

Instructor: Peter Pachowicz, ppach@gmu.edu

Catalog course description

Advanced topics in satellite development life cycle, mission planning, operational considerations, satellite structure, bus architecture, and subsystems such as power, communications, on-board computing hardware and software. In depth study of lessons learned from CubeSat development, testing, and operations in space, as well as recommendations for the development practice, mission assurance, and required legal and technical compliances. Development executed through group design meetings, take-home designs/assignments, and/or in-house fabrication and testing.

Course format: Mix of lecture, seminars, design, development, and experimentation

Class topics:

NASA system development process; Mission planning; Satellite architecture design; CubeSat standards and systems; Electrical power system design; Ground segment and SatCom design; CubeSat and ground system antennas; Improvements to SatCom systems; Lessons learned from CubeSat design and operations plus recommended remedies for new designs; Satellite operational modes; CubeSat software development; High reliability software; Mission assurance; and other.

Seminar outline:

Seminars cover your own study of selected topics, reporting, and presentations. Each student will study one/two separate topics. One or more students may work on a team. An initial list of topics will be provided.

Scholarly paper:

You can complete your scholarly paper requirement during this course. Time needed for paper presentation will be provided.

Design, development, and experimentation:

As a class, depending on the number of students enrolled, we will design, fabricate and test a subsystem for Mason CubeSat. We will decide which system to focus on so such activity can be accomplished in a short period of time. Candidate systems include: electric power system, and attitude detection system. The design process will be carried by course instructor with the help of students. Development and experimentation will be performed in the ECE CubeSat Lab. Both EE and CpE students will play a role in this hands-on activity.

MasonSat:

We are pursuing two standards for MasonSat; 2p PQ (5cm cube standard), and 0.5U (10cm cube standard). Initial structural design has already been defined. These satellites have deployable solar panels and redundant antennas.

Textbook:

No formal textbook is required. All supporting materials will be available for download.

