ASEN 6080: Statistical Orbit Determination
Syllabus, Spring 2022

Lecture: Tuesdays & Thursdays, 10:05-11:20am in AERO N244

Instructors

Prof. Marcus Holzinger
Office: AERO 457 / Email: marcus.holzinger@colorado.edu
Office Hours: Thursdays, 1:00pm-2:00pm

Course Website

https://canvas.colorado.edu

This semester we will be using Canvas, CU Boulder's learning management system. We will be using Canvas for posting all class information (assignments, notes, slides); work will also be turned in and returned through this site. There will also be a discussion board that will be used.

To access Canvas, go to: https://canvas.colorado.edu. Log-in using your CU login name and IdentiKey password.

Once you log-in, click on ASEN6080 to go into our course.

Make the most out of Canvas by downloading the Canvas Student App to view your grades, view course materials, submit assignments, take quizzes, and more.

Subscribe to notifications to be reminded of due dates, receive announcements, and grades. Browsing the Canvas Guides or help videos for information on how to use Canvas. If you run into any problems, click the Help Icon within Canvas to report a problem or chat 24x7 with Canvas Support.

For additional assistance, contact the IT Service Center at help@colorado.edu or 303-735-4357.

Remote Lectures

If campus is remote, course lectures will occur at the regularly scheduled times at the following Zoom link. These lecture recordings will be posted to the Canvas page.

https://cuboulder.zoom.us/j/94062848322

Course Text

Required:

- *Statistical Orbit Determination*, Byron D. Tapley, Bob E. Schutz, and George H. Born, 2004.

Not required, but recommended and available for free through library (links on web site):

- *Optimal Estimation of Dynamic Systems*, John Crassidis and John Junkins, 2004.

- *Applied Optimal Estimation*, Edited by A. Gelb, 1974.

Cheap (in Dover) and worth buying for reference:

- *Factorization Methods for Discrete Sequential Estimation*, Gerald J. Bierman, 2006.
- *Stochastic Processes and Filtering Theory*, Andrew H. Jazwinski, 2007.

Course Description

ASEN 6080 is a course providing an in-depth discussion of advanced orbit determination techniques. The focus is on the fundamentals of these methods based on non-linear estimation theory and, critically, the ability to implement them in software.

Course Format

The course will consist of two weekly lectures, homework and a final project. Lecture attendance is highly recommended since many topics are not covered in the course textbook. The final project will be assigned mid-semester, and will be due at the end of the semester (exact date to be announced). Project presentations will be held the last week of class or during the finals week (TBD) and will count toward the 10% participation grade.

Collaborative study and exploration of the course material is highly encouraged.

Course Grading

Project 1	25%
Project 2	35%
Homework	30%
Discussion	10%

Homework

Electronic submission of each homework is due at/by the beginning of lecture on the specified due date. Late assignments will not be accepted unless there are extenuating circumstances (at my judgement).

Homework grading is on a scale of 0 $\rightarrow$ "✓-" $\rightarrow$ "✓" $\rightarrow$ "✓+" scale as follows.

- 0 = assignment not turned in
- "✓-" = assignment turned in, but either not complete or with major errors
- "✓" = assignment turned in complete
- "✓+" = assignment turned in complete with above average effort/analysis

It is expected that students will generally get a "✓" or "✓+" on all assignments. Averaging above a "✓" for the term will receive all homework points.

Projects

There are two projects in this course. They both require significant coding effort and analysis. The details will be released later in the semester. See the class schedule for the timing of the projects.

Discussion

Discussion requirements can be satisfied through speaking out loud in class and/or by adding to online discussion. It is often the case that you can explain things better to one another than I will explain them to you - I want you to all take advantage of this. Furthermore, just because you think you understand something doesn't mean you should stop thinking about it - ask any professor and they will tell you that mastering material reaches a new level once you *teach* it.

Zoom Information for Distance Students

While this course contains a distance learning section, classrooms in the AERO building are not fully equipped for live concurrent discussions with distance students during lecture. Instead, lecture capture is used, providing recorded lectures.

1 University Policies

This class will be conducted in accordance with university policies:

1.1 Accommodation 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 (`www.colorado.edu/disabilityservices/students`). 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.

1.2 Religious Holidays

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, you must let the instructors know of any such conflicts within the first two weeks of the semester so that we can work with you to make reasonable arrangements. See the campus policy regarding religious observances for full details.

1.3 Classroom and On-Campus Behavior

Students and faculty each have responsibility for maintaining an appropriate learning environment. Those who fail to adhere to such behavioral standards may be subject to discipline. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with race, color, national origin, sex, pregnancy, age, disability, creed, religion, sexual orientation, gender identity, gender expression, veteran status, political affiliation or political philosophy. Class rosters are provided to the instructor with the student's legal name. I will gladly honor your request to address you by an alternate name or gender pronoun. Please advise me of this preference early in the semester so that I may make

appropriate changes to my records. For more information, see the policies on classroom behavior and the Student Code of Conduct.

1.4 Sexual Misconduct, Discrimination, Harassment and/or Related Retaliation

The University of Colorado Boulder (CU Boulder) is committed to fostering a positive and welcoming learning, working, and living environment. CU Boulder will not tolerate acts of sexual misconduct (including sexual assault, exploitation, harassment, dating or domestic violence, and stalking), discrimination, and harassment by members of our community. Individuals who believe they have been subject to misconduct or retaliatory actions for reporting a concern should contact the Office of Institutional Equity and Compliance (OIEC) at 303-492-2127 or cureport@colorado.edu. Information about the OIEC, university policies, anonymous reporting, and the campus resources can be found on the OIEC website.

Please know that faculty and instructors have a responsibility to inform OIEC when made aware of incidents of sexual misconduct, discrimination, harassment and/or related retaliation, to ensure that individuals impacted receive information about options for reporting and support resources.

1.5 Honor code

All students enrolled in a University of Colorado Boulder course are responsible for knowing and adhering to the Honor Code. Violations of the policy may include: plagiarism, cheating, fabrication, lying, bribery, threat, unauthorized access to academic materials, clicker fraud, submitting the same or similar work in more than one course without permission from all course instructors involved, and aiding academic dishonesty. All incidents of academic misconduct will be reported to the Honor Code (honor@colorado.edu); 303-492-5550). Students who are found responsible for violating the academic integrity policy will be subject to nonacademic sanctions from the Honor Code as well as academic sanctions from the faculty member. Additional information regarding the academic integrity policy can be found at the Honor Code Office website.