

Aerospace Engineering
Level and Major: Undergraduate

Division:

Course Title: Orbital Mechanics
Lecturer: Dr. Naghash

Number of Credits:

Prerequisite

Course Description:

In this elementary course the physics and basics of orbits in space are described. Gravity effects between two bodies and other external forces for translational motion of bodies are explained. In this course a body motion is modeled as point mass in space and only translational motion is discussed. Since this is the only course in BS program in aerospace engineering in this area, some rigid body motion is discussed as well.

Course Topics:

1) Introduction

- a. Background
- b. Different orbits and satellites
- c. Kepler's laws

2) Two body problem- Conical Sections

- a. Kepler's equation and its solution
- b. Classical Orbital Elements, Time on elliptical and hyperbolic orbits
- c. canonical units

3) Orbit Transfer

- d. Orbit plane change
- e. Hohmann Transfer
- f. Transfer to Geosynchronous orbit
- g. Non-Hohmann transfer
- h. Rendezvous

4) Planetary trajectories

- a. Earth to Mars Transfer
- b. Sphere of influence

5) Satellite rotational Dynamics

- a. Euler equations
- b. Axial symmetry rotation without torque
- c. Spin stability around a principle axis

6) Summary of satellite disturbance

7) Gravity gradient torque disturbance and its effect on Euler equations

8) Attitude control of a satellite in brief

Evaluation: