

AGENCY

Students log on for ESA Academy's Online Space Debris Training Course 2021

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ESA / Education / ESA Academy

From 17 to 28 May 2021, 36 university students from 13 different [ESA Member States and Canada](#) booted up their computers to participate in ESA Academy's Online Space Debris Training Course 2021.

A collaboration between ESA's [Education](#) and [Space Debris Offices](#) and delivered by ESA and external experts -- all specialists in the field -- the goal of this training course was to give the participants an introduction to the concept of [space debris](#): why is it a problem, and what can be done to help?

— ESA trainer explaining how to estimate on ground risk after spacecraft re-entry

"These two weeks have been a fantastic experience," said an Italian student from Parthenope University of Naples. "To learn about space debris directly from the ESA people, who collaborate on it, was an incomparable opportunity for me. A

full immersion in the subject gave us the awareness about how a compliant space environment is essential for the future."

The first week began with an introduction to space debris. The forces acting on a space object were explained, followed by an overview of the space debris environment, what it comprises and how it evolved to the current stage, and the dangers it contains. Lessons on legal and regulatory aspects proved enlightening, and certainly gave the students a different perspective. Lectures then moved on to the topic of mitigation, investigating why this is important, and technologies for passivation and deorbiting. A lecture on the future evolution of the space debris population showed the influence of successful implementation (or not) of these mitigation measures as well as other factors such as future launch rates. The ESA experts then discussed space surveillance, a topic that many students found to be particularly valuable. The first week finished with a deep-dive into collision avoidance, and the challenges of operating in an environment with the perils of space debris.

The second week started with a fascinating presentation on protection and shielding, before segueing to re-entry, beginning with the aerothermodynamics that rule the journey of an object into Earth's atmosphere, then simulating this re-entry for various satellites. On-ground risk estimation for these re-entries was also discussed. The final two days of the course were dedicated to the future of the space debris problem, with an overview of active debris removal, and design for demise, which sees spacecraft specifically designed to optimise their destruction during re-entry.

Throughout these two weeks, the technical lectures were complemented by a set of dedicated group project sessions. Using [MASTER](#) and [DRAMA](#) software, developed and used by the Space Debris Office and available to everybody, student groups worked on:

— Participants and ESA trainer discussing the DRAMA model during a group project session

- Introduction to ESA tools and flux assessment
- Disposal strategies
- Collision avoidance and damage assessment
- Re-entry and casualty risk assessment

Another session focused on the high-level mission and operations concept design of an active debris removal mission using approaches of system engineering and concurrent design.