IAF SPACE EDUCATION AND OUTREACH SYMPOSIUM (E1)
On Track - Undergraduate Space Education (3)

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INTRODUCING SPACE ENGINEERING TO ENGINEERING UNDERGRADUATES: DESIGN OF A "INTRODUCTION TO SPACE ENGINEERING" COURSE FOR NON-AEROSPACE ENGINEERING STUDENTS IN COSTA RICA.

Abstract

Costa Rica became a space nation on 2018, with the launch of the CubeSat "Project Irazú". Also, in 2016 the Costa Rica Aerospace Cluster was created with the objective of strengthen the capabilities of the companies working in aerospace engineering, an industrial area of very high added value. The Space Systems Engineering Laboratory (SETEC Lab) of the Costa Rica Institute of Technology (TEC) was created in 2017, becoming the first of its class in Central America. It was responsible for the technology development of Project Irazú and currently is partner with both George Washington University and Kyushu Institute of Technology in the development of small-satellite missions. Despite all these advancements, before 2019, no formal space engineering education existed in Costa Rica. The current development in the space area and the capabilities of SETEC Lab led to interested students to request an "Introduction to Space Engineering" (ISE) elective course at the Electronic Engineering School at TEC. It was identified that the capabilities of electronic engineering students with formation in space engineering will improve the development of future projects at both university and industrial level. ISE was proposed with the objective of teaching non-aerospace engineering students the fundamental knowledge needed for them to develop a space mission, focused on the design of small satellite missions. ISE is divided in two: the first segment consists of lectures on the general knowledge needed for non-aerospace engineering students to develop a space mission, including fundamentals of astrodynamics, space engineering concepts, spacecraft subsystems and mission simulations. In the second stage, the students are guided through the NASA Systems Engineering method to develop a mission. This leads to a "Preliminary Design Review" of the design of a satellite or a constellation of satellites using TRL-9 hardware and proving the feasibility of the mission via simulations. A hard requirement for the mission is that it should be a proposal for a mission that creates a non-existing capability useful for a company or an institution in Costa Rica. Examples of missions developed are satellite systems to monitor ships in Costa Rica waters, or volcanoes monitoring, both with better time-resolution than current existing solutions. It is expected that due to the success of this course, a space engineering specialization consisting of three courses would be open as part of electronic engineering curriculum. Also, it is expected that ISE would be open for students from any career at TEC