AA 310 COURSE DETAILS

TITLE:	Orbital and Space Flight Mechanics
CREDITS:	4
FORMAT & SCHEDULE:	Lecture, 4 hours / week
FACULTY CONTACT:	Mehran Mesbahi

COURSE DESCRIPTION (Catalog Short Form, 50 words Max):

Newton's law of gravitation. Two-body problem, central force motion, Kepler's laws. Trajectories and conic sections. Position and velocity as functions of time. Orbit determination and coordinate transformations. Rocket dynamics, orbital maneuvers, Hohmann transfer. Interplanetary trajectories, patched conics. Planetary escape and capture. Gravity assist maneuvers.

COURSE OVERVIEW & LEARNING OBJECTIVES:

The topics that we will cover in this course include: two body problem, central force motion, Kepler's Laws, conic sections, orbit determination, rocket dynamics, orbital maneuvers, Hohmann transfer, interplanetary trajectories, and depending on time/students' interest, spacecraft attitude dynamics or restricted three-body problem. Course Objectives:

1. Students will have a general understanding of space flight systems and how different engineering disciplines contribute to the success of missions, both in near-Earth orbit and interplanetary orbits.
2. Students will understand the application of Newton's laws for particles and show skill in applying them to model spaceflight trajectories.
3. Students will understand the application of modern computational tools for the calculation of spacecraft motion.

COURSE REQUIREMENTS

PREREQUISITES: M E 230

REQUIRED TEXTBOOK: *Orbital Mechanics for Engineering Students*, 3rd ed by H. D. Curtis, Elsevier

COURSE SCHEDULE

Topics
Mathematics and physics background, notation and basic concepts
Two-body problem, Kepler’s laws
Geocentric orbits, orbit shaping, orbital transfers
Orbital elements, orbit determination
Interplanetary missions, sphere of influence, patched conics
Rocket equation, staging
Relative motion
Restricted three-body problem
Spacecraft attitude dynamics