ASEN 5090 INTRODUCTION TO GNSS - SYLLABUS

UPDATED 2019-09-02

Lecture MW 3:30-4:45 PM, AERO N240

Instructor:

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Overview

ASEN 5090 *Introduction to GNSS* is a core Aerospace Engineering Sciences (AES) course for the Astrodynamics and Satellite Navigation Focus Area. It provides an overview of the principles of operation of satellite navigation systems with primary emphasis on the U.S. Global Positioning System. This course covers the fundamentals of both hardware and algorithms/software aspects of GNSS and is meant for graduate students interested in pursuing further study in GNSS as well as those pursuing specializations in astrodynamics, vehicle systems, remote sensing, communications, and other fields that rely upon GNSS instruments. ASEN 5090 is a prerequisite for advanced satellite navigation courses including ASEN 6091 GNSS Receivers, ASEN 6090 GNSS Software and Applications, and a new ASEN course on GNSS Remote Sensing, all of which are typically offered in the spring semesters.

Prerequisites & Eligibility

ASEN 5090 is open to graduate students in Engineering, Physics, Applied Math, Geological Sciences, Geography, and related fields. Advanced undergraduates who are interested in taking the course must get instructor permission. Students are expected to have good problem-solving skills, physics, calculus, vector and matrix math, linear algebra, computer programming, and the ability to write clearly.

Required Textbook:

Global Positioning System, Signals Measurements, and Performance, Revised 2nd Edition, by P. Misra and P. Enge, Ganga-Jamuna Press.

You can order it directly from this website: http://www.gpstextbook.com/
There are two different versions of the 2nd edition available that you might find online. Both are fine. You should NOT purchase the 1st edition. It is missing a number of sections that we will use.

Subject Outline

1. GNSS Basics
2. Measurements and Errors
3. Position Solutions
4. GPS Signals and Receivers
5. Applications

Assignments

There are 10 homework assignments that range from working assigned problems in the book to a series of assignments that build up to programming a GPS position solution. Collaboration is permitted on these assignments. This means you may discuss the means and methods for solving problems and even compare answers, but you are not free to copy solutions from classmates or from internet resources. The work that you turn in must be your own--copying is not allowed for any assignments. Students who are caught copying any portion of an assignment will be reported for violation of honor code and may incur both academic and non-academic sanctions. For some assignments, students will be encouraged to work in teams of two and submit a joint solution, for which they will both receive the same grade.

One of the assignments is an all-hands experiment that we will conduct during the first few weeks of the semester. Everyone in the class will collect GPS/GNSS/other positioning data with a cell phone or GPS receiver during a specified time period, and share their data set with the class. We will use this crowd-sourced data set to explore differences in satellite visibility, signal strength, and solution accuracy with different devices and environments. Each student will decide what aspect of the experiment they would like to explore and submit a brief report with their analysis. Logistics will be coordinated in Week 2.

Each homework assignment will identify what must be turned in and the deadline for submission, which is the same for both on-campus and distance learning students. All assignments are to be submitted via the Canvas website, accessible through the CU Boulder portal. Late assignments are not accepted, except under extenuating circumstances such as a school closure, sudden illness, or unexpected critical work-related deadline. If such an event occurs you are expected to contact the instructor immediately by phone or email. If you know in advance that you will not be on campus for a due date, you may submit your assignment via Canvas or to the instructor any time prior to the due date.

Exams

There will be a midterm exam in week 7 and a final exam due on the assigned date and time. Both exams will be administered as 24-hour take-home exams via Canvas. Each student, whether on-campus or distant, is personally responsible to abide by the CU Honor Code and the exam rules specified on the assignment. Any violation of this requirement including collaboration or copying on an exam constitutes cheating and will result in an F for the course. An honor code violation report will also be filed.

Grading Policy

Grades on individual assignments and for the overall course are set based on the following criteria.

A, A-	Demonstrates superior understanding of the material, excellent technical work
B+, B	Demonstrates comprehensive understanding of the material, strong technical work
B-	Demonstrates adequate understanding of the material, complete technical work
C	Demonstrates barely adequate understanding of the material and minimally sufficient technical work
D	Poor technical work
F	Unsatisfactory performance

Final grades will be based on the following weighting

Participation	5	*Includes in-class activities and/or on-line Canvas discussions*
Midterm Exam	10	
Final Exam	15	
Assignments	70	
Total	100%	

University Policies

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. 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.

Classroom 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.

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 Honor Code academic integrity policy can be found at the Honor Code Office website.

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 intimate partner abuse (including dating or domestic violence), stalking, protected-class discrimination or 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.

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. For this class, you are expected to review the course schedule and let the instructor know within the first two weeks of the semester of any such conflicts so that we can work out an accommodation plan.

See the campus policy regarding religious observances for full details.