ASEN 3200
Orbital Mechanics / Attitude Dynamics and Control
Spring 2020

Instructor (1st half): Dr. Natasha Bosanac
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Office Hours: Monday 11:00am-12:00pm, Wednesday 11:00am-12:00pm, during Friday labs

Instructor (2nd half): Dr. Daniel Scheeres
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Office Hours: TBD

Lectures: MW 2:00 – 3:15pm, AERO 120
Labs: F 8:30-10:20am (AERO 141), F 1:30-3:20pm (AERO N100)

Exam Dates:
Orbital Mechanics: 02/10 (in class), 03/04 (in class)
Attitude Dynamics and Control: Date for quiz is TBD (likely either 4/6 or 4/8 in the evening); final will be scheduled during regular final exam period

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Course Assistants:
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TA Office Hours:
Monday: 4pm-5pm in AERO 302
Tuesday: 1pm-2pm in AERO 302; 4pm-5pm in AERO 302
Wed 0. 02-esday:

understanding of these natural 3D rigid body kinematics and dynamics, using this to discuss common methods of passive and active attitude control. Attitude sensor and actuator technology will be investigated, as well as common ways of representing and determining attitude. On the topic of rigid body kinematics, the goal is for the student to be comfortable with a small sub-set of attitude representations such as the DCM and the 3-2-1 Euler angles, and make them at least aware of other set of coordinates such as other Euler angle sequences and the Euler parameters (quaternions). On the topic of rigid body dynamics, the goal is to expose the students to repeated uses of Euler's equation and the angular momentum vector to develop the system equations of motion. On the topic of control, the goal is to show students how simple open-loop and closed-loop flow diagrams can be created, and how to use the frequency space modeling methods to develop single-input-single-output linear controls. This is applied to 1-D constrained rotational motion only.

Lab experiments will be conducted to measure spacecraft mass properties, understand the operation of gyroscopic instruments, and design feedback control to achieve precise spacecraft pointing. In these labs, the goal is for students to receive hands-on opportunities to see the complex dynamic interactions that can occur with spinning rigid bodies, or even gyroscopic systems.

Homework Policy:

Please note the following policies regarding completing and turning in your homework:

- For grading purposes, homework is considered part of the group grade and only contributes to the total grade when the individual work is C or better.
- Collaboration is permitted on homework. You may discuss the means and methods for formulating and solving problems and even compare answers, but you are not free to copy someone's assignment. Copying material from any resource (including solutions manuals) and submitting it as one's own is considered plagiarism and is an Honor Code violation. Remember, the less you think about the problems yo

Grading Policy:

In an effort to ensure that each student leaves the class with a fundamental understanding of the topics covered in this course, the final grades will be heavily weighted on each student's individual performance. That is, if a student does not pass the individually graded aspects of the course, they will not pass the class overall. Keeping this in mind, the final grades will be determined as shown in Tables 1 and 2.

Table 1: Course Grade Percentages if the student achieves an overall grade of C or better on all exams.

All Homework: 15%
Orbital Quiz: 10%
Orbital Final Exam: 15%
Attitude Quiz: 10%
Attitude Final Exam: 15%
Lab Experiments: 30%
Research Projects: 5%

Table 2: Course Grade Percentages if the student achieves an overall grade less than a C on all exams.

Orbital Quiz: 20%
Orbital Final Exam: 30%
Attitude Quiz: 20%
Attitude Final Exam: 30%

Accommodations for Disabilities:

If you qualify for accommodations because of a disability, please submit your accommodation letter from Disability Services to your faculty member in a timely manner so that your needs can be addressed. Disability Services determines accommodations based on documented disabilities in the academic environment. Information on requesting accommodations is located on the Disability Services website. Contact Disability Services at 303-492-8671 or dsinfo@colorado.edu for further assistance. If you have a temporary medical condition or injury, see Temporary Medical Conditions under the Students tab on the Disability Services website.

Religious Observances:

Campus policy regarding religious observances requires that faculty make every effort to deal reasonably and fairly with all students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance. In this class, please alert the instructors about any possible conflicts you potentially foresee during the first week of class. Early knowledge of possible conflicts will enable us to plan appropriately with you. See the campus policy regarding religious observances for full details.