

Outline

The n-Body Problem

- equations of motion
- the two-body problem
- the elliptic orbit
- parabolic, hyperbolic, and rectilinear orbits
- energy of the orbit

Position in Orbit as a Function of Time

- solution for the eccentric anomaly-successive approximation methods
- the f and g series
- universal variables

The Orbit in Space

- orbital elements
- determining the orbit elements from \mathbf{r} and \mathbf{v}

The Three-Body Problem

- equations of motion
- equilibrium (Lagrange) points
- stability of the Lagrange points
- energy integral; Hill's limiting surfaces

Lambert's Problem

- Lambert's theorem
- properties of the solution
- applications

Rocket Dynamics

- the rocket equation
- solution in field-free space
- solution with external forces
- advantages of staging
- optimal staging

Impulsive Orbit Transfer

- two-impulse transfer between circular orbits
- the Hohmann transfer
- coplanar extensions of the Hohmann transfer
- noncoplanar extensions of the Hohmann transfer

Interplanetary Mission Analysis

- sphere of influence
- patched-conic approximation
- planetary flyby (gravity assist) trajectories

Perturbation

- the perturbation equations (Gauss form)
- effect of atmospheric drag
- effect of Earth oblateness
- effect of third body (Moon or Sun) on GEO satellite

Linear Orbit Theory

- local reference frame
- derivation of the CW equations
- special solutions