ECE699
Small Satellite Development
(3:3:0)

Prerequisite: Minimum 9 credits already completed or POI
Recommended taking ECE590 Small Spacecraft Design & Eng before this class

Instructor: Dr. Peter W. Pachowicz
OH: Wed 1-2:30pm and by an appointment
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Course format: Lecture/Seminar and Hands-on workshop at about 60/40 ratio

Course description:
Advanced topics in satellite bus: structure, power, communications, on-board computing hardware and software. In-depth study and analysis of selected CubeSats. Hands-on workshop covering 2-3 projects for the development of a SmallSat bus and its ground station. Development executed through a group design meetings, take-home designs/assignments, and in-house fabrication and testing.

Lecture/Seminar outline:
I am currently developing slides and selecting topics to be covered. Candidate topics will primarily focus on practical aspects of small satellite and ground station development (based on selected examples: SwissCube, UWE-3) and foundations leading to these designs; and include:
- SmallSat mission, requirements, environment, system engineering, and testing
- PocketQube standard and structural design
- CubeSat power system - in-depth case study
- CubeSat on-board computing - in-depth study
- Satellite communications antennas for a ground station
- Modern CubeSat antennas

Hands-on workshop topics:
The following is a preliminary list of topics for group projects leading towards the development of a GMU PocketQube (PQ) and supporting ground station. The final selection will be based on
students' interest and include 2-3 projects. Projects will result in working prototypes and subsequent testing.

- PQ external and internal structure
- Power system for a 2U PQ using space graded solar cells
- Solar simulator station
- Dual-band TX antenna for a ground station
- SDR framework for a dedicated/custom ground station receiver

**NOTE:** *It is expected that the class will have a supporting role in our ThinSat project already qualified for launch in F’19.*

**Grading: (preliminary)**

- Design/analysis paper: 20%
- Design and development: 40%
- Final (will cover 3 topics): 40%

**Textbook:**

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