

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

Author: Dr. Jonathan Black
Air Force Institute of Technology, United States, jonathan.black@afit.edu

Dr. Eric Swenson
Air Force Institute of Technology, United States, eric.swenson@afit.edu

Dr. Richard Cobb
Air Force Institute of Technology, United States, richard.cobb@afit.edu

Dr. Bradley Ayres
The Aerospace Corporation, United States, bradley.ayres@afit.edu

GRADUATE SPACE VEHICLE DESIGN

Abstract

The U.S. Air Force Institute of Technology (AFIT) is the Air Force's technical graduate school, offering master's of science and PhD degrees. Recently AFIT adopted a new Space Vehicle Design (SVD) specialty class sequence consisting of three courses: Space Mission Analysis and Systems Design (Asys 531), Spacecraft Systems Engineering (Asys 631), and Satellite Design and Test (Asys 632). The new Asys 531 course teaches fundamental systems engineering approach to space mission design and requirements definition. Asys 631 focuses on satellite subsystems design and culminates in a final design review attended by external collaborators and sponsors. The June 2011 review (the first time AFIT held such a review) was attended by 30+ distinguished visitors from space organizations including NASA, Air Force Space Command, the U.S. Air Force Academy (USAFA), and the Air Force Research Laboratories. The SVD sequence concludes with Asys 632 giving students a unique immersive hands-on space hardware educational experience building and testing a functioning prototype satellite. This new specialty sequence is designed to produce the highest-quality space engineering graduates.

In addition to the unique immersive hands-on space hardware experience, graduate students are exposed to a union of experimental research and education. External organizations sponsor paper designs in Asys 631 and satellite prototypes in Asys 632. The results of the classes were used in MS theses, proposals for full flight experiments (two of which have been funded), and proposals for sponsorship of design projects and prototypes. The unique educational experience created by the merging of the immersive hands-on space hardware and sponsored flight experiments has led all sponsors of space students at AFIT to formally request that all students going to their organizations take this sequence.

The new Space Vehicle Design sequence has resulted in a custom AFIT satellite bus that is the baseline for all future AFIT flight experiments, and is being incorporated into USAFA's space hardware class. A satellite command and control ground station was developed enabling hands-on satellite flights for Asys 631 students. The ground station will also fly USAFA and AFIT space experiments. A copy of the ground station hardware and coursework was implemented at Vandenberg AFB for use in basic air force space education. The result is that all AF space officers leave with satellite flight experience.

This paper will detail AFIT's commitment to graduate space education and the innovations it is implementing to produce the next generation of space engineers.