AE 6353: Orbital Mechanics
Course Syllabus

1. Course Introduction (1 hr.)

2. Orbital Mechanics (5 hrs.)
   - 2.1 Newton's law of gravitation, N-body problem, Two-body problem
   - 2.2 Two-body orbital mechanics (Kepler's Laws, conic section orbits)
   - 2.3 Orbital elements
   - 2.4 Conservation of angular momentum and energy
   - 2.5 Earth orbits (LEO, GEO, etc.)

3. Orbit Determination (7 hrs.)
   - 3.1 Reference frames
   - 3.2 Determination of orbital elements from position and velocity
   - 3.3 Determination of position and velocity from orbital elements
   - 3.4 Spacecraft ground tracks and special orbits (LEO, GEO, SSO, Molyniya)

4. Orbital Maneuvers (3 hrs.)
   - 4.1 Orbit shaping and orbit transfer (ΔV's, Hohmann transfers)
   - 4.2 Orbital plane change

5. Kepler's Problem: Time of Flight (4 hrs.)
   - 5.1 Time-of-flight for elliptic orbits (mean anomaly, eccentric anomaly)
   - 5.2 Time-of-flight for parabolic orbits
   - 5.3 Time-of-flight for hyperbolic orbits

6. Gauss' Problem: Intercept & Rendezvous (5 hrs.)
   - 6.1 Lambert's theorem
   - 6.2 p-iteration technique
   - 6.3 Universal variable formulation
   - 6.3 Mission design

7. Interplanetary & Lunar Trajectories (12 hrs.)
    - 7.1 Phase angle and synodic period
    - 7.2 The patched conic approximation (spheres of influence)
    - 7.3 Planetary departure and capture; Interplanetary trajectories
    - 7.4 Gravity assist maneuvers
    - 7.5 Simple lunar transfers
    - 7.6 Lunar free-return trajectories
    - 7.7 The restricted 3-body problem as applied to lunar transfer

8. Special Topics (4 hrs.)
    - 8.1 Orbital rendezvous
    - 8.2 Space navigation

*4 hours reserved for in-class midterms, semester break, or guest lectures