

# Syllabus for AST 6309 Galaxies and Cosmology Spring 2023

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Office: 211 Bryant Space Science Center  
Office Hours: Tuesday 4-5pm, and by appointment  
Class Periods: T7R78 (T 1:55-2:45, R 1:55-3:50pm)

**Online Course Information:** Handouts and assignments will be posted on Canvas.

**Textbooks:**

Required: Galaxy Formation and Evolution (Mo, van den Bosch, & White, 2010)

**Course Content**

This course is designed to cover the basic physical foundations for the fields of cosmology and galaxy evolution. Both topics are too extensive to be thoroughly covered in a single semester course, and so we will focus upon building up the basic physical picture of structure formation and evolution in the framework of the standard cosmological model. For cosmology, content will include spacetime geometry, particle production, Big Bang nucleosynthesis, inflation, and cosmological tests. For galaxy evolution, we will aim to understand the observed properties of the galaxy population in the context of structure formation from initial density perturbations in the early Universe, and explore the physics of the evolution of stellar populations and gas in galaxies. There will be a significant amount of reading for this course, and it is expected that you will read the relevant sections before lectures.

**Course & Grading Information**

Your grade for the course will be based on the following:

Assignments	<b>50%</b>
Exams (Feb 15, May 2)	<b>50%</b>

Details regarding UF grading policies can be found at:

<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

**Grading scale:** The following grading scale is guaranteed:

Letter Grade	% Points	Letter Grade	% Points	Letter Grade	% Points
A	88 – 100	B-	76 – 78	D+	64 – 66
A-	85 – 87	C+	73 – 75	D	61 – 63
B+	82 – 84	C	70 – 72	D-	58 – 60
B	79– 81	C-	67 – 69	E	< 58

Your actual final grade will be no lower than on this scale, which may be curved based upon the overall performance of the class.

### **Homework**

Problem sets must be submitted on time (at the beginning of class) to receive full credit. For late assignments there will be a deduction of 33% per day. No homework extensions will be granted unless the extension is approved in advance of the deadline or documentation of a medical issue is provided. You are allowed to work together on problem sets and help each other, but the work you submit must be your own. There will be problems that require the use of python; please come to office hours if you need help with coding.

### **Exams**

Both exams will focus upon material covered since the previous exam. The mid-term exam will be primarily focused upon cosmology; the final primarily on galaxy evolution. The mid-term exam will be on Thursday, February 15. The final exam will be on May 2 from 10am-12pm.

### **Class Expectations**

You are also expected to not engage in any activity during class that is distracting to other students or detrimental to their ability to learn. Please be courteous to your fellow classmates and turn off the ringer on your phones.

### **Attendance and Make-up Policy**

Students are expected to complete all requirements by the specified due dates. If you miss an assignment due to an excused absence as specified in the university attendance policies ([catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/](http://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/)), you will be allowed a reasonable time to make up the missed work. The format of any make-up exam will be at the discretion of the instructor. While there will be no formal deduction for missing a class, participation is a component of your grade for the semester and regular attendance is thus strongly encouraged.

### **Academic Honesty Policy**

UF students are bound by The Honor Pledge which states, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: “On my honor, I have neither given nor received unauthorized aid in doing this assignment.” The Honor Code ([sccr.dso.ufl.edu/process/student-conduct-code/](http://sccr.dso.ufl.edu/process/student-conduct-code/)) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor in this class.

I strongly adhere to the previous statements and **DO NOT TOLERATE CHEATING.**

### **Special Accommodations**

Students who require a classroom accommodation are required by UF policy to arrange accommodations themselves when needed. Students must first contact the Dean of Students Office of Disability Resources in Peabody 202 (352-392-1261). Please see the University of Florida Disability Resources website for more information at <http://www.dso.ufl.edu/drp/services/>. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation.

### **UF Counseling and Wellness Services**

On-campus resources are available at the UF Counseling & Wellness Center (392-1575) for students experiencing personal or stress related problems.

### **Student Feedback**

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at [gatorevals.ua.ufl.edu/students/](http://gatorevals.ua.ufl.edu/students/). Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via [ufl.bluera.com/ufl/](http://ufl.bluera.com/ufl/). Summaries of course evaluation results are available to students at [gatorevals.ua.ufl.edu/public-results/](http://gatorevals.ua.ufl.edu/public-results/).

### **Recording**

Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A “class lecture” is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations or student-led instruction, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To “publish” means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media

platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

### Preliminary Lecture Schedule (Subject to Change)

The table below indicates the approximate dates for each topic/chapter. Updates will be given in class as the schedule changes.

<b>Lecture Date</b>	<b>Lecture Content</b>	<b>Relevant Section in Textbook</b>
<b>Week 1 (1/8)</b>	<i>Course Overview, Geometry and Dynamics</i>	1.1-1.2 3.1.1-3.1.2, 3.2.1-3.2.3
<b>Week 2 (1/15)</b>	<i>Geometry and Dynamics, Big Bang Cosmology</i>	3.1.6, 3.2.4-3.2.6
<b>Week 3 (1/22)</b>	<i>Thermal History of the Universe, Early Universe</i>	3.3-3.5
<b>Week 4 (1/29)</b>	<i>Cosmic Microwave Background, Inflation</i>	2.9, 3.5-3.6
<b>Week 5 (2/5)</b>	<i>Testing the Standard Cosmological Model, Evidence for Dark Matter and Dark Energy</i>	6.5-6.7
<b>Week 6 (2/12)</b>	<i>No class 2/13, <b>Exam 2/15</b></i>	
<b>Week 7 (2/19)</b>	<i>Structure Formation: Density perturbations, spherical collapse</i>	4.1, 4.5, 5.1
<b>Week 8 (2/26)</b>	<i>Properties of the galaxy population, Collisionless dynamics</i>	1.3-1.4, 2.3-2.4, 5.4.1-5.4.4
<b>Week 9 (3/4)</b>	<i>Galaxy Formation and Evolution: Hierarchical Structure Growth, Gas Halos and Cooling</i>	7.2, 8.1-8.2
<b>Week 10 (3/18)</b>	<i>Galaxy Formation and Evolution: Gas Halos and Cooling, Star Formation History</i>	8.4-8.5, 2.6.8, 9.5-9.7
<b>Week 11 (3/25)</b>	<i>Galaxy Formation and Evolution: Luminosity and Stellar Mass Functions, Chemical Evolution</i>	10.3-10.4, 15.2-15.4
<b>Week 12 (4/1)</b>	<i>Galaxy Disks, Mergers</i>	11.2.1, 11.3, 11.7-11.8
<b>Week 13 (4/8)</b>	<i>Ellipticals and Environment</i>	12, 13
<b>Week 14 (4/15)</b>	<i>Intergalactic Medium, Supermassive Black Holes</i>	14, 16.1-16.3
<b>Week 15 (4/22)</b>	<i>Feedback, Baryon Cycle, Review</i>	14, 16