

AST 346: Galaxies (Spring 2025)

Date and Time: Tu & Th 8:00-9:20AM

Instructor: Jin Koda, ESS 455, jin.koda@stonybrook.edu

Office Hours: Mon 3:00-4:30PM & Thu 10:00-11:30AM (or email me for appointment)

Learning Outcomes

Students will study the properties of galaxies, including the Milky Way and others, and examine the physical processes that govern the structure and evolution of galaxies, including stars, gas and dust, and dark matter.

Prerequisite

AST 203, PHY 251/252, MAT 203 or 211 or 307 or AMS 261. We will assume the knowledge of Mechanics from the physics course.

Textbook (Required)

“Galaxies in the Universe: An introduction”, 2nd edition by Sparke and Gallagher (ISBN-13: 978-0521671866)

Brightspace

The syllabus, course materials, and announcements will be on Brightspace. Students must regularly monitor Brightspace for notices.

Course Grading:

Homework (100%):

- Submission with reasonable efforts (50%)
- Score from submitted answers (50%).

Homework (HW):

- Approximately 10 problem sets (HW) will be given (see *Schedule* in this syllabus).
- Each HW carries the same weight for final grade.
- HW will be distributed on Brightspace at a class start time. It is due exactly one week after the distribution (see *Schedule*).
- Students must submit their answers through Brightspace.
- Submission without efforts (e.g., blank, little content, etc.) will receive no score.
- The answers must be written in a concise and legible manner. Lengthy or illegible reports are subject to score-reduction.
- Late submission will *NOT* be accepted under any circumstance.
- To accommodate unforeseeable events beyond students' control, two lowest HW scores will be dropped without any question.
- No extra credit will be offered.

AST 346 (Spring 2025) Lecture and Homework Schedule

#	Date	Chap.	Subject	HW assigned	HW due
1	Jan 28	1	Overview and About this Course		
2	30	1	Background: Astronomical Measurements		
3	Feb 4	1	Background: Astro. Measurements/Stars and Stellar Evolution		
4	6	2	Background: Stars and Stellar Evolution		
5	11	2	The Milky Way Galaxy: Observation Summary		
6	13	2	The Milky Way Galaxy: Interstellar Medium/ Kinematics	1	
7	18	2	The Milky Way Galaxy: Kinematics		
8	20	2	The Milky Way Galaxy: Face-on View	2	1
9	25	2, 3.1	The Milky Way Galaxy: Mass Distribution & Dark Matter		
10	27	2, 3.1	The Milky Way Galaxy: Mass Distribution & Dark Matter	3	2
11	Mar 4	4.3	The Milky Way Galaxy: Chemical Evolution		
12	6	4.3	The Milky Way Galaxy: Chemical Evolution / Galaxy Formation	4	3
13	11		The Milky Way Galaxy: Formation		
14	13	5	Spiral Galaxies: Observation Summary	5	4
	18		<i>Spring Break</i>		
	20		<i>Spring Break</i>		
15	25	5, 3	Spiral Galaxies: Stellar and Gas Orbits in Disks		
16	27	5	Spiral Galaxies: Disk Stabilities	6	5
17	Mar 1	5	Spiral Galaxies: Density Wave Theory and Swing Amplification		
18	3	6	Elliptical Galaxies: Observation Summary	7	6
19	8	6, 3	Elliptical Galaxies: Stellar Hydrodynamics & Equilibrium		
20	10	6, 3	Elliptical Galaxies: Jeans Equation and Virial Theorem	8	7
21	15	6	Elliptical Galaxies: Dark Matter & Supermassive Blackhole		
22	17	9	Active Galactic Nuclei	9	8
23	22	8	The Large-Scale Structure & Statistical Properties of Galaxies		
24	24	4	The Local Group: Dwarf Galaxies/Galactic Archeology	10	9
25	29	7	Galaxy Groups and Clusters: Galaxy Encounters		
26	May 1	7	Galaxy Groups and Clusters: Mass Distribution & Dark Matter	(11)	10
27	6	8	Galaxy Formation: Hierarchical Galaxy Formation		
28	8	8	Galaxy Formation: Baryonic Physics		(11)

University Policies:

- **Student Accessibility Support Center Statement:** If you have a physical, psychological, medical, or learning disability that may impact your course work, please contact the Student Accessibility Support Center, 128 ECC Building, (631) 632-6748, or at sasc@stonybrook.edu. They will determine with you what accommodations are necessary and appropriate. All information and documentation is confidential.

Students who require assistance during emergency evacuation are encouraged to discuss their needs with their professors and the Student Accessibility Support Center. For procedures and information go to the following website:

<https://www.stonybrook.edu/commcms/studentaffairs/sasc/accessibility/emergencies.php>

and search Fire Safety and Evacuation and Disabilities.

- **Academic Integrity Statement:** Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty is required to report any suspected instances of academic dishonesty to the Academic Judiciary. Faculty in the Health Sciences Center (School of Health Technology & Management, Nursing, Social Welfare, Dental Medicine) and School of Medicine are required to follow their school-specific procedures. For more comprehensive information on academic integrity, including categories of academic dishonesty please refer to the academic judiciary website at http://www.stonybrook.edu/commcms/academic_integrity/index.html
- **Critical Incident Management:** Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of University Community Standards any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn. Faculty in the HSC Schools and the School of Medicine are required to follow their school-specific procedures. Further information about most academic matters can be found in the Undergraduate Bulletin, the Undergraduate Class Schedule, and the Faculty-Employee Handbook.
- **Academic Dishonesty:** Any form of academic dishonesty, including cheating and plagiarism, will be reported to the Academic Judiciary. All parties involved (both the copier and the person who produced the original work) will be held accountable for any instance of plagiarism or dishonesty.
- **Electronic Communication:** Email to your University email account is an important way of communicating with you for this course. For most students the email address is 'firstname.lastname@stonybrook.edu'. *It is your responsibility to read your email received at this account.* For instructions about how to verify your University email address see this: <http://it.stonybrook.edu/help/kb/checking-or-changing-your-mail->

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[forwarding-address-in-the-epo](#) If you choose to forward your University email to another account, we are not responsible for undeliverable messages.

- **Religious Observances:** See the policy statement regarding religious holidays at http://www.stonybrook.edu/commcms/provost/faculty/handbook/employment/religious_holidays_policy.php

Students are expected to notify the course professors by email of their intention to take time out for religious observance. This should be done as soon as possible but definitely before the end of the 'add/drop' period. At that time they can discuss with the instructor(s) how they will be able to make up the work covered.