THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING

Orbital Mechanics for Engineers

AEROENG 5626

Credit Hours:
3.00

Course Levels:
Undergraduate (1000-5000 level)
Graduate (5000-8000 level)

Course Components:
Lecture

Course Description:
Introduction to orbital mechanics with orbit determination techniques, orbital maneuvers and lunar and interplanetary trajectories.

Prerequisites and Co-requisites:
Prereq: 3520 (520) and MechEng 2030 (430).

Course Goals / Objectives:
- Educate students about fundamentals of orbital mechanics.
- Enable students to use basic tools of orbit determination.
- Train students to analyze and design orbital trajectories for various space missions.

Course Topics:

- Introduction and Review of Two Body Orbital Motion
- Orbital Position and Velocity as a function of Time (Time of Flight) including Universal Formulation of Time of Flight
- Orbital Elements; Effects of Earth’s Oblateness and Ground Tracks
- Basic Orbital Maneuvers
- Lunar Trajectories
- Basics of Interplanetary Trajectories
- Orbit perturbations: special and general perturbations, numerical integration methods
- Initial orbit determination: range-azimuth-elevation observations, angles only observations, mixed observations; three position vectors and time; two position vectors and time
- Orbit determination and estimation I : linear and nonlinear least squares estimation
- Orbit determination and estimation II : sequential-batch least squares, Kalman filtering Applications and practical considerations via ODTK (Orbit Determination Tool Kit)

Designation:

Elective