

Choose an investigation

Six ways to use the mechanics already available

Choose **one** topic. The named system is a starting point, not the project question by itself. Read its two-page sheet for the required foundation, comparison, check, stopping rule, and first-week task.

	Investigation	Question and approach
A	Discrete evolution	What changes when an oscillator update is symmetrized? Separate trajectory accuracy, phase, energy behavior, and reversibility. Analytical + computational.
B	Discrete conservation	Which charges survive exactly in a discrete model? Derive one symmetry result and make one controlled comparison. Analytical; computation optional.
C	Mechanisms and soft modes	How do a brace or supports alter internal motion? Compare small frameworks using compatibility, nullspaces, and stiffness. Geometry + computation.
D	Beyond the Kepler ellipse	How does a specified central-potential change alter the angle between periapses? Compare an analytic prediction with an independent calculation. Analytical + numerical.
E	Designing motion	What torque produces a prescribed pendulum motion? Compare a bounded trajectory family using a clearly defined performance measure. Modeling + computation.
F	Evolution versus action	When do initial and endpoint data select the same oscillator trajectory? Examine uniqueness and one precise interpretive claim. Mathematical + foundational; computation optional.

How to choose

Prefer a question whose first calculation you can begin this week. Choose a method you want to develop, but avoid a plan requiring several new theories before anything can be checked. Ask about a prerequisite early; the selected sheets supply the essential starting definitions.

Several students may choose the same family with different approved comparisons. An alternative is welcome with instructor approval and the same scope, evidence, and stopping-rule standards. Do not wait for later Hamiltonian lectures to begin; advanced connections are optional extensions.

Due October 28: A 1–2-page proposal with a preliminary result, not only a topic name. Use the [proposal template](#).

[Common assignment](#) [Starting resources](#) [Package index](#)