Objectives for Orbital Mechanics
Sept 2017

Course Goal:

Because the design of an orbit determines a spacecraft's access and proper access is a requirement for mission success, knowledge of orbital mechanics is essential to understanding the potential capabilities and limitations of space systems. The overall goal of this course is to introduce you to the basic physics of orbital mechanics, as well as the characteristics used to describe various types of orbits.

Module 1: Laws of Physics Governing Orbital Mechanics

TO: Explain how and why a satellite stays in orbit

- Define the term orbit
- Explain how the balance between Gravity and Velocity enables a satellite to stay in orbit
- Summarize Kepler's three Laws of Motion

Module 2: Characteristics of Orbits

TO: Characterize a satellite's orbit by its altitude, eccentricity, inclination, and reference points on the ground

- Define the reference points on the ground that describe an orbit
- Define eccentricity and list the effects of an orbit's eccentricity
- Explain the effects of altitude on a satellite's orbit
- Define the inclination of an orbit and list the effects of an orbit's inclination
- List and describe the types of orbits as defined by inclination
- Explain the impact of launch point and direction on the orbit of a satellite

Module 3: Common Orbit Types

TO: List and describe the common types of orbits used by man-made, earth orbiting satellites

- Describe the characteristics, pros and cons, applications, and variations of the Low Earth Orbit (LEO)
- Describe the characteristics, pros and cons, and applications, and variations of the Medium Earth Orbit (MEO)
- Describe the characteristics, pros and cons, and applications of the Highly Elliptical Orbit (HEO)
- Describe the characteristics, pros and cons, applications, and variations of the Geosynchronous Orbit (GEO)
- Describe the characteristics, pros and cons, and applications of the tundra orbit

Module 4: Classical Orbital Elements

TO: Describe a satellite's orbit by viewing the Two Line Element (TLE) set

- Define Orbital Nodes, Right Ascension of the Ascending Node, Argument of Perigee, and True Anomaly
- List and define the six classical orbital elements
- Locate the orbital elements on the TLE set for a given satellite.