

## **AE 403: Spacecraft Attitude Control**

Spring 2008 • CRN# 29973 • 3 units  
<http://www.ae.uiuc.edu/~tbretl/ae403/>

Department of Aerospace Engineering  
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Office Hours: Wed 2-5PM

### **Time and Location**

Tu/Thu 12:30-1:50PM, 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)

### **Topics**

- 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** (no curve: A+ 97-100, A 93-97, A- 90-93, B+ 87-90, ... , D- 63-60, F < 60)

- 5% "Scribing" three lectures.
- 25% Homework.
- 30% Midterm exam (in class on Thursday, March 13).
- 40% Final exam (7-10PM on Wednesday, May 7).

## **Homework Policy**

Assignments will be approximately weekly. Homework is due at the start of class. Late homework will be penalized 10% per calendar day. (So if homework is due Tuesday, handing it in at 5PM gets you -10%, handing it in at 9AM the next morning gets you -20%.) No homework will be accepted after graded homework is returned.

## **Conflicts with Exams**

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

## **“Scribing” Lectures**

My own notes are rough and will not be posted. Each of you will be responsible for taking careful notes on three days, and for emailing me those notes (either typed or clearly handwritten and scanned) within 48 hours. Scribed notes will be graded on a credit/no-credit basis.

## **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>.