Mathematics 242, Fall 2023
Fraydoun Rezakhanlou

Lectures: TT, 11–12:30, 2 Evans
Office Hours: TT, 5–6:30 pm, 803 Evans

Prerequisites : Math 214, or familiarity with differential forms and manifolds

Hamiltonian systems appear in conservative problems in mechanics as in celestial mechanics but also in the statistical mechanics governing the motion of atoms and molecules in matter. The discoveries of last century have opened up new perspectives for the old field of Hamiltonian systems and let to the formation of the new field of symplectic geometry. In this course, I will give a detailed acount of some basic methods and results in symplectic geometry and its application to physics and other fields of mathematics. Here is an outline of the course:

1. Sympletic linear algebra. Quadratic Hamiltonians.
2. Symplectic manifolds, cotangent bundles. Darboux's theorem. Contact manifolds.
3. Variational problems. Minimax principle. Hofer-Zehnder Capacity and Hofer Geometry.
4. Weinstein's conjecture, Viterbo's theorem. Gromov-Eliashberg C^0-rigidity.
5. Holomorphic Curves and Gromov's Symplectic Width
5. Arnold's conjecture, Floer Homology

Grading: Grading is based on your performance on the weekly homework assignments, and your participation in the class. The answer to homework assignments must be typed (and preferrably written in LaTex).

Text: I will follow
F. Rezakhanlou: " Lectures on Symplectic Geometry"

Additional references:

- Hofer, H. and Zehnder, E. " Symplectic invariants and Hamiltonian dynamics." Birkhauser.
- McDuff, D. and Salamon, D. " Introduction to symplectic topology." Oxford.