



Michigan**Engineering**

# Atmospheric, Oceanic and Space Sciences

## **Space Engineering Concentration Electives: Select any two courses\* (6 credit hours)**

### **Space Instrumentation (AOSS-584, 3 credit hours)**

Space science instrumentation is a discipline aimed at creating state-of-the-art sensors capable of measuring the environments of the Earth, the planets and their satellites, the Sun, and interplanetary space. AOSS 584 is a recently developed course that surveys the physical principles and engineering of instrumentation used throughout the many related fields of space science. Upon completion of the course students will have a firm grasp of the principles and techniques used to sense and measure photons, neutral gases, charged particles, and cosmic dust. After a review of methods, instrumentation, and vacuum technology, the laboratory section of the course will concentrate on the testing and characterization of prototype instruments for future Mars missions. The laboratory is equipped with a small (clean) high-vacuum facility, clean bench, modern electronic instrumentation, photon and particle sources, and optical benches (photon and charged particle).

### **Introduction to Remote Sensing and Inversion Theory (AOSS-585, 3 credit hours)**

Introduction to active (radar and lidar) and passive (thermal emission) visible, infrared and microwave remote sensing. Fundamentals of electromagnetic emission, absorption and scattering. Sensor performance characteristics. Mathematical methods for inversion of integral transforms and ill-conditioned systems of equations commonly encountered in remote sensing applications.

### **Geophysical Data Analysis (AOSS-468, 3 credit hours)**

A hands-on data analysis class that will introduce students to using real-world data sets. The course will cover a variety of subjects, including an introduction to basic plotting and data file types, plotting 1D, 2D, and 3D data sets, errors and missing data, regridding data, searches and sorts, fitting data, wave analysis, statistical analysis, numerical analysis, and using model output within a data framework.

*\* Students may petition the SGUS Program Director to substitute alternative concentration electives. The alternate course(s) should cover a topic or topics of significant current interest and activity in the field of Space Engineering. See Example Degree Plasma Electrodynamics and Sensors Program and Computer Control and Data Handling Program for two feasible alternative selections of concentration electives.*