

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

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DEVELOPMENT OF A CONCURRENT ENGINEERING TUTORIAL AS PART OF THE ESA\_LAB@  
INITIATIVE

**Abstract**

As part of the “ESA\_Lab@” initiative, a Concurrent Engineering (CE) facility has been constructed at the Mechanical Engineering department of Technical University Darmstadt. Concurrent Engineering is a well-proven concept for designing complex space systems and missions in the pre-phase 0/A mission phase. The CE methodology and processes are enabled by a multidisciplinary team and suitable infrastructure in terms of both hardware and software, which generate an effective and time efficient design management system.

The university’s “Concurrent Engineering Lab” (CEL) provides an environment for both researchers and students to explore and apply the Concurrent Engineering approach to areas such as (model-based) systems engineering, Industry 4.0/ Space 4.0, and space traffic management. Furthermore, collaboration with the European Space Operations Center (ESOC) – also located in Darmstadt – regarding the application of CE for ground segment & operations is planned.

The first addition to the university’s curriculum centered around the CEL will be a “Concurrent Engineering Tutorial”, an opportunity to introduce the Concurrent Engineering process as a hands-on experience to university students of the newly established Master’s degree programme “Aerospace Engineering”. Building on the lectures “Fundamentals of Space Systems” as well as “Space Systems and Space Operations”, the participating students can use their acquired knowledge to develop a preliminary design via CE for a predefined CubeSat mission. Planned is a week-long tutorial, offered as an elective block course, which will award participants 4 ECTS credits upon successful completion. This tutorial will not only provide a closer understanding of the individual subsystems of the space segment and of the CE process and the relevant software “COMET” by RHEA Group to the students, but also create a synergy with a student association of the university, as one of their projects is the development of a CubeSat.

This paper describes the background of and the approach to the development of the tutorial, in particular the structure of the re-usable model architecture in “COMET”, which was specifically derived and implemented for the tutorial, as well as validation results from a pilot study.