

Astronomy 6516: Galactic Structure and Stellar Dynamics

MW 1010-1125, SSB 301

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available by appointment in person or via Zoom

This course will focus on topics related to the structure and dynamics of collisionless and mildly collisional systems in galaxies: stars in the galactic disk, stars in globular clusters, stars in open clusters, spiral arms, and the galactic center, as well as stars in binary and triple systems. We shall also discuss the formation, structure and evolution of the galaxy and its halo.

Topics to be covered include:

- Observational overview of the structure of our Galaxy and others
- Physics of stellar systems with $N = 2, 3, 100 - 1000, 10^5 - 10^6, \dots 10^{11}, \dots$ etc. stars. Physics of clusters and superclusters of galaxies.
- Conditions for the importance of “two-body collisions.” Collisionless vs. collisional systems
- Description of collisionless systems. Phase space distributions.
- Equilibria and their stability. Waves in collisionless systems.
- Slow evolution of collisional systems: globular clusters and the Fokker-Planck equation.
- Collisionless relaxation.
- Evolutions of weakly collisional systems like globular clusters.

Problems to be assigned, but frequency and format TBD. Most likely about 5 problem sets, some problems drawn from the text by Ryden.

In addition, there will be two prelims. One will be in class, the other will be either in class or an oral exam.

Course texts:

- Ryden, “Celestial and Stellar Dynamics” (course text)
- Binney & Tremaine, “Galactic Dynamics” (reference)
- Binney & Merrifield, “Galactic Astronomy” (reference)
- Spitzer, “Dynamical Evolution of Globular Clusters” (reference)