SYLLABUS: ASTRONOMY 8400 – SPRING 2026
EXTRAGALACTIC ASTRONOMY
Dr. Michael Crenshaw

Office Hours: Tues, Thurs: 10:30 – 11:45 AM
Office Location: Room 631, 25 Park Place
Phone: 678-232-6440
Email: dcrenshaw@gsu.edu
Web Site: http://www.astro.gsu.edu/~crenshaw/astr8400.html
(lectures will be posted on this site)
Webex Address: https://gsumeetings.webex.com/meet/dcrenshaw
Class Location: Room 628, 25 Park Place
Class Times: 9:30 – 10:30; Tuesday, Thursday

Recommended Textbooks:
An Introduction to Active Galactic Nuclei,
Bradley M. Peterson, Cambridge University Press (1997)
Galaxies in the Universe, An Introduction (2nd Edition)
Linda S. Sparke and John S. Gallagher, Cambridge University Press (2007)

Other Useful Texts:
The Physics and Evolution of Active Galactic Nuclei
Hagai Netzer, Cambridge University Press (2013)
Galactic Astronomy
James Binney & Michael Merrifield, Princeton University Press (1998)
Astrophysics of Gaseous Nebulae and Active Galactic Nuclei,
Donald E. Osterbrock, University Science Books (1989)

Description: This is a graduate course that covers the basics of extragalactic astronomy, including external galaxies (classification, integrated properties, stellar and gaseous content), clusters of galaxies (velocity dispersions, intracluster gas, dark matter), active galactic nuclei (supermassive black holes and surrounding material, Seyfert galaxies, quasars), and large-scale structure (redshift surveys, formation and evolution of galaxies).

Objectives: The principal objectives of this course are to survey the observational properties of galaxies, AGN, and other extragalactic structures; to study the existing correlations that exist between these properties; and to understand the basic physical processes at work (when known). Recent results in these areas will be explored to prepare students for their future research careers.

Grading: There will be problem sets distributed throughout the semester, and we will have a take-home midterm and final exam. Each student will be assigned a cosmic distance scale technique to present to the class (15 min. for the presentation, 5 min. for questions) at the end of the semester.
Grades will be determined as follows:
Problem sets - 30%, Midterm - 20%, Presentation - 30%, Final - 20%

ASTRONOMY 8400 – SPRING 2024 SCHEDULE

The following schedule is subject to change.

Class Schedule

Dates	**Lecture Topics**	**Peterson Chapter**
Jan 13, 15	AGN Observations, Surveys	1, 10
Jan 20, 22	AGN Family	2
Jan 27, 29	AGN Central Engines, Black Holes, Accretion Disks	3
Feb 3, 5	AGN Components	"
Feb 10, 12	AGN Kinematics	
Feb. 17, 19	AGN Kinematics (part 2)	
Feb. 24, 26	Introduction to Galaxies, Catalogs, Classification	
Mar. 3, 5	Photometry of Galaxies, Luminosity Functions	
Mar 10, 12	TBD	
Mar 24, 26	Spectroscopy, Kinematics	
Mar. 31, Apr. 2	Synthetic Spectra, Stellar Populations	
Apr. 7, 9	Dark Matter, Clusters, Large Scale Structure	
Apr. 14, 16, 21, 23	Student Presentations on Cosmic Distance Scale	

Other Important Dates:

Feb. 24 – Mar. 3	**Midterm, Due on Mar. 3 at 10:30 am**
Mar 16 – 20	Spring Break
April 23 – 30	**Final Exam, Due on May 5 at 10:30 am**

Additional Info: This syllabus provides a general plan for the course; deviations may be necessary. Attendance in class is required. All students are expected to do their own work and abide by the University's Policy on Academic Honesty in the **Student Handbook**.