**MAE 4060: Introduction to Spaceflight Mechanics**

**Course (catalog) description:** Fall. 3 credits.

Introduction to spacecraft orbit mechanics, attitude dynamics, and the design and implementation

of spaceflight maneuvers for satellites, probes, and rockets. Topics in celestial mechanics

include orbital elements, types & uses of orbits, coordinate systems, Kepler’s equation, the

restricted two-body problem, interplanetary trajectories, the rocket equation and staging,

Clohessy-Wiltshire equations and relative formation flight, drag and orbital decay, and

propulsive maneuvers. Topics in attitude dynamics include kinematics, Euler’s equations,

stability of spinning spacecraft, attitude perturbations such as gravity-gradient and magnetic

torques, equations of motion of rigid spacecraft with momentum actuators and thrusters, attitude

maneuvers such as nutation control and reorientation, low-speed fluid behaviors, and elementary

feedback control of linearized attitude and orbit dynamics. Principles of spacecraft propulsion

technology and attitude-control technology are introduced. Discussions of current problems and

trends in spacecraft operation and development.

**Prerequisite(s):** MATH 2930, MATH 2940, and MAE 2030, or permission of instructor.