MMAE 552 – Introduction to the Space Environment – Fall 2013

Course Description:
Overview of the space environment, particularly Earth's ionosphere, magnetosphere, and interplanetary space. Effects of solar activity on geospace variability. Basic plasma characteristics. Single particle motions. Waves in magnetized plasmas. Charged particle trapping in planetary magnetic fields, and its importance in near-earth-space phenomena. Macroscopic equations for a conducting fluid. Ground and space-based remote sensing, and in situ measurement techniques. Space weather effects on human-made systems. Pre-requisites: undergraduate course in electromagnetics, undergraduate course in fluid mechanics.

Prerequisites by Topic:

- Undergraduate electromagnetics
- Undergraduate fluid mechanics

Course Coverage:

- OVERVIEW OF SOLAR-TERRESTRIAL ENVIRONMENT

  Ionosphere, magnetosphere, interplanetary space, solar wind, sun. Effects of solar activity on geospace variability.

- FUNDAMENTALS OF PLASMA PHYSICS

  Basic plasma characteristics. Single particle motions. Waves in magnetized plasmas. Charged particle trapping in planetary magnetic fields, and its importance in near-Earth-space phenomena. Macroscopic equations for a conducting fluid.

- SPACE WEATHER MEASUREMENTS

  Ground and space-based remote sensing. In situ measurement techniques. Space weather effects on human-made systems.

- SPECIAL TOPICS

  Subject to time availability: Geospace environment models. Data assimilative techniques.

Computer Usage:

Use of MATLAB (or similar programming environment) may occasionally be required.

References:

Bittencourt, J., *Fundamentals of Plasma Physics*, 3rd Edition, Springer, 2004.

Tascione, T., *Introduction to the Space Environment*, 2nd edition reprint, Krieger, 2010.

Walt, M., *Introduction to Geomagnetically Trapped Radiation*, Cambridge, 2005.