

Introduction to Astronomy II : The Dark Universe
ASTR 201 - Spring 2016

Bulletin Information

ASTR 201 – Introduction to Astronomy II : The Dark Universe (3 credits)

Course Description:

Astronomical topics including stellar death, black holes, dark matter, and dark energy. Astronomical techniques and application of the scientific method in modern astronomy.

Prerequisites: ASTR 101 or SCHC 115, or consent of the instructor

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Course Overview:

Astronomy 201 will be an interactive lecture course. It is designed to be accessible to students in non-science majors, but also engaging for students interested in an astronomy minor. The lectures will build on the material covered in ASTR 101 (astronomical observations, the solar system, stars, our galaxy and the big bang). In ASTR 201 we will explore selected topics in greater depth and extend to new areas of modern astronomy with an emphasis on the “dark” components of the universe. Subjects will include: stellar death, black holes, dark matter in galaxies and galaxy clusters, dark energy and the very early universe. The goal of the course is to develop an understanding of how astronomers study a universe that is mostly unknown and largely invisible.

Learning Outcomes:

Students who successfully complete this course will be able to:

- (1) Explain how the scientific process is applied in advancing astronomical understanding, from exploration to data collection and confrontation with theory.
- (2) Formulate productive questions when presented with new astronomical information or observations.
- (3) Name different types of astronomical observations, and explain how they are executed and what information they can provide.
- (4) Demonstrate an understanding of the role of uncertainty and probability in scientific reasoning, including differentiation and joint application of related concepts such as precision and accuracy, and statistical and systematic uncertainty.
- (5) Identify ways in which societal pressures and human bias can incentivize and influence scientific investigation.

Mastery of these outcomes will be evaluated through in-class questions, homeworks and exams.

Communication: I will use the Blackboard system to post all course information.

Textbook and Online Material:

The required text for the course is *Astronomy, A Beginners Guide to the Universe*, Seventh Edition, Chaisson and McMillan, 2013, Pearson Education Inc. (Glenview, IL). ISBN 978-0-321-81535-4. Along with the physical textbook purchase, students will have online access to the Mastering Astronomy web site – www.masteringastronomy.com - that has an electronic version of the textbook and video tutorials.

NOTE: This is the same book used in the ASTR 101 course in Fall 2015 and Spring 2016.

Pre-class Reading Assignments:

The chapters covered in class are designated on the syllabus timetable and should be read prior to the class period. All students are expected to read the designated chapters before coming to class, as the lecture periods will not be used to revisit all the content from the reading assignments. Reading comprehension questions will be given at the beginning of every class for the instructor to gauge what content areas need more attention, and to set the priorities for in-class discussion.

Lectures, Class Participation, and iClickers:

An “iClicker2” student response device is required for this class and will be employed throughout each class session. They can be purchased new from the bookstore or used from third-party retailers. In-class participation will be scored by the *iClicker* system and will count toward 10% of your grade. In order to receive this credit, you will need to register your iClicker remote on Blackboard within the first week of class.

Throughout the class sessions, students will be asked questions based on the lectures and reading. Students will work individually or in small groups to answer the questions using iClickers. Based on the answers to the questions, the lecture will be tailored to address in more detail any areas of difficulty for the students. The grading system for iclicker questions is presented on the next page.

Your Course Score (Final Grade): Grading is based on the following formula that includes your clicker question score (Q), homework score (H), test average (T), and final exam score (F).

$$\text{Course Score} = (0.2 * Q) + (0.3 * H) + (0.3 * T) + (0.2 * F)$$

Each of these components of your course score is described below. Your clicker, homework, and test scores will be periodically posted on Blackboard to allow you to assess your course progress and project your final course score. Letter grades are assigned after the final course score is computed using the table below. A course score that lands precisely at the boundary will be given the higher letter grade (i.e. a course score of 85.000 will be a B+ instead of a B).

Course Score	0 – 60	60 – 65	65 – 70	70 – 75	75 – 80	80 – 85	85 – 90	90 - 100
Grade	F	D	D+	C	C+	B	B+	A

In-class Questions (Q): The in-class iClicker questions will account for 20% of your final course score. Your iClicker score is the percentage of questions that you get correct. The “Q” value (see table below) is then factored in to the course formula to calculate your course score. For example: if you get 70% or better on “clicker” questions, you will get full credit (Q = 100) when computing your course score. **Students get a 0.5-point credit for each class session attended. Note that to get the credit, you must attempt all questions for that class session.**

iClicker Score	“Q” Value
70-100%	100
50-70%	75
25-50%	50
0-25%	0

Example – Suppose I ask 100 questions over the semester, and you answer 60 of them correctly, while attending all 25 lectures and attempting all questions every time. Then your clicker question score would be: $(60 + 0.5 \cdot 25) / 100 = 0.725$ or 72.5%.

This is in the 70-100% range, so the Q value is 100 when computing the final course score

Homework (H): Weekly homework assignments will consist of conceptual and numerical problems that accompany each chapter under discussion. Your homework grade will count towards 30% of your course score. Problem sets are to be completed each week as designated on the course timetable and announced in class. Answers will be made available the next day. The Blackboard system will be used for all homework. Since the computer records when you submit your answers, **LATE HOMEWORK WILL NOT BE ACCEPTED.** Occasionally, the network is slow or disabled, or the server is down; so please plan ahead. Deadlines will not be changed due to network latency.

Astronomy Center Computers (Jones 005, Jones 007) are available for students to complete homeworks if needed. A schedule of computer room availability will be posted on the class Blackboard site.

Tests (T): The exams for the class will include both conceptual and numerical problems in multiple choice questions. These exams will be closed-book, without notes. Successful completion of the exams will demonstrate mastery of the learning outcomes outlined above. Each exam is worth 10% of your final course score, so that all three together account for 30% of your course score.

Missed Exam policy: The test days are all scheduled in advance. Therefore, there are **NO makeups for exams missed due to unexcused absences.** If you have a documented excused absence for an exam date, presented to the instructor in advance or at the earliest date possible, then the weight of the missed exam will be put onto the final. Each exam is worth 10% of the final course score, so if an exam is missed for an excused absence, then the final will count for 40% of the final grade instead of 30%.

Final Exam (F): The final exam is comprehensive and will cover all concepts introduced in this course. The final counts towards 20% of your course score. All students must take the final exam.

Attendance: Attendance at all classes and exam periods is required. We will adhere to the University policy on attendance and the “10% rule” (see <http://www.sc.edu/bulletin/ugrad/acadregs.html>). This course has 28 class sessions, so **more than 3 missed classes qualifies as excessive absence. Your final grade will be docked by 5 course score points (half of a letter grade) for absences beyond 3.** If you must miss a class due to official reasons, see me in advance. Reminder: there will be no makeups for missed exams (see above), and you can not recover points for iClicker questions from classes you miss.

Cheating: Students are expected to abide by the USC Honor Code :

It is the responsibility of every student at the University of South Carolina Columbia to adhere steadfastly to truthfulness and to avoid dishonesty, fraud, or deceit of any type in connection with any academic program. Any student who violates this Honor Code or who knowingly assists another to violate this Honor Code shall be subject to discipline.

I consider bringing a fellow student's iClicker to class to be cheating and a violation of the University Honor Code. If you are caught with a remote other than your own or have votes in a class that you did not attend, you will forfeit all clicker points and may face additional disciplinary action. "Clicker Audits" will be performed at random times during the semester.

Electronics: Cell Phones, iPods, laptops, etc must be turned off and stowed away during class time. Use of unauthorized electronics during exams will be considered cheating.

Class Start and End times: The class will begin and end promptly at the times posted on the University's website. I will be available for quick questions or discussion 5-10 minutes before each class begins. I will respect your time by starting promptly and not extending the lecture period. Accordingly, I expect you to respect your fellow students and myself by arriving before class begins, being ready to start at the appropriate time, and refrain from packing up or leaving before the end of class.

Student Disability and Health Services: The University of South Carolina provides high-quality services to students with disabilities, and I encourage you to take advantage of them. Students with disabilities needing academic accommodations should:

- (1) Register with and provide documentation to the Office of [Student Disability Services](#) (777-6142) in LeConte College Room 112A, and
- (2) Discuss with the instructor the type of academic or physical accommodations you need. Please do this as soon as possible.

Note also that the Office of [Student Health Services](#) (777-3175) provides wellness programs, counseling, and support to help you manage physical and mental stress. I encourage you to make use of their services to stay healthy and focused. They are located on the 5th floor of the Close/Hipp Building.

ASTR 201 Spring 2016 Schedule of Course Content

Week	Date	Topic	
1	Tue, Jan 12, 2016	Introduction and overview	
	Thu, Jan 14, 2016	White Dwarfs, Neutron Stars and Pulsars	Part 1 : The Stellar Graveyard
2	Tue, Jan 19, 2016	Supernovae	
	Thu, Jan 21, 2016	Gamma Ray Bursts	
3	Tue, Jan 26, 2016	Black Holes I : Introduction	
	Thu, Jan 28, 2016	Black Holes II : Relativity	
4	Tue, Feb 2, 2016	Black Holes III : Supermassive Black Holes	
	Thu, Feb 4, 2016	Gravitational Waves	
5	Tue, Feb 9, 2016	TEST 1	
	Thu, Feb 11, 2016	Dark Matter in Galaxies	Part 2 : Dark Matter
6	Tue, Feb 16, 2016	Galaxy Clusters	
	Thu, Feb 18, 2016	Gravitational Lensing	
7	Tue, Feb 23, 2016	Collisions and Mergers	
	Thu, Feb 25, 2016	Large Scale Structure	
8	Tue, Mar 1, 2016	Direct Detection Experiments	
	Thu, Mar 3, 2016	TEST 2	
9	Tue, Mar 8, 2016	SPRING BREAK. NO CLASSES	
	Thu, Mar 10, 2016		
10	Tue, Mar 15, 2016	Geometry of the Universe	PART 3 : Cosmology and Dark Energy
	Thu, Mar 17, 2016	Observable Cosmological Parameters	
11	Tue, Mar 22, 2016	Cosmic Acceleration and Dark Energy	
	Thu, Mar 24, 2016	Cosmic Microwave Background	
12	Tue, Mar 29, 2016	Nucleosynthesis	
	Thu, Mar 31, 2016	Inflation	
13	Tue, Apr 5, 2016	The Fate of the Universe	
	Thu, Apr 7, 2016	TEST 3	
14	Tue, Apr 12, 2016	Life in our solar system	PART 4 : Life in a Dark Universe
	Thu, Apr 14, 2016	Habitability in our galaxy and beyond	
15	Tue, Apr 19, 2016	Intelligent Life in the universe	
	Thu, Apr 21, 2016	The next decade in astronomy	
16	Tue, Apr 26, 2016	Reading Day	
	Wed, Apr 27, 2016	FINAL EXAMS BEGIN	