ASTR 201 - Stars, Galaxies and the Universe
Fall 2017

Instructor:	**Prof. Andrea Isella (354 Herman Brown Hall, ext. 5491)**
Email:	**isella {at} rice.edu**
Class Website:	**Canvas**
Lectures:	**Tuesday and Thursday, 9:25am – 10:40am, KCK 100**
Office Hours:	**After class on Tuesday and by email appointment**
Teaching Assistants:	**To be defined**

Course Description

This course is intended to provide an overview of the fundamentals of modern astronomy and the underpinnings of our understanding of our place in the universe. The course is designed to satisfy Group III distribution requirements. Students majoring (or intending to major) in astronomy / astrophysics are better served by the courses ASTR 350 (Introduction to Astrophysics - Stars) and ASTR 360 (Introduction to Astrophysics – Galaxies and Cosmology). If you are currently undecided about your major then this course and its companion ASTR 202 (Exploration of the Solar System) are good places to begin determining where your interests lie.

Stars, Galaxies and the Universe starts with an overview of the universe and our place within it, before embarking upon an exploration of the cosmos to encounter: the birth, life and death of stars; the formation and evolution of galaxies; and the origin, large scale structure and the future of the universe. Along the way we will learn about some of the history of astronomy and the interesting characters who led its development. We will also study many of the fundamentals of astronomy such as the motion of celestial bodies, why understanding these motions matters to us on Earth, and how we came to know much of what we know about the skies thanks to the invention of the telescope.

During the course we will review and emphasize basic physics such as forces and motion, conservation laws, energy and temperature, and the interaction between light and matter, all of which are needed to understand the fascinating objects that we see in our skies.

Learning Outcomes

The student learning outcomes of this course encompass a variety of knowledge and skills that apply scientific reasoning to an understanding of the universe, the bodies of which it is comprised, and the means by which we gather and interpret the information that lead to this understanding. In particular, the students will be able to:

o Demonstrate and understanding of the basic principles of science and scientific investigation;
o Show how observations can inform our understanding of astronomical phenomena;
o Explain the basic properties of the universe and of the bodies of which it is comprised.

o Discuss how electromagnetic radiation is used by astronomers to gain information about the properties of astronomical bodies;
o Relate the basic properties of matter to an understanding of astronomical observations;
o Discuss the basic processes that govern the formation and evolution of stars and galaxies;
o Explain the basic processes that govern the evolution of the universe;
o Apply scientific reasoning to everyday situations.

Prerequisites

No scientific or mathematical background beyond high school physics and algebra is assumed. The homework problem sets will not require calculus, but **will involve equations and making calculations.** Remember that they are designed to reinforce what you learn, not to catch you out. Examples relevant to the homework problem sets will be worked through during class.

Course Textbook

The text for this course is:

The Cosmic Perspective: Stars, Galaxies and Cosmology (7th edition);
by Bennett, Donahue, Schneider and Voit;
ISBN-10 0321841077;
ISBN-13 978-0321841070.

If you are also planning to take ASTR 202 (or think you might) then you may instead purchase the following text:

The Cosmic Perspective (7th edition);
by Bennett, Donahue, Schneider and Voit;
ISBN-10 0321839552;
ISBN-13 978-0321839558.

The first book contains only the material that we will cover in ASTR 201. The second book contains all of the material for ASTR 201 and ASTR 202. Both books come with access to the website MasteringAstronomy, which provides a large amount of supplementary course material that you are strongly recommended to make use of. If you have a used copy of either textbook then you can purchase access to the website separately at: www.masteringastronomy.com.

Note that the 6th edition of both textbooks is also available. The 6th edition is suitable for this course and significantly less expensive.

Class Website

All course materials including problem sets, links to relevant websites, supplementary material, and class updates and announcements will be posted on the ASTR 201 **Canvas** page. It is the responsibility of the student to check **Canvas** regularly for the most recent information concerning the class.

Special Needs

If you have a documented disability that requires special consideration for this class then please contact the professor as soon as possible to discuss your needs. Students with disabilities should also contact the Disability Support Services Office in the Ley Student Center (dss.rice.edu).

Assessment

The Honor Code applies to all assessment tasks. You can review Rice's Honor Council documentation online at: honor.rice.edu/index.cfm

Homework problem sets: There will be biweekly (1 homework every 2 weeks) problem sets with questions from the course text and other questions at the same level that will be based on the material covered in class. **Problem sets will be posted on Canvas and will be due by the end of the day on Monday following the schedule listed below. The problem set questions should be answered using the Canvas interface. Paper copies of the homework will not be accepted except. Late homework will not be accepted and will receive 0 points.** Requests for extensions must be granted by the professor (by email, so that a written record exists) **BEFORE** the due date of the assignment. You will need a valid reason accompanied by supporting documentation. The problem sets will be take-home and open-book. You may discuss general concepts with your classmates before attempting the questions, but your answers must be the result of your own understanding of the material and you should therefore write up the solutions to each problem set by yourself.

Midterm and Final exams: There will be a midterm and a final exam following the schedule listed below. **The exams will be in-class and closed-book** and will comprise multiple-answer questions. Under **exceptional** circumstances (e.g., conflict with university sport events, hospitalization, etc.) the exams may rescheduled to a different date.

Plagiarism will not be tolerated and the professor has no discretion about whether to report it. Cutting and pasting solutions found on the internet is a form of plagiarism. The procedure for dealing with cases of suspected plagiarism is manifestly unpleasant and stressful (for student and professor), and emphatically not worth the risk to your academic career and to your future. Your work should be clearly distinguishable from its sources and be a direct result of your own understanding of the material. For a guide to what constitutes plagiarism and how to avoid it please consult the Honor Council's document concerning academic fraud: honor.rice.edu/bluebook.cfm?doc_id=10355

Attendance and Participation

Students who attend class regularly will be at a significant advantage because material not included in the textbook or class presentations made available on Canvas is often featured during class. Furthermore, the examples that will be worked through during class are directly applicable to the homework problem sets, as well as to the midterm and final exam. You are expected to participate actively in class activities and to ask questions. Attendance will be taken

during classes. Attendance will not be recorded during the first week of classes. **Students with less than 4 (three or less) unexcused absences will receive three extra points. These extra points will be added to the final grade based on homework, midterm, and final exams.**

Grades

Task	Weighting
6 problem sets	50% (~8.3% for each problem set)
Midterm and Finals	50% (25% midterm - 25% final)

Each problem set and in-class exam will receive a number grade from 0 (minimum) to 100 (maximum). The overall percentage grade (PG) will be calculated from the percentage grade awarded for each task, with the appropriate weighting. The final letter grade will be determined from the overall percentage grade by:

PG < 60% (F)
60 % < = PG < 62 % (D -)
62 % < = PG < 68 % (D)
68 % < = PG < 70 % (D+)
70 % < = PG < 72 % (C-)
72 % < = PG < 78 % (C)
78 % < = PG < 80 % (C+)
80 % < = PG < 82 % (B-)
82 % < = PG < 88 % (B)
88 % < = PG < 90 % (B+)
90 % < = PG < 92 % (A-)
92 % < = PG < 99 % (A)
PG >= 99 % (A+)

You do not need to have a scientific background to get a high grade. However, you will need to work hard and regularly to achieve a top grade. This includes attending class, completing all of the problem sets and talking to the professor as soon as possible when difficulties arise. Misunderstandings can often be cleared up quickly and easily, but if left to fester they will adversely affect your grade and will spoil your enjoyment of the course.

Cellphones, Tablets, Laptop Computers, etc.

Cellphones must be switched off upon entering the classroom.

Laptop computers, netbooks, iPads, etc., may be used for the purpose of note taking only. Other activities are likely to be extremely distracting for others sitting nearby. If non-course-based electronic-device use becomes a problem during the semester then an in-class ban will be implemented.

Observing Sessions

The Rice University Campus Observatory (RUCO: http://www.ruf.rice.edu/~ruco/observatory.html) provides an excellent opportunity for hands-on stargazing. At least one nighttime star gazing session will be scheduled during the semester. However, as with most Earth-based astronomical endeavors, we are at the mercy of the weather and the local 'seeing' conditions. This means that observing sessions may be organized and cancelled at unavoidably short notice. The best nights for practical astronomy are clear and cold, so you are advised to dress warmly.

Class Schedule (tentative)

August

(1) Tuesday 22rd - Introduction to the course
(2) Thursday 24th - Part I: Ch. 1. A Modern View of the Universe
(3) Tuesday 29th - Part I: Ch. 1. A Modern View of the Universe;
Ch. 2. Discovering the Universe
(4) Thursday 31st - Part I: Ch. 2. Discovering the Universe

September

(5) Tuesday 5th - Part I: Ch. 3 The Science of Astronomy
(6) Thursday 7th - Part II: Ch. 4. Making Sense of the Universe
(7) Tuesday 12th - Part II: Ch. 4. Making Sense of the Universe
(8) Thursday 14th - Part II: Ch. 5. Light and Matter
(9) Tuesday 19th - Part II: Ch. 5. Light and Matter
(10) Thursday 21st - Part II: Ch. 5. Light and Matter
(11) Tuesday 26th - Part II: Ch. 6. Telescopes
(12) Thursday 28th - Part II: Ch. 6. Telescopes
- Part V: Ch. 14. The Sun

October

(13) Tuesday 3rd - Part V: Ch. 14. The Sun
(14) Thursday 5th - Part V: Ch. 15. Surveying the Stars
(15) Thursday 12th - Part V: Ch. 15. Surveying the Stars

(16) **Tuesday 17th - In-class midterm exam**

(17) Thursday 19th - Part V: Ch. 16. Star Birth
(18) Tuesday 24th - Part V: Ch. 17. Star Stuff
(19) Thursday 26th - Part V: Ch. 17. Star Stuff
(20) Tuesday 31st - Part V: Ch. 18. The Bizarre Stellar Graveyard

November

(21) Thursday 2rd - Part VI: Ch. 18. The Bizarre Stellar Graveyard
(22) Tuesday 7th - Part VI: Ch. 19. Our Galaxy
(23) Thursday 9th - Part VI: Ch. 20. Galaxies and the Foundation of Modern Cosmology
(24) Tuesday 14th - Part VI: Ch. 21. Galaxy Evolution
(25) Thursday 16th - Part VI: Ch. 21. Galaxy Evolution
(26) Tuesday 21st - Part VI: Ch. 22. The Birth of the Universe

(27) Tuesday 28th - Part VI: Ch. 23. Dark Matter, Dark Energy, and the Fate of the Universe
(28) Thursday 30th - Part VI: Ch. 23. Dark Matter, Dark Energy, and the Fate of the Universe

December

(29) **Thursday 7th - In-class final exam**

Summary of Problem Set and Exams Deadlines

Deadlines are strictly enforced. Requests for extensions must be granted by the professor (by email, so that a written record exists) **BEFORE** the due date of the assignment. You will need a valid reason accompanied by supporting documentation.

September
(1) end of the day Monday 4th - Problem Set 1 due.
(2) end of the day Monday 18th - Problem Set 2 due.

October
(3) end of the day Monday 2nd - Problem Set 3 due.
(4) Tuesday 17th - Midterm exam
(5) end of the day Monday 30st - Problem Set 4 due.

November
(6) end of the day Monday 13th - Problem Set 5 due.
(7) end of the day Monday 27th - Problem Set 6 due.

December
(8) Thursday 7th - Final exam