

# Spacecraft Attitude Dynamics

EAS 6403

**Class Periods:** MWF, 4<sup>th</sup> Period (10:40-11:30)

**Location:** NEB 102

**Academic Term:** Fall 2025

## **Instructor**

Norman Fitz-Coy

Email: nfc@ufl.edu

Office Phone: 352-392-1029

Office Hours: MW 7<sup>th</sup> period; in person (NEB 451) or online via Zoom

## **Teaching Assistant/Peer Mentor/Supervised Teaching Student**

- N/A

## **Course Description**

To rigorously develop the concepts, mathematical procedures, and methods associated with defining, determining, and controlling the attitude of a spacecraft. Specifically, the student will develop the theoretical background necessary to pursue research in the field of Spacecraft Attitude Dynamics.

## **Course Pre-Requisites / Co-Requisites**

A fundamental knowledge of vector dynamics, matrix algebra, and computer programming skills or consent of the instructor.

## **Course Objectives**

Upon completion of the course, student will develop the theoretical background necessary to pursue research in the field of spacecraft attitude mechanics.

## **Required Textbooks and Software**

- Spacecraft Attitude Dynamics, by Peter C. Hughes, Dover Publications, ISBN: 978-0486439259 (ISBN-13) or 0486439259 (ISBN-10)

## **Recommended Textbooks**

- Fundamentals of Spacecraft Attitude Determination and Control, F. Landis Markley and John L. Crassidis
- Analytical Mechanics of Space Systems, by Hanspeter Schaub and John Junkins
- Spacecraft Dynamics and Control: A Practical Engineering Approach, by Marcel J. Sidi
- Archival papers (Shuster)
- Spacecraft Attitude Determination and Control, Edited by James R. Wertz
- Spacecraft Attitude Dynamics and Control, by Vladimir A. Chobotov
- Space Vehicle Dynamics and Control, by Bong Wie

## **Course Schedule**

- Week 1-3: Attitude variables (direction cosines, Euler angles, axis-angle, Euler parameters, Rodrigues parameters, Modified Rodrigues parameters)
- Week 4-6: Kinematics of angular motion
- Week 6-8: Dynamics of free rigid bodies
- Week 9-11: Environmental forces and torques
- Week 11-12: Effects of energy dissipation on externally torque-free attitude motion

- Week 13-14: Stabilization techniques (spin stabilization, dual-spin stabilization, gravity gradient stabilization)
- Week 14-15: Attitude determination techniques
- Week 14-15: Active attitude control devices and strategies

**Important Dates**

Oct – Midterm Exam (date to be defined in class)

Dec 10 – Final Exam (Group D) (3:00 – 5:00 PM in NEB 102)

**Evaluation of Grades**

Assignment	Total Points	Percentage of Final Grade
Midterm Exam	100	50%
Final Exam	100	50%
		100%

Homework problems will be assigned to provide a basis for understanding of the material; they shall not be a part of your course grade. It is strongly recommended that you work on these homework problems to gain meaningful insights into the course material.

**Grading Policy**

Percent	Grade
90.0 - 100.0	A
87.0 - 89.9	A-
84.0 - 86.9	B+
81.0 – 83.9	B
78.0 - 80.9	B-
75.0 - 77.9	C+
72.0 – 74.9	C
69.0 - 71.9	C-
66.0 - 68.9	D+
63.0 - 65.9	D
60.0 - 62.9	D-
0 - 59.9	E

More information on UF grading policy may be found at: [UF Graduate Catalog](#) and [Grades and Grading Policies](#)

**Attendance Policy, Class Expectations, and Make-Up Policy**

Class attendance is not mandatory, but students are strongly encouraged to attend all lectures. When in class, however, ALL personal communication devices (cell phones, etc.) must be turned off (or in silent mode).

Excused absences must follow university policies in the Graduate Catalog and require appropriate documentation (<https://catalog.ufl.edu/graduate/regulations>). Additional information can be found here: <https://gradcatalog.ufl.edu/graduate/regulations/>.

**Academic Policies & Resources**

To support consistent and accessible communication of university-wide student resources, instructors must include this link to academic policies and campus resources: <https://go.ufl.edu/syllabuspolicies>. Instructor-specific guidelines for courses must accommodate these policies.

***Commitment to a Positive Learning Environment***

The Herbert Wertheim College of Engineering values varied perspectives and lived experiences within our community and is committed to supporting the University's core values.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:

- Your academic advisor or Graduate Coordinator
- HWCOE Human Resources, 352-392-0904, [student-support-hr@eng.ufl.edu](mailto:student-support-hr@eng.ufl.edu)
- Pam Dickrell, Associate Dean of Student Affairs, 352-392-2177, [pld@ufl.edu](mailto:pld@ufl.edu)