MAE 462: Space Vehicle Dynamics and Control

Syllabus
Instructor: M. Peet
Meeting Time: TTh 6:00-7:15 in SCOB 152 (Schwada 152)
Office Hours: TTh 11:00-12:00 in ERC 253

Volunteer Teaching Assistant  Reza Kamyar. Office GWC 543.

Grader  TBD


Textbook  The textbook is “Orbital Mechanics” by J. E. Prussing and B. A. Conway. This book has several important errata which should be corrected prior to use. For a list or errata, see https://netfiles.uiuc.edu/prussing/www/Errata.11.03.pdf. This is an entry-level textbook. Anyone wishing to pursue the topics we cover in more depth should refer to “Fundamentals of Astrodynamics and Applications” by D. A. Vallado. There is no textbook for the attitude dynamics portion of this course. However, students may consult “Spacecraft Attitude Dynamics” by P. C. Hughes - an inexpensive Dover publication.

Schedule  Class will meet TTh 6:00-7:15. There will be a mid-term examination and a final examination. Assignments will be given approximately bi-weekly. Exception: I will be teaching a short class in Grenoble, France from January 29 - February 5. During this time, I will attempt to arrange substitute lectures.

Prerequisites  MAE 318 with a grade of ‘C’ or better.

Format  Lectures will utilize a constantly-evolving set of LaTeX slides. The slides developed in previous years can be found online at my website http://control.asu.edu under the classes heading - MMAE 441. As a new set of slides is developed, these will be posted on Blackboard.

Blackboard  Lecture Notes will be posted on Blackboard, along with all assignments and supplementary material. Grades will also be posted on blackboard.

Evaluation  Homework will be the basis for 30% of the grade. Problem sets will be given on a bi-weekly basis. Late homework will be graded for 50% credit. Submit late homework directly to the TA. An in-class midterm and an in-class final exam will be given, each for 35% of the grade. Note: These percentages are approximate and are subject to change based on performance. Grade distribution is at the discretion of the instructor.

Honest Policy  Collaboration on exams will result in an F for the course. Copying of homework or duplication of material found online will result in a “0” on the homework and a referral to the ASU office of academic integrity. Reminder: Two referrals to the office of academic integrity is grounds for expulsion from the university. If in doubt about a specific case, ask me.
**Classroom Behavior**  Disruptive noises are not allowed.

**Violence**  See the Student Services Manual, SSM 10402, Handling Disruptive, Threatening, or Violent Individuals on Campus

**Disabilities**  A reminder to students that when requesting accommodation for a disability, they must be registered with the Disability Resource Center (DRC) and submit appropriate documentation from the DRC

**Lectures**  Lectures will cover the following topics.

Lecture 1 - History of Orbital Mechanics  
Lecture 2 - The N-body problem: Invariants  
Lecture 3 - The Two-Body Problem: Elliptic Orbits  
Lecture 4 - Position and Velocity  
Lecture 5 - Hyperbolic Orbits  
Lecture 6 - The Orbital Plane  
Lecture 7 - Converting to and from \( r \) and \( v \)  
Lecture 8 - Relative Motion  
Lecture 8 - Rocketry: \( \Delta v \)  
Lecture 9 - Impulsive Orbital Maneuvers  
Lecture 10 - Targeting  
Lecture 11 - Targeting  
Lecture 12 - Bi-elliptics and Out-of-Plane Maneuvers  
Lecture 13 - Orbit Perturbations  
Lecture 14 - The Effect of a Non-Spherical Earth  
Lecture 15 - Interplanetary Mission Planning  
Lecture 16 - Orbit Determination  
Lecture 17 - Rigid-Body Dynamics  
Lecture 18 - Torque-Free Motion  
Lecture 19 - Stabilization