

EE/AERSP 472 – Space Astronomy and Introduction to Space Science

Designation: EE elective course for electrical engineering majors.

University Bulletin Description: EE 472 (AERSP 492) (3) The physical nature of the solar system, the Earth's atmosphere, ionosphere, radiation belts, magnetosphere, and measurements of their properties by remote sensing, balloon, rocket and satellite probes are examined.

Prerequisite: EE 330.

Prerequisites by Topics:

1. Understanding of the basic properties of ER&M fields.
2. Understanding of the characteristics of radiation.
3. Understanding of particle dynamics (mechanics) of PHYS 211.

Textbook/Required Materials:

Introduction to the Space Environment, 2nd Edition, T. F. Tascione, Orbit Book Company, 1994 and Course Notes provided by instructor.

Learning Outcomes:

The goal of this course is to introduce students to the fundamental understanding of the important topics in space science. The course will provide a background to the space environment, the basics of astronomy, the properties and physical/chemical processes of the atmosphere, ionosphere, magnetosphere, sun, trapped particle belts, solar wind and related topics. The depth will be sufficient to allow a beginning engineer or scientist to account for the basic properties needed while designing an instrument for operation in space or analyzing results from space based sensors. A major goal is to excite the creative ideas of students for the engineering and scientific challenges of space exploration.

Topics:

1. The Universe
2. Astronomy
3. E&M Fields and Plasma Physics
4. Solar Physics
5. Solar Wind
6. Geomagnetism
7. Magnetosphere
8. Neutral Atmosphere
9. Ionosphere
10. Ionospheric Variability
11. Radiowave Propagation
12. Communications
13. Spacecraft Operations
14. Spacecraft and Instrument Design
15. The Role of a Project Engineer

Class/Laboratory Schedule: Three 50-minute lectures and one 3-hour laboratory per week.

Computer Usage: Students prepare and present a PowerPoint lecture to the class on their project which is rated by each class member.

Laboratory Projects/Assignments: Two "Astronomy Night" laboratories are held to introduce the students to the constellations, planets and their moons, other galaxies, and our moon using four telescopes belonging to the instructor.

Contribution to Meeting the Requirements of Criterion 5. Curriculum:

This course contributes to both the engineering topics and design components.

The course emphasizes and seeks to challenge the creative ideas of the student through the emphasis on the many exciting aspects of space exploration in lectures and project activity during the semester. The course prepares students for project work on one of the several space related projects in the Student Space Projects Laboratory (SSPL), and for advanced projects in the space physics area in several departments of the university (for example EE581)

Relationship to Program Outcomes:

- O.1.1. Graduates will possess mathematics skills necessary for electrical engineering.
- O.1.2. Graduates will have a theoretical and practical background in both physics and chemistry.
- O.2.4. Graduates will understand fundamental electricity and magnetism concepts and be able to use them in applications.
- O.3.1. Graduates will have in-depth technical knowledge in one or more areas of specialization.
- O.3.2. Graduates will have practical understanding of the major electrical engineering concepts and demonstrate application of their theoretical knowledge of the concepts.
- O.4.1. Graduates will interact with industry both within and outside of a classroom setting.
- O.4.2. Graduates will develop an appreciation of continuing educational and professional development.
- O.5.1. Graduates will have good teamwork skills.
- O.5.2. Graduates will possess good oral and written communication skills.
- O.6. Graduates will appreciate their role as engineers in society.

Prepared by: C. Russell Philbrick

Date: 29 March 2008