Academic Engagement

NASA Science Mission Design Schools

Learning Goals

The Science Mission Design Schools are designed to prepare early-career scientists and engineers for participation and leadership in space science missions of the future. A science mission can be thought of as an experiment (or set of experiments) designed to collect and analyze data to address scientific hypotheses of interest to NASA. The school guides the participants through an approach to developing scientific hypotheses and the corresponding experiments that address those hypotheses, which together define the science mission.

The course embraces the philosophy that experiential learning is the most effective means of instruction. Therefore, the participants will develop and propose their mission in the same way that many actual integrated teams do by responding to a NASA Announcement of Opportunity (AO). Any differences between the course content and reality are clearly explained.

Key learning goals

How NASA science missions are formulated, proposed, and selected.

- Participants will be working through the process for NASA missions competed via an Announcement of Opportunity. The course covers the formulation process for directed missions.

Best practices in converting the science goals of NASA into a mission implementation framework.

- Develop scientific hypotheses for a mission, Science Traceability Matrices, and link them to NASA scientific objectives.
- Use state-of-the-art practices for developing mission concepts and mission point designs. Participants will be partnered with experienced mentors in one or more of NASA's concurrent design environments to develop their mission.

The teamwork required to develop a mission concept.

- Missions are a joint effort typically involving hundreds to thousands of participants with expertise covering a wide range of disciplines. The design environments will expose you to an important subset of the disciplines involved with mission development.
- The course and the concurrent design environments are also designed to enhance the mutual understanding between scientists and engineers regarding their roles and perspectives. This understanding is a key part of successful mission development.

Best practices in responding to an announcement of opportunity.

- Key roles in the proposal process.
- Responding to the AO requirements, including requirements tracking.
- Strategies for crafting a winning proposal.
- How to present to a review board.

The NASA structure for developing missions.

- Mission development lifecycle.
- Mission roles and how they are organized.
- Realities and challenges of mission development.
- Key concepts such as requirements, risk mitigation, and descoping.
- Initial exposure to NASA jargon and acronyms.

Learning Goals (Continued)

The program's culminating week finishes with a presentation of the participants' mission concept to an experienced mock review board of NASA Headquarters and NASA Center experts. The review board provides instructional feedback on the mission presented by the participants, including key points to remember when proposing a real mission.

The Science Mission Design Schools are structured so that the quality of work going into the participants' mission concept studies have the potential for contributions to wider science community interests and literature. For example, recent concepts from Planetary Science Summer Schools have been on par with the quality of some of the mission studies done for white-paper inputs to the Decadal Surveys, and have been well received by the NASA Planetary Science assessment groups (OPAG and SBAG). Published journal articles exist from the studies in 2015-2018 and the 2019 class has a paper in preparation. See summaries on the Research Gate - Planetary Science Summer School.