

# AE 415/713 : Spaceflight Mechanics

- Course Outline

- Two-body problem
  - \* Kepler's laws of planetary motion
  - \* Conic sections
  - \* Orbit determination from initial conditions
  - \* Three-body problem
- Orbital maneuvers
- Rocket performance
  - \* Rocket equation
  - \* Multistaging
  - \* Optimal multistaging
  - \* Rocket trajectories
- Attitude Motion
  - \* Rotational kinematics
  - \* Euler's equations
  - \* Motion of a torque-free rigid body
- Attitude Control

- Text: W. E. Wiesel, *Spaceflight Dynamics*, McGraw-Hill International Edition, 1997, on reserve in the study section.

- References:

- J. W. Cornelisse et al *Rocket Propulsion and Spaceflight Dynamics*, 1979, on reserve.
- B. Wie, *Space Vehicle Dynamics and Control* 1992.
- M. J. Sidi, *Spacecraft Dynamics and Control*, 1997.
- M. H. Kaplan, *Modern Spacecraft Dynamics and Control*, 1976, on reserve.
- J. B. Kuipers, *Quaternions and Rotation Sequences*, 1999, on reserve.
- P. C. Hughes, *Spacecraft Attitude Dynamics*, 1986.
- W. T. Thomson, *Introduction to Space Dynamics*, 1961, on reserve.
- R. R. Bate et al, *Fundamentals of Astrodynamics*, 1971.

- Evaluation

Quizzes	25 %
Midsem	30 %
Endsem	40 %
Class participation	5 %

- Some exams/tests/quizzes may be open notes. For such exams, only notes written in one's own handwriting will be allowed. Photocopies will not be allowed.