

AGENCY

Online Clean Space Training Course 2021 challenges university students to clean a “Mega Constellation”

21/05/2021 2282 VIEWS 12 LIKES

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Environmental awareness is increasingly important in every area of our modern world, and the space sector is no exception. [ESA's Clean Space Office](#) was established in 2012 to assess and mitigate the environmental effects of the entire life cycle of space missions. [ESA Education Office](#) teamed up with ESA's Clean Space Office to offer a second edition of the ESA Academy's Clean Space Training Course , which ran online from 3 to 7 May 2021.

The course's goal was to offer university students valuable insight into the environmental impact of space missions; and to consider design approaches that are environmentally friendly, do not generate debris, and can remove debris, such as defunct satellites already in orbit. In attendance were 30 university students of 11 different nationalities from [ESA Member States and Canada](#). Lectures were delivered by ESA experts, and an expert from the European Commission. The entire course was held online due to the ongoing COVID-19 pandemic.

— Introduction to Clean Space during Day 1 of ESA Academy's Clean Space Training Course 2021

The activities of the Clean Space Office fall into three main areas, which the training course mirrored:

- EcoDesign: addressing environmental impacts on Earth and fostering green technologies;
- Management of End-Of-Life: minimising the production of space debris and making future satellites easier to be removed in case of failure of the disposal strategy;
- In-Orbit Servicing: removing spacecraft from orbit and demonstrating in-orbit servicing, such as re-fuelling.

Monday began with the students receiving a warm welcome before being introduced to the training course. They then enjoyed an inspiring and interactive lecture from the Head of the Clean Space Office, who gave an overview of the main challenges faced in the mission to create a more sustainable space environment. “ESA's efforts to protect the environment are really inspiring,” said a French student from Cranfield University. “I’ve been rethinking my personal position on what is actually eco-friendly in space-related topics.”

Next came a fascinating explanation of Life Cycle Assessments, given by an expert from the European Commission. This was followed by a lecture on EcoDesign, where the students were familiarised with the current environmental framework at a worldwide level, and how, at ESA, the Life Cycle Assessment is implemented to quantify and reduce environmental impact. The day concluded with a practical exercise in which the students, divided into groups in virtual break-out rooms, were challenged to apply the knowledge they had gained so far.

Tuesday saw the students introduced to topics related to satellites’ end of life, and space debris reduction. They were fully focussed during immersive lectures covering Space Debris Mitigation Requirements and the implications of these in Spacecraft Design, Re-entry Strategies, and Passivation Techniques. An interactive group project then gave participants the opportunity to practice applying Space Debris Mitigation Requirements. “The highlight of my experience was definitely the group exercises,” said a Canadian Student from Université Laval. “Not only they were fun, but they really helped my comprehension.”

On Wednesday the course continued at pace. An interactive lecture on Design for Demise had the students enthralled, and was quickly followed by a practical group project. Then it was on to lessons centred on In-Orbit Servicing and Close

— Life Cycle Assessment group project during ESA Academy's Clean Space Training Course 2021