

Introduction to Galaxies and AGN

Review Summary

Chapter 1

Understand apparent magnitudes, absolute magnitudes and colors; stellar effective temperatures and Black-body radiation.

Understand how mass controls stellar structure and evolution, in particular the temperature, luminosity and lifetime. Nuclear burning is the source of the energy radiated. Evolutionary phases of stars.

Know how gas is detected, in particular atomic hydrogen through the 21cm fine-structure emission line.

Understand the effects of dust on star light.

Understand surface brightness of a galaxy, as a function of distance from the galaxy's center, and how does not depend on the distance of that galaxy from the observer.

Chapter 2

Understand trig parallax and what a parsec is. Know the meaning of Distance Modulus. Luminosity function and mass function of nearby stars plus the IMF. Mass-to-light ratio and how that varies between stars and galaxies.

Vertical and radial structure of disks.

The effects of metallicity and age on stellar populations.

Stellar motions as a function of age and position.

Gas motions and mapping the rotation curve of the Galaxy. Oort's constants. High velocity clouds.

Derivation of enclosed mass from gas motions.

Gas processes: sound speed, heating, ionization, cooling. The concept of Jeans mass – sound crossing time and free-fall collapse time.

Chapter 3

Gravitational potential and relation to density profile, enclosed mass and rotation (circular velocity) curve.

Total angular momentum constant in spherical potential, only z-component constant in axisymmetric potential.

Virial theorem; velocity dispersion and fact need not be isotropic, unlike pressure in a gas.

Virial 'temperature' and negative specific heat of self-gravitating system.

Stellar encounters: weak and strong and timescales for each.

Stellar orbits: epicyclic approximation in disks.

Chapter 4

The properties of the different types of galaxies in the Local Group.

How to interpret color-magnitude diagrams of galaxies and bulges.

The effects of tides on satellite galaxies.

Tidal torques and the origin of angular momentum.

Chemical evolution: the simple model.