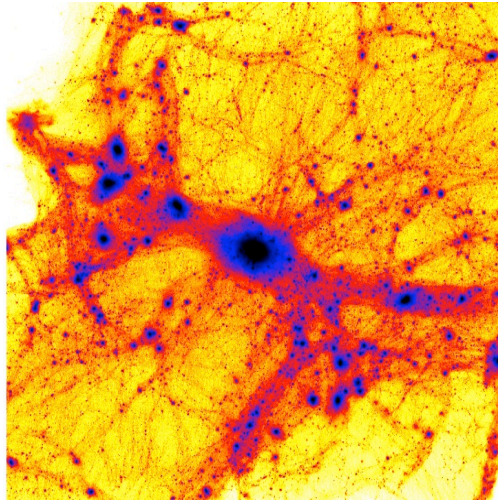


ASTR421: Galaxies (Spring 2022; Mushotzky)



Prof: Richard Mushotzky

Phone: (301)405-6583

E-mail: richard@astro.umd.edu

Office PSC 1154

Office hours:

Thursday 2:00-3:00 via zoom (may change) or by appointment

Textbook: Galaxies in the Universe: Sparke and Gallagher- Supplementary text Galaxy Formation and Evolution H. Mo, F. van den Bosch, S. White

Room ATl 2330 9:30-10:45 Tues/Thurs

•Course description

Astronomy 421 is an introduction to modern studies of galaxies, the building blocks of the universe. We start by briefly looking at the global and basic properties of galaxies. We then discuss the detailed properties of their main baryonic components, stars, gas and dust. We then discuss the MW as a prototype for detailed understanding of other galaxies and then move on to detailed discussions of spiral and elliptical galaxies and dark matter. We then move on to large scale distributions of galaxies (groups and clusters) and then finish with a set of lectures on the centers of galaxies, focusing on active galaxies.

It will contain links to course information, homework, additional interesting information and links and lecture notes.

•Course Pre-requisites

It is assumed that you have knowledge of astronomy at the ASTR300 level. In addition, some mathematics (algebra, trigonometry, calculus and geometry) will be required for the classes, homeworks and examinations..

•Course expectations

Attendance: In order to successfully complete this course, I expect you to attend class 2 times a week. If you have to miss a lecture, please be sure to see the power point presentations which will be posted on ELMS, and make sure that you understand what you missed. There will also be times when I will ask for class participation.

Preparation: I expect you to be prepared to work. We will be covering some fascinating *but* challenging concepts - you will understand this material much more easily if you preview the recommended chapter of the course book ahead of time, as well as giving it a more careful read after the lecture. You also should review your class notes sometime before the next lecture to make sure everything is clear. I encourage you to ask questions in the lectures or during my office hours. The order in which I present some material will differ from the text.

Study Habits: It is better to keep up with the material on a daily basis than cram the night before the exam. I encourage you to chat about problems with your friends and classmates – you will learn a huge amount from trying to explain confusing issues to each other. Please ask for help if you need it.. ***However, all graded materials, including class-assignments and home-works, must be your own thoughts in your own words.***

•Grading

Grades are based on a point scale with different assignments weighted as shown below.

Assignments:

Homework:	25%
Midterm :	20%
Class project	25%
Final :	30%
TOTAL :	100%

Class participation is encouraged but not graded

Letter grades will be assigned based upon your cumulative score. The exam grades will be renormalized.

•Midterm exam

There will be one in-class examination on the 15th March 2022. This exam will be closed book and will consist of a section of short answer questions, with essay and problem solving questions. University regulations will apply regarding academic honesty and excused absences. Please see the Schedule of Classes for these policies. If you are not able to take an exam due to illness or other legitimate reasons, you must contact me on or before the day of the exam either by email or voice mail. In addition, you must document the reason for your absence. A make up exam must be taken promptly. If, for whatever reason, the University is officially closed on the day of the exam, the exam will be re-scheduled for the next lecture date. This is subject to changes depending on COVID.

• Final exam

As per the University examination schedule, the final exam for this course will be held on Friday 13th May 2022, 8:00am-10:00am, in room AT12330. The final exam is cumulative in the sense that it will cover all material discussed in this course, but stress the second half. The format of the final exam will be the same as the midterm exam, with a section of short answer questions and a section of longer essay or problem solving questions. This is subject to changes due to COVID

•Homeworks

I will aim for a total of 4-6 homeworks in this course. On the due date, homework should be handed in at the front of the class or sent in via e-mail or ELMS. Homework will be considered late by the end of class. If you cannot make it to class, you should either ask a friend/classmate to hand it in for you, or make sure that it gets to me before the time that it is due. If you have a valid emergency, you should send me an email or voice mail message before the due date telling me the nature of the emergency. Please document all such emergencies.

If, for whatever reason, the University is officially closed on the day of the due date, the due date will be moved to the next lecture.

•Term Paper

The term paper will be due the next to last week of the class Tuesday May 3 and should be 8-12 pages long on a topic of your own choosing, but clearly related to the class.

Academic Integrity

The University's policies and rules on academic integrity are laid out in the Schedule of Classes. You must never engage in acts of academic dishonesty at any time. Acts of academic dishonesty include cheating, fabrication, plagiarism, or helping any other person to do these things. These rules apply to homeworks and quizzes as well as exams. As a part of these rules, you must give credit to any book (including the course textbook!), published article or web-page that you have used to help you with a particular assignment. The University and I take these issues extremely seriously.

To underscore the need for academic integrity, the University asks you to write the following pledge on any assignment or exam:

"I pledge on my honor that I have not given or received any unauthorized assistance on this assignment/examination."

COVID

N95 masks or equivalent over the nose and mouth are required while you are indoors at all times. **There are no exceptions** when it comes to classrooms and laboratories.

Students not wearing a N95 mask will be given a warning and asked to wear one, or will be asked to leave the room immediately. ***Students who have additional issues with the mask expectation after a first warning will be referred to the Office of Student Conduct for failure to comply with a directive of University officials.*** Current County and University guidelines **require all individuals** to wear a mask indoors. Any student not abiding by these expectations may be in violation of the Code of Student Conduct, Part 10(e)(3). Any student with an approved COVID-19 vaccination exemption must wear a

mask at all times while indoors and outdoors. Masking is a University requirement, and students are not permitted to remain in the classroom (or building) should they refuse to follow this expectation.

Preliminary Course Outline

Lecture #	TOPIC	Text Chapter (S&G)
Lec 1	INTRODUCTION	
Lec 2	Continuation of introduction	Ch 1
Lec 3	Basic Galaxy Properties	Ch 1
Lec 4,5	Relevant Properties of stars	
Lecs 6,7,8	Properties of Gas and Dust	
Lecture 9, 10	Milky Way	Ch 2
Lecture 11	Galactic Rotation	
Lecture 12--15	Dynamics I--III	Ch3
Lectures 16,17	Local group	Ch 4
Lecture 18	Chemical Evolution	
Lecture 19	Star Formation	
Lecture 20--22	Spiral Galaxies	Ch 5
Lecture 23--25	Elliptical galaxies	Ch 6
Lecture 26--27	AGN I--II	Ch9
Lec 28	Summary	