaw, drew on their own experiences developing hardware for the harsh space environment. Students were also able to interact with and learn from a series of guest speakers with direct experience developing hardware for the lunar environment, including industry representatives from organizations such as the Jet Propulsion Laboratory, Draper Laboratory, Lockheed Martin, and even former retired Apollo Engineers.

Throughout the semester, students worked on two distinct projects: an individual "Mission Concept" plan for an innovative near-future mission to the moon, and a team "Payload Project", developing actual hardware for existing MIT Lunar missions. Each project was refined with special "office hours" sessions and subjected to a rigorous set of design reviews with feedback from the industry guests.

**Democratizing Access:** This course offering falls under the ethos of the MIT Space Exploration Initiative of democratizing access to space. While there were many students from the AeroAstro department at MIT, students from other departments and schools were encouraged to join. Additionally, as much course content as possible, including the syllabus, lecture recordings, and

slides, was made open-access and is available on the course website [1].

**Outcomes:** Four payload projects were developed as part of the course, with additional development on each currently ongoing. Course funding was used to create professional rendering of each for use in future publicity and grant opportunities. Additionally, the MIT Space Exploration Initiative is moving towards securing a near-term launch opportunity to the moon, with the goal to include several payloads that participated in the course.

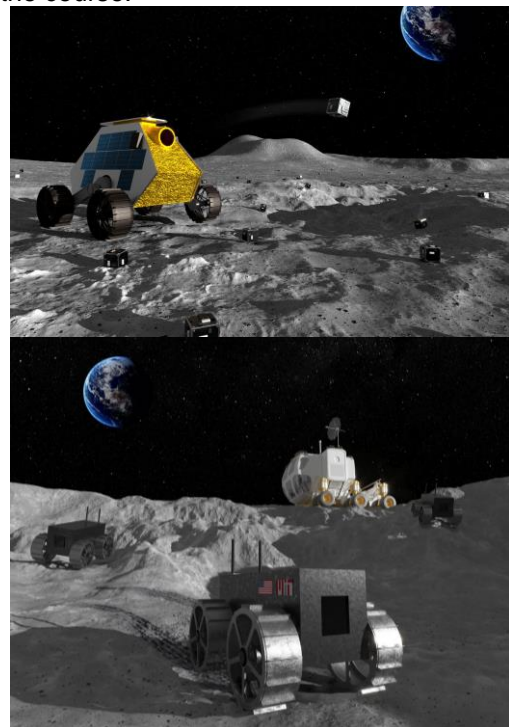


Figure 1. Artist renditions of two of the payloads developed during the course.

**References:**

[1] <https://tothemoon.pubpub.org/>