

ASTRONOMY 157 – Stars and Galaxies - Syllabus

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Office hours: one hour before each class

We will derive details only mentioned in Astr 005, with algebra and basic geometry, appropriate for non-science majors. Most class slides will be posted on UVM Blackboard.

Prerequisite: Astronomy 005; Math 10

Brief Course Outline:

<u># classes</u>	<u>Subjects</u>
4	Course Introduction; overview of important stars
2	Observing limits: effects of Rayleigh criterion and atmospheric turbulence on adaptive optics; geometric parallax; mass calculation, Cepheid distances and exoplanet detection
1	Sun: sunspots, magnetic cycle, superflares, coronal holes
1	Molecular clouds and the Jeans mass limit for collapse; Fragmentation; protostar observation limitations
1	Early collapse stages: expanding photosphere; stellar modeling equations; effects of rotation, mag. Fields, collisions etc.
1	Nuclear fusion cycles, total energy production, star lifetime estimation; photon random walk calculation
2	Core collapse, H shell burning, expansion to red giant, helium flash, heavy element production
1	Planetary nebulae, supernovae and gamma ray bursts
1	White dwarves: surface gravity, derivations of degenerate gas pressure, radius/mass, density, mass limit and visible lifetime
1	Dwarf binaries, mass transfer, type 1A supernovae; dark energy
1	Neutron stars: derivations of radius and density; pulsars; binary pulsars and tests of general relativity
1	Stellar black holes; details of Cygnus X-1; mass/radius derivation
1	Galactic BH's; Milky Way and M87 core radius and mass derivations; various arguments for BH's
2	Overview of nearby galaxies and galaxy clusters; standard candles
2	Galaxy and cluster formation, galaxy evolution, stellar populations
2	Galactic mass distributions, derivation of galactic rotation curves, comparison to observations; dark matter distribution, MACHOS
1	Spiral pattern and material rotations, shock formation, star birth triggers and inter-arm travel time
1	Quasars; galactic BH formation; Lyman alpha forest

Recommended Text: Web references

Grade Structure: (Could change with Covid restrictions)

- 7 biweekly assignments worth 7% each

- Midterm exam worth 20%

- Final cumulative exam worth 31%