

AST 346: Galaxies (Spring 2021)

Date and Time: Tu & Th 1:15-2:35, *Online Synchronous*
Instructor: Jin Koda, ESS 455, jin.koda@stonybrook.edu

COVID-19 Remote Learning Requirements

This class is entirely online for the Spring 2021 semester. Students will need the following:

- A computer with a microphone that can run Zoom
- The ability to upload each of their homeworks and exams as a single legible PDF file.
- Assessment will be done via homeworks and take-home exams, which the student will upload to Blackboard.

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. It is very important that you have the necessary prerequisites—we will assume a knowledge of mechanics from your physics class. We will also assume basic programming knowledge and the ability to make plots. Any other material needed from physics will be introduced during the course.

Textbooks

- **Primary (required):** “Galaxies in the Universe: An introduction”, 2nd edition, by Sparke and Gallagher (ISBN-13: 978-0521671866)
- **Secondary (not required):** “Introduction to Galaxy Formation and Evolution”, by Cimatti, Fraternali, and Carlo Nipoti (ISBN-13: 978-1107134768)

Course Website/Syllabus

The syllabus and all course material/class announcements will be available on Blackboard.

Version 1

Course Grading:

Two midterm examinations (30% each) – take-home exams in Spring 2021
Final examination (40%) – take-home exams in Spring 2021

Office Hours

Tue & Thu 2:35-4:00 via Zoom

Office hours will be via Zoom. Students will contact the instructor for a Zoom link. It is not possible to pick office hours that can accommodate the schedule of all students in this class. You are encouraged to contact the instructor to make an appointment outside of these times.

Midterm and Final Exams

There are two midterms and a final exam. The midterms will focus on the material since the previous exam. The final will cover the entire course. For each of the exams, students are responsible for knowing the material presented in the lectures, assigned as homework, and in the assigned chapters of the text.

Due to COVID-19 all exams will be done as take-home exams and will be due by the date/time listed on the exam (and in the schedule section of this syllabus). Students are not allowed to work with one another or ask each other about the exam material. **Students will be responsible for uploading their exam solutions to Blackboard as a single PDF by the exam due time.**

Students should not expect that they will be allowed to make up an exam. Reasons for wanting to make-up an exam will be judged on a case-by-case basis. Students wanting to make up an exam must have a *valid* excuse (e.g. athlete in University-related sporting event, jury duty, medical emergency) and notify the instructor *before* the scheduled exam. *No make-ups will be allowed more than one week after the original exam date.*

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-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.

AST346 Tentative schedule for Spring 2021

Lecture and Exam Schedule & Reading Assignments			
Lecture	Date	Chapter	Subject
1	Feb 2	1	Overview and About this Course
2	4	1	Background: Astronomical Measurements & History
3	9	1	Background: Stars and Stellar Evolution
4	11	2	The Milky Way Galaxy: Observation Summary
5	16	2	The Milky Way Galaxy: Kinematics
6	18	2	The Milky Way Galaxy: Face-on View
7	23	2	The Milky Way Galaxy: Mass Distribution & Dark Matter
8	25	2	The Milky Way Galaxy: The Interstellar Medium
9	Mar 2	2	The Milky Way Galaxy: Formation & Chemical Evolution
10	4		Midterm Exam 1 (distributed in Mar 2 class, deadline 2:35PM, Mar 4)
11	9	3	Dynamics: Relaxation, Poisson Equation, Fluid Dynamics Equations
12	11	3	Dynamics: Relaxation, Poisson Equation, Fluid Dynamics Equations
13	16	5	Spiral Galaxies: Observation Summary
14	18	5, 3	Spiral Galaxies: Stellar and Gas Orbits in Disks
15	23	5	Spiral Galaxies: Disk Stabilities
16	25	5	Spiral Galaxies: Density Wave Theory and Swing Amplification
17	30	6	Elliptical Galaxies: Observation Summary
18	Apr 1	6, 3	Elliptical Galaxies: Stellar Hydrodynamics & Equilibrium
19	6	6, 3	Elliptical Galaxies: Jeans Equation and Virial Theorem
20	8	6	Elliptical Galaxies: Dark Matter & Supermassive Blackhole
21	13		Midterm Exam 2 (distributed in Apr 6 class; deadline 2:35PM, Apr 13)
22	15	8	The Large Scale Structure & Statistical Properties of Galaxies
23	20	4	The Local Group: Dwarf Galaxies/Galactic Archeology
24	22	7	Galaxy Groups and Clusters: Galaxy Encounters
25	27	7	Galaxy Groups and Clusters: Mass Distribution & Dark Matter
26	29	9	Active Galactic Nuclei
27	May 4		Galaxy Formation: Hierarchical Galaxy Formation
28	6		Galaxy Formation: Baryonic Physics
			Final Exam (distributed in last class, deadline 2:35pm, May 13)