

ASEN 6060: Advanced Astrodynamics Spring 2024

Course description:

This course focuses on studying motion within multi-body gravitational systems via the circular restricted three-body problem. We will derive this dynamical model in detail. Then, we will explore the complex solution space through the numerical computation, characterization, and analysis of fundamental dynamical structures and the application of dynamical systems theory. We will use these solutions to construct a transfer and generate similar motions in higher-fidelity models using commercial software. This course will involve a significant amount of numerical computation using code/scripts that students write on their own.

Prerequisites: ASEN 5050/5052 or equivalent, or instructor permission required.

Instructional Team Information

Instructor: Prof. Natasha Bosanac

Teaching Assistant: Kevin Bonnet

Course Information

Assigned Lecture Periods: T,Th: 10am-11.15am in AERO N250

During some smal

Software

submitted in writing using Gradescope and include an outline of the reason that you believe there may be an error and the relevant rubric item/s.

Final Project:

There will be one final project that is due towards the end of the semester. This project will focus on numerically generating a transfer in the circular restricted three-body problem. The format for this submission will follow the expectations for the homework. Except in the case of unforeseen emergencies or illness, no extensions will be provided for this due date. Late projects without a prior approved extension will not be accepted, receiving a score of zero.

Restrictions:

You are not allowed to use artificial intelligence (AI) or machine learning tools (e.g., ChatGPT or Dall-E 2) on any assignment or project for this course. Each student is expected to complete each assignment and project without assistance from AI. Use of AI will be treated as a form of academic dishonesty akin to plagiarism or cheating.

Classroom Behavior!

Students and faculty are responsible for maintaining an appropriate learning environment in all instructional settings, whether in person, remote, or online. Failure 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.

For more information, see the [classroom behavior policy](#), the [Student Code of Conduct](#), and the [Office of Institutional Equity and Compliance](#).

Requirements for Infectious Disease

Members of the CU Boulder community and visitors to campus must follow university, department, and building health and safety requirements and all applicable campus policies and public health guidelines to reduce the risk of spreading infectious diseases. If public health conditions require, the university may also invoke related requirements for student conduct and disability accommodation that will apply to this class.

If you feel ill and think you might have COVID-19 or if you have tested positive for COVID-19, please stay home and follow the [guidance of the Centers for Disease Control and Prevention](#)

[\(CDC\) for isolation and testing](#). If you have been in close contact with someone who has COVID-19 but do not have any symptoms and have not tested positive for COVID-19, you do not need to stay home but should follow the [guidance of the CDC for masking and testing](#).

Accommodation for Disabilities, Temporary Medical Conditions, and Medical Isolation

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, see [Temporary Medical Conditions](#) on the Disability Services website.

If you have a required medical isolation for which you require adjustment, please notify the instructor as soon as possible.

Preferred Student Names and Pronouns

CU Boulder recognizes that students' legal information doesn't always align with how they identify. Students may update their preferred names and pronouns via the student portal; those preferred names and pronouns are listed on instructors' class rosters. In the absence of such updates, the name that appears on the class roster is the student's legal name.

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 Honor Code may include but are not limited to: plagiarism (including use of paper writing services or technology [such as essay bots]), 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 Student Conduct & Conflict Resolution: honor@colorado.edu, 303-492-5550. Students found responsible for violating the [Honor Code](#) will be assigned resolution outcomes from the Student Conduct & Conflict

Free and unlimited telehealth is also available through [Academic Live Care](#). The Academic Live Care site also provides information about additional wellness services on campus that are available to students.

Tentative List of Topics

*These topics may change throughout the semester

Formulating the Circular Restricted Three-Body Problem

Jacobi constant and zero velocity surfaces

Equilibrium points