

ASTR400B Syllabus

Theoretical Astrophysics: Galaxies and Cosmology

Details:

Professor: Dr. Daniel Stark
Office: 322
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Office hours: Time TBD based on student schedules, or by appointment.

Textbooks

- 1) Galaxies in the Universe: An Introduction, Second Edition (2007), L.S. Sparre & J.S. Gallagher
- 2) Introduction to Cosmology, Second Edition (2017), B. Ryden

Grading:

Homework: 25%
Class Participation / Attendance: 15%
Midterms: 35%
Final Exam: 25%

Homework

Students should first attempt to solve problems on their own. Books and published papers may be consulted, but students should not look at old homework solutions or solutions of the problems that may be available online. Discussion of the problems with other students is permitted after students have tried the problems on their own. The submitted homework should represent each student's individual work. Homework will be submitted in class on the due date. Anything turned in after the due date will be considered late. Work turned in before the next class period will receive 75% credit. Work turned in two class periods following the due date will receive 50% credit. Work turned in more than two class periods late will not receive credit. Exceptions can be made for some extraordinary circumstances.

Midterms and Final Exam

There will be two close book midterm examinations:

- February 21, 2017
- April 20, 2017

The final will also be closed book (some relevant equations and physical constants will be provided) and will take place on **Monday May 8** from 3:30 pm to 5:30 pm.

Class Participation / Attendance

This will be assessed through attendance and discussion/participation in class. Please come to class ready to learn and engage with your peers. In order to ensure a productive learning environment for all students, please note the following rules:

1. Laptops / tablets / cell phones must only be used for note taking.
2. Follow the University of Arizona Code of Academic Integrity

Students with disabilities who require reasonable accommodations to fully participate in course activities or meet course requirements are encouraged to register with the Disability Resource Center (<http://drc.arizona.edu>) and contact Prof. Stark to discuss accessibility issues.

Code of conduct: Students are expected to understand and follow the Student Code of Conduct, which is available at <https://deanofstudents.arizona.edu/policies-codes>.

Lecture Schedule (subject to change):

1/12 Introduction, Distances, Solar neighborhood, stellar luminosity function, IMF

Reading: SG 1.2-1.3, 2.1-2.2

1/17 Stellar Populations, Stars in the Milky Way Disk

Reading: SG 1.1, 2.2-2.3

Guest Lecture: Dr. Ian McGreer

1/19 Bulge and halo of Milky Way, Galactic rotation, dark matter in the Milky Way

Reading: SG 2.3-2.4

Guest Lecture: Dr. Kevin Hainline

1/24 **No Lecture**

1/26 Galactic dynamics, virial theorem, two-body relaxation,

Reading: SG 3.1-3.2

1/31 Cluster dynamics, orbits

Reading: SG 3.3

2/2 Collisionless Boltzmann equation

Reading: SG 3.4

2/7 Local Group galaxies

Reading: SG 4.1-4.2

2/9 Models of chemical enrichment, dwarf galaxies

Reading: SG 4.3-4.4

2/14 Disk galaxies (radial density profiles, kinematics)

Reading: SG 5.1-5.4

2/16 Spiral arms and galactic bars, galactic bulges

Reading: SG 5.5

2/21 Exam 1

2/23 Elliptical galaxies: light distribution, orbits

Reading: SG 6.1-6.2

2/28 Elliptical galaxies: stellar populations, dark matter, black holes

Reading: SG 6.3-6.4

3/2 Galaxy groups, dynamical friction, galaxy mergers, starbursts.

Reading: SG 7.1

- 3/7 Galaxy clusters, missing baryons, dark matter in clusters.
Reading: SG 7.2-7.3
- 3/9 Cosmic Dynamics I
- 3/21 Cosmic Dynamics II
- 3/23 Model Universes I
- 3/28 Model Universes II
- 3/20 Measuring Cosmological Parameters
- 4/4 Cosmic Microwave Background I
- 4/6 Cosmic Microwave Background II
- 4/11 Nucleosynthesis
- 4/13 Structure Formation I (gravitational instability in expanding universe)
- 4/18 Structure formation II (power spectrum, nature of dark matter, BAO)
- 4/20 Exam 2
- 4/25 Structure Formation: Baryons
- 4/27 Disk Galaxy Formation Intro, AGN
- 5/2 Intergalactic Gas, Reionization

