

AE 403: Spacecraft Attitude Control
Spring 2014 • CRN# 29973 • 3 units

Department of Aerospace Engineering
University of Illinois at Urbana-Champaign

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Time and Location

Tue/Thu 15:30-16:50PM, Talbot 225A

Course Description

Theory and application of spacecraft attitude dynamics and control; Euler angles, direction cosines, quaternions and Gibbs-Rodrigues parameters; attitude sensors and control actuators; spin, three-axis active, reaction wheel, control moment gyro, gravity gradient control systems; environmental effects.

Required Texts

None

Recommended Texts

On reserve:

- Space Vehicle Dynamics and Control (B. Wie, 1998 - 629.41w634s)
- Spacecraft Attitude Dynamics and Control (V. A. Chobotov, 1991 - Q 629.4742 C451s)
- Modern Spacecraft Dynamics and Control (M. H. Kaplan, 1976 - 629.45 K14m)
- Spaceflight Dynamics (W. Wiesel, 1997 - 629.411w637s1997)
- Spacecraft Attitude Determination and Control (J. R. Werz, 1978 - 629.4742Sp11)

Others:

- Orbital Mechanics for Engineering Students (H. D. Curtis)
- A Mathematical Introduction to Robotic Manipulation (R. M. Murray, Z. Li, and S. S. Sastry)
- Spacecraft Attitude Dynamics (P. C. Hughes)

Topics (subject to change)

- Kinematics (9 days).
- Rigid-body dynamics (9 days).
- Feedback control (9 days).
- Application to spacecraft (hardware, sensing, environment, etc.) will be an ongoing topic.

Grading

30% Homework.
30% Midterm exam
40% Final exam

Conflicts with Exams

If you have a serious problem and cannot take an exam at the normal time, you must contact me at least two weeks in advance and take the exam early.

MATLAB

Several homework problems will require the use of MATLAB (or a similar computational tool of your choice). At this stage in your career, you are expected to have some experience with MATLAB already. If you need help, consult either the documentation (type “doc” at the MATLAB command prompt) or a reference like *Getting Started with MATLAB 7: A Quick Introduction for Scientists and Engineers* (Rudra Pratap, Oxford University Press, 2006). See the website <http://www.mathworks.com/support/books/book11696.html>.