

- Final Project: 40%. There are several separate submissions for the final project. Due dates and point values will be clearly denoted on the assignment.
- There are no exams in this class and there are no dropped assignments. If you do not submit an assignment, it is counted as a zero.

- Collaboration is permitted on assignments. However, each student must submit a assignment write-up.
- Many assignments in the class will require coding. You may use the coding language or software package of your choice. It is not necessary to include code as part of your submission.
- Partial credit will be given based on intermediate steps and explanations provided in the assignment.

- I. Review
 - a. History of Interplanetary Missions
 - b. The Two-body problem
 - c. The N-body problem
 - d. Perturbations
 - e. Patched conics
 - f. Reference frames
 - g. Sphere of Influence
 - h. Hohmann transfers
- II. Lambert's Problem
 - a. Lambert's general theorem
 - b. Type 1 vs Type 2 orbits
 - c. Discussion of Geometry of Lambert's problem
 - d. Universal Variables Algorithm
 - e. Revisit f and g functions
 - f.

- c. Performance index, constraints
- d. Defining state vector
- e. Pruning the search space
- f. Algorithms for optimization
 - i. Deterministic vs Stochastic
- g. Examples of optimization algorithms
- X. Tisserand Plots
- XI. Three Body Problem
 - a. History
 - b. Simplified forms (Restricted, Elliptical Restricted, Circular Restricted)
- XII. Circular Restricted Three Body Problem
 - a. Geometry of nondimensional, rotating frame
 - b. Derivation of Equations of Motion
 - c. Transformation from synodic to inertial frame
 - d. Libration Points
- XIII. State Transition Matrix
 - a. Motivation
 - b. Derivation for CRTBP
- XIV. Libration Point Orbits
 - a. History in Mission Design
 - b. Types of orbits (Halo, Lissajous, etc)
 - c. Construction of LPOs using Single Shooting Algorithm
 - d. Stability
- XV. Invariant Manifolds
 - a. Definition
 - b. Stable/Unstable Eigenvalues and vectors
 - c. Computing Invariant Manifolds (general discussion)
 - d. Applications to Mission design
- XVI. Differential Correction

Additional information regarding general CU classroom policies:

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

scheduled exams, assignments or required attendance. In this class, please provide me with a list of potential conflicts within the first two weeks of the semester. See the [campus policy regarding religious observances](#) for full details.