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SPACE EDUCATION AND OUTREACH SYMPOSIUM (E1)
ON TRACK - UNDERGRADUATE AND POSTGRADUATE SPACE EDUCATION (2)

Author: Dr. Jose I. Rojas
Universitat Politecnica de Catalunya (UPC), Spain

ROCKETRY EDUCATION FOR ENGINEERING STUDENTS THROUGH A PROBLEM-BASED LEARNING EXPERIENCE

Abstract

This paper describes an innovative Problem-Based Learning (PBL) experience for 3rd year undergraduate students of aerospace engineering. In this PBL experience, students work in teams (each student having a specific role) to design, simulate, build, certificate and launch a model rocket. Among others, the PBL experience involves two relevant steps: testing the rockets in a wind tunnel to assess their aerodynamic performances and the numerical resolution of the rocket motion equations using common software tools and control modelisation. The rocket is built using commonly available and easily obtainable materials. The certification process allows the students to test the robustness of their design and the compliance with the design requirements. The former are delivered by the educators, which assume the role of a customer company, at the beginning of the activity. The rockets carry a payload consisting of an on-board altimeter. A model rocket was also launched carrying a camera sending real-time images. After the launching, the payload is recovered and the students download and analyze the data acquired by the altimeters. Finally they compare the experimental results with the trajectory computed numerically to assess the accuracy of their simulations.

This experience, in which the students are the real and leading actors of their education, constitutes an example of how the classical structure of engineering and physics courses and education can be improved. Although the initial goal was teaching rocketry, we have found that this PBL experience has the added value of allowing students to develop improved research, self-learning, problem-solving skills and teamwork capabilities in a multidisciplinary approach. It is worth noting that, in general, students get rapidly and truly involved in the project. An improved education and motivation of the youth is of foremost importance for the human benefit and space exploration. Results and feedback from several editions of the experience, as well as future improvements and ideas, are reported too.