

IAF SPACE EDUCATION AND OUTREACH SYMPOSIUM (E1)
In Orbit - Postgraduate Space Education (4)

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GET SPACE – GROWTH OF EDUCATION AND TECHNOLOGY FOR SPACE: AN INTERDISCIPLINARY EDUCATION PROJECT ON TETHERED CUBESAT MISSIONS AND ROBOTIC SPACE TECHNOLOGIES AT THE UNIVERSITY OF STUTT GART

Abstract

In 2022 the University of Stuttgart’s Institute of Space Systems (IRS) started a new educational program, combining several study courses on Small Satellite Design and Robotic Space Systems into an interdisciplinary education project. Within the innovative format student teams of different disciplines in space education worked together in parallel on the design of a complex space system technology development in both, theoretical design studies and practical hands-on projects. In this context, the student teams, several student-led research projects, and supervising experts from connected research groups (e.g. satellite design, space robotics, orbit mechanics, communications) from both, industry and research, are linked together. The interdisciplinary educational project was funded by the Innovation in Higher Education Foundation (StIL) and covered a one-year project duration.

Within the education program, several teaching and learning formats like lectures, practical tutorials, analytical theoretical design studies, student-led milestone presentations and technical reviews are elaborated and combined. One overall technological mission goal of the program is the analyses and development of small sized autonomous space systems for a future sustainable space environment. To setup a competitive framework, the participating student teams were divided into two different development clusters which were required to fulfil the same mission goal. Experiences from past educational projects showed, that the competitive framework enhance the individual motivation as well as the team dynamics significantly, but also encourages a communicative exchange of innovative solutions and a profound reflection of the own research results at equal basis. Besides technical knowledge-gains on the highly complex subject of space system development also individual key competences and a reflection of the professional emphasis of the students are fostered.

Within this context the Small Satellite Design Course’ student teams were investigating technologically challenging solutions with tethered CubeSat configurations in feasibility studies. The CubeSats carry robotic sensory payloads which allow detection and tracking of small sized objects in ranges of 100m, that were developed and tested in breadboard-models by the student teams within the Space Robotics Course’ hands-on project phase in parallel. All teams have a significant high number of interfaces during analyses and elaboration of the technical solutions and presented their results within final full-day presentation events.

This paper presents the project framework and activities, and the innovative solutions and results from the student teams. Furthermore, the lessons-learned from this multidisciplinary education program are described, which shall reflect on the experience and learning outcome for both, students and supervisors.