

AGENCY

Online CubeSat Design Training Week 2021 combines lectures and group projects to enhance university students' learning

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ESA Academy's pilot version of CubeSat Design Training Week went fully online, in response to the continuing COVID-19 pandemic.

Running over nine afternoon sessions between 13 – 23 September 2021, in virtual attendance were 30 Bachelor, Master, and PhD students in science and engineering-related fields, drawn from 15 ESA Member States and Canada.

— ESA expert presenting different Spacecraft Communication options to the students

CubeSats are miniature satellites that can fit in the palm of your hand. Despite being small and light, they carry advanced payloads and conduct valuable science. At the same time, they are effective educational tool that offers hands-on experience in the development phases of a spacecraft. ESA is keen to equip future scientists and engineers with the skills necessary to help develop CubeSats through courses like this Online CubeSat Design Training Week.

Experienced ESA experts delivered a series of CubeSat-themed lectures spread across the training week. Covering various aspects of a mission ranging from System Engineering, Mission Analysis, CubeSat Configuration, Electrical Power System, Attitude Determination and Control System, On-Board Data Handling, Communications and Spacecraft Operations.

Working in parallel to these lectures, the university students were split into groups of six and challenged to design their own CubeSat mission during project sessions supported by the team behind Fly Your Satellite! – the ESA Education programme that supports university student teams in the development of their own CubeSat. Each group first had to choose a mission area, such as Earth Observation, Space Observation, or Astronomy and Science. Students were then given objectives and limitations for their CubeSat missions. Theoretical information gained from the online lectures proved invaluable.

"The Online CubeSat Design Training Week 2021 was a great experience for me as a CubeSat rookie," said a Czech student from Brno University of Technology. "The lecturers gave us a deep view on the approach to CubeSat mission and subsystems design. All the new information was also immediately applied within the group project sessions, where we developed our own mission proposal. I would not hesitate to recommend this training to any of my colleagues and I am grateful for the opportunity to participate."

The first week culminated in the students practising their presentation skills, gaining valuable feedback for the eventual final group presentations. Each group also had the chance to share the progress of their CubeSat Design project with the other students, pooling ideas and lending each other a helping hand.

— During the lecture of the CubeSat Design Training Week about Mission Analysis

Week two began with a virtual tour of ESA's CubeSat Support Facility, where EIRSAT-1, one of the teams participating in the Fly Your Satellite! programme, was carrying out an environmental test campaign on their CubeSat. Through the livefeed, the students could directly interact with the EIRSAT-1 student team and ask questions about design and testing processes. It was enlightening for the students to see the procedures and challenges of CubeSat development for a real mission.

The final day each group presented their CubeSat designs to the other students and the tutors. Innovative solutions were offered to a myriad of challenges, and it was evident that the content of the lectures had helped the students to think creatively about how to best complete their mission objectives! The students' performances were evaluated, meaning that participants received a certificate of participation and transcript, which in turn can be used to request ECTS Credit(s) from their respective universities.

The students are now able to apply the knowledge and skills gained during the training week for CubeSat projects at their home universities, and perhaps as future Fly Your Satellite! applicants – or even, eventually, as professionals within the space sector!

"These nine days have been an outstanding experience to learn new ideas, assimilate previous concepts, and meet incredible people from across the globe interested in space and satellites," summarised a Spanish student from Universitat Politècnica de Catalunya (UPC). "Even though it was an online version, it kept us all engaged and focussed as if we were all in the same room thanks to the dedication of ESA Academy's staff and lecturing experts. Ultimately, totally unforgettable!"

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