

ASTR 30400 Galaxies

Course description

This course will overview the basic properties of galaxies, introduce modern concepts of how galaxies form and what shapes their observed properties. We will use the SDSS survey and other datasets to review galaxies' population properties and work with a galaxy formation model to understand the main physics that drives galaxy evolution. The class is based on material presented in class, reading, discussions, and hands-on exercises.

Syllabus

Week 1: Morphology, magnitudes, luminosities, surface brightness models, luminosity function, distributions of galaxy properties, Malmquist bias

Week 2: Galaxy clustering and large-scale structure

Week 3: Evidence for dark matter, galaxy scaling relations

Week 4: Density perturbations in early Universe, non-linear growth of perturbations, spherical collapse model

Week 5: Halo mass function, Press-Schechter theory, halos properties

Week 6: Baryonic processes: cooling and heating, star formation

Week 7: Baryonic processes: feedback

Week 8: Physics of the hot intergalactic medium, final project presentations

Week 9: Final project presentations

Textbooks

1. "Galaxy Formation and Evolution" by H. Mo, F. van den Bosch, S. White
2. "Galaxy Formation" by M. S. Longair

Prerequisites

It is expected that the students are familiar with the concepts of general astrophysics and cosmology. Basic knowledge of programming on Python is required for understanding exercises and completing homework assignments.