

Distance
Learning

Small Satellite Engineering Graduate Certificate

Overview

The Department of Electrical and Computer Engineering, in collaboration with the Department of Systems Engineering and Operations Research, offers a graduate certificate in small satellite engineering with a focus on CubeSats. This certificate provides a broad understanding of small satellite missions and operations and of technologies for spacecraft design and engineering including satellite bus, hardware and software systems, and communications. A two-semester hands-on project course is included to transition theory into engineering practice in satellite and ground station engineering. Course work for the graduate certificate can be used for credit toward the MS in Electrical Engineering or Computer Engineering, or MS in Systems Engineering.

Who Should Enroll?

As satellite technology is evolving rapidly, the adoption of CubeSats for complex missions has gained widespread approval and is stimulating a transformation of the entire industry. The certificate's primary purpose is to provide a well-defined body of information for students who want to advance or update their knowledge in CubeSat technologies, but who do not necessarily wish to complete requirements for the MS degree.

Certificate Requirements

The certificate is awarded on completion of four required graduate courses (12 credits) in space systems. A cumulative GPA of 3.00 is required, and at most one course with a grade of C may be applied toward the certificate.

Coursework:

- ECE580 Small Spacecraft Engineering (3)
- ECE639 Satellite Communications (3)
- SYST682 Space Systems Engineering (3)
- ECE691 and ECE692 CubeSat Design/CubeSat Engineering (a two semester project course 1.5+1.5)

Program Delivery

The certificate program has been designed to meet the needs of working professionals. Hence, courses are offered in class and synchronously online; students can participate from a remote location or attend the class on campus. Video recordings of class lectures will be archived and available for viewing by enrolled students. One or two courses will be offered every semester; the time required to complete the certificate may vary from three to five semesters depending on individual circumstances.

Admissions

The graduate certificate is open to all students who hold BS degrees in science and engineering disciplines from accredited universities and can hold graduate status (either degree or non-degree) in the Volgenau School of Engineering. Students must be admitted to Mason's Graduate School to receive a graduate certificate.

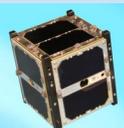
To apply:

<https://volgenau.gmu.edu/academics/graduate-programs>

Email: vsegadm@gmu.edu

Phone: 703-993-1512

For information on program content:
Contact Dr. Peter Pachowicz: ppach@gmu.edu



Course Catalog Descriptions

ECE580: Small Spacecraft Engineering (3 credits)

Comprehensive study of small spacecraft design, operations, bus, communications, computing hardware, software, sensors, power, attitude control, testing, and other topics needed for successful engineering of a spacecraft and its ground station. Review of ultra-small CubeSats, their hardware, software, and missions.

ECE639: Satellite Communications (3 credits)

Comprehensive study of satellite communication systems. Topics include link budget and quality of service considerations, basics of information transmission, digital modulation and demodulation, channel coding and coded modulation, multiple access, networking services for voice, broadcasting and Internet access over satellites, payload and reliability issues, and technological applications. Understanding of satellite system architectures, propagation link characteristics, key communication techniques, power and bandwidth requirements, and various satellite communications systems and applications.

SYST682: Space Systems Engineering (3 credits)

Overview of the scientific and engineering foundations of spacecraft systems and interaction among satellite subsystems. Topics include fundamentals on astrodynamics, power, communications, command and data handling, thermal management, attitude control, mechanical configuration, structures and launch systems. In addition to traditional instruction, a number of case studies and a team design project provide further breadth and exposure.

ECE691: CubeSat Design (1.5 credits)

First phase of a project course focused on design and early prototyping. Design and implementation of a project related to CubeSats, satellite communication ground and space systems, satellite bus modules, embedded hardware and software.

ECE692: CubeSat Engineering (1.5 credits)

Second phase of a project course dedicated to project implementation and testing. Design and implementation of a project related to CubeSats, satellite communication ground and space systems, satellite bus modules, embedded hardware and software.

Project Options

The ECE691/2 project course emphasizes practical hands-on aspects of satellite engineering. Projects cover a variety of topics so that students with different backgrounds and interests can select a project based on knowledge and skills. A list of projects will be made available. Students can also propose their own topics, or with a permission of an academic advisor, can propose a topic from their work environment. They can take an individual project or work on a team of two. ECE691 can be taken any time including summer. However, ECE692 is scheduled only for the Spring and Fall semesters.

