Course Description: ASTR 406: Galaxies and the Universe provides a thorough introduction to the contents of the Universe, with a particular focus on the Universe beyond our own Milky Way Galaxy. We first will being with a discussion of the Milky Way, which will form a basis for our exploration of the Local Group of galaxies before we move on to Spiral Galaxies, Elliptical Galaxies, Galaxy Groups, Galaxy Clusters, Active Galactic Nuclei, re-ionization, and extragalactic background radiation. The course will emphasize the interpretation of observational results within the prevailing cosmological model. This course is an advanced undergraduate major course, which will be reflected in the expected course workload.

Prerequisite: To enroll in this course, you must have completed Physics 212—University Physics: Electricity and Magnetism, or have obtained the consent of the course instructor. Furthermore, it is recommended that you have completed Astronomy 210—General Astronomy, Physics 213—University Physics: Thermal Physics, and Physics 214—University Physics: Quantum Physics.

Grading Method: Letter grades following the standard scale. Extra credit will be available and a curve will be applied as necessary to the final numerical scale.

Credit: 3 hours

Contact Information:
Professor: Robert J. Brunner
226 Astronomy
bigdog@illinois.edu
Mo: 1:30 PM–2:30 PM
We: 9:00 AM–10:00 AM

Teaching Assistant: Yiran Wang
234 Astronomy
wang60@illinois.edu
Tu: 3:00 PM–4:00 PM
Th: 3:00 PM–4:00 PM

Recommended Textbook: The recommended textbook for this class is *Galaxies in the Universe: An Introduction* (2nd ed.), by Sparke & Gallagher. The book’s website is located at


where an errata is maintained. You do not need to purchase it, but it does provide the background for the lecture material.
If you have questions or concerns, you should feel free to contact me, the best way is via email. The official course moodle site located at https://learn.illinois.edu/course/view.php?id=248, be sure to regularly check for important updates and information. All grade information will be reported via this moodle site. There is also a draft lecture schedule posted on moodle.

**Contract:**

To promote an atmosphere of discovery and provide the best possible learning environment, we will be entering into a contract as part of the first homework assignment. From the instructional side, I promise to provide an environment conducive to learning that is fair and responsive to all. From the student’s side, you will promise to perform to the best of your abilities with the highest level of integrity, complete assignments on time, and respect others. Anyone caught in violation of the Universities rules for academic integrity will be punished to the maximum extent possible.

**Homework:**

There are four homework assignments due for this course during the semester. The assignments will be posted on the course moodle site at least two weeks prior to their due date. Your written solutions will be due at the start of class on the indicated due date. Homework problems will indicate the level of difficulty you can expect for the exam. You can discuss homework problems with your classmates, but your solutions must be your own work. Given a suitable excuse from the instructor, homework can be turned in late, but will suffer a 50% reduction in total points allowed. Any homework assignment turned in after the start of lecture will be considered late. One week past the due date, late homework will NOT be accepted. The homework will be based on lecture material and relevant real world research questions.

**Informatics:**

Traditional homework assignments due not capture the true nature of real world research. As a result, there will be two non-traditional homework assignments that will require basic informatics concepts. These assignments will be posted on the moodle site at least two weeks prior to their due date. You will submit all electronic files that are part of your solutions as a single compressed archive via the moodle site (note: there is a hard cutoff, so don’t be late). Background information will be provided, including a virtualization environment that will simplify the process of getting all of the necessary software to work, and background reading and sample code for any programming requirements.

**Paper Presentation:**

An important skill to learn is the ability to read, digest, and present information. As a result, you will be required to read a scientific paper, from a provided list, and provide an oral summary during class. The presentation will be done as a group, but you will write your own paper. More information is available on the course moodle site. Presentation dates will be selected later in the semester.
Grading:

- Final Exam: 30%
- Midterm Exam: 15%
- Homework Assignments: 20%
- Informatics Assignments: 10%
- Paper Presentation: 15%
- Participation: 10%

There will be four homework assignments and two informatics assignments, each of which are worth five percent of your grade (extra credit will be available). The midterm and final examinations will be based off material presented in lecture and homework assignments. Some exam problems will be similar to homework problems. Participation will be important in this class, and will be determined in part by your class attendance and also by how effectively you participate in class discussions. Final grades will be graded on a curve, if necessary. The letter grade cutoffs will be set at the traditional 90%, 80%, and 70% limits, and plus/minus will be added if you are within two points of the traditional cutoffs (so 100–98 is an A+ and 90–92 is an A-).

Tentative Schedule:

The final schedule will be maintained on the course website. The paper presentations will be assigned dates later in the semester.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Date</th>
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<tbody>
<tr>
<td>Homework #1</td>
<td>September 21</td>
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<tr>
<td>Informatics #1</td>
<td>October 5</td>
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<tr>
<td>Homework #2</td>
<td>October 12</td>
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<tr>
<td>Midterm Examination</td>
<td>11:00–11:50 PM, October 17</td>
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<tr>
<td>Homework #3</td>
<td>November 2</td>
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<tr>
<td>Informatics #2</td>
<td>November 30</td>
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<td>Homework #4</td>
<td>December 7</td>
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<tr>
<td>Final Examination</td>
<td>8:00–11:00 AM, Friday, December 14</td>
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