

**The University of Texas at El Paso
College of Engineering
Department of Mechanical Engineering
Syllabus**

Course Prefix and Number: AERO 4353

Course Title: Spacecraft Environments

Credit Hours: 3

Prerequisite Courses:

MATH 2326: Differential Equations and PHYS 2420: Physics I or equivalent both with C or better.

Course Description:

The environment that a spacecraft must operate on is very different to the standard environment on the surface of the Earth that we are used to operating in. The spacecraft environment begins during construction and testing, and carries through into launch, operation in space, and end of life. This course will give you an overview of all facets of the space environment, and introduce you to environmental considerations affecting spacecraft design and operation.

Learning Outcomes:

- Understand the fundamentals of the spacecraft environment
- Apply the fundamental knowledge to specific regimes of space and systems of spacecraft
- Evaluate how the space environment effects mission and spacecraft design

Required Materials: All required materials will be provided. Recommended textbook is:

Pisacane, V., *The Space Environment and Its Effects on Space Systems*, AIAA Educational Series, ISBN 978-1-56347-926-7

Course Schedule:

Week 1	Solar	The influence of the Sun throughout the Solar System
Weeks 2-3	Vacuum	Effects of the low pressure environment including outgassing and contamination
Weeks 4-5	Neutrals	Considerations due to individual neutral gas particles such as atomic oxygen and sputtering
Weeks 6-7	Particulate	Probability and extent of damage from micro-meteoroids and orbital debris
Weeks 7-9	Radiation	Electromagnetic, neutral particle, and charged particle radiation.
Weeks 10-12	Plasma	Impact of charged particles on spacecraft operation and design, spacecraft charging and arcing.
Weeks 13-14	Thermal	Regulation of spacecraft temperature in various thermal environments, with a focus on thermal radiation.
Week 15	Launch	Environmental considerations both before and during launch. Qualification testing for spacecraft.