SYLLABUS
ASTR 250 (Lecture #001)
Fundamentals of Astronomy
Spring 2014

LECTURES: Tuesday/Thursday: 2:00 p.m. - 3:15 p.m.
Steward Observatory, Room 202
(No Class on March 18 & 20, spring break. Last lecture May 7.)

INSTRUCTOR: Dr. Nathan Smith
OFFICE: Steward Observatory, room 336
TELEPHONE: (520) 621-4513 (*voice messages are not checked regularly*)
EMAIL: profsmith170@gmail.com (*this is the best way to contact Dr. Smith*)
OFFICE HOURS: Tues./Thurs. (11:00 a.m. - noon) or by appointment

TEACHING ASSISTANT: Megan Kiminki
Office: Steward Observatory, room 352
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Office Hours: Mon./Wed. (11:00 a.m. – noon) or by appointment
GRADER/PRECEPTOR: C.T. Smith, Email: ctwsmith@email.arizona.edu
Office hour: Wed. 3-4 pm, Parker Library

MIDTERM EXAMS: Thursday, February 20, 2:00 p.m.
Thursday, April 3, 2:00 p.m.
FINAL EXAM: Tuesday, May 13, 1:00 p.m. - 3:00 p.m., Steward Obs. 202

REQUIRED TEXTBOOK: *Foundations of Astrophysics*, by Ryden & Peterson (Addison Wesley)
COURSE WEBSITE: http://D2L.arizona.edu

PARTICIPATION IN CLASS: Regular attendance of lecture is essential; 30% of your grade (homework/participation and group exercises) is based on in-class participation. Points may be awarded at any lecture in the form of in-class homework presentation or other questions, group activities, quiz shows, etc. (see below). Students are responsible for all information given out in the lecture, including problems sets and any announced schedule changes, and you must be present in class to turn in your homework, so attendance is ***required***. If you must miss class, talk to another student or contact Prof. Smith or your TA to find out what you missed. You will not be allowed to make up any missed participation points. To allow for unavoidable periodic absences for a legitimate reason (medical emergency, death in the family, serious illness, etc.), we allow two absences with no penalty. In other words, your two lowest participation scores will not be counted (whether the score is a zero due to an absence or a low score due to a relatively poor performance).

REQUIRED TEXT: The textbook named above is required for the course. The syllabus lists which chapters in the text correspond to lecture topics each week, and assigned reading. You are required to read those chapters ***before*** coming to class that week. Most of the homework problems will be taken from this textbook. An optional supplementary text is *The Physical Universe: An Introduction to Astronomy*, by Frank Shu. This will be helpful to you but is not required.

TOPIC SCHEDULE & READING/HOMEWORK ASSIGNMENTS:

Week	Topic	Chapters	Assignments/Exams
Jan 16	Introduction/overview/units/basics	...	...
Jan 21/23	The Sky, History: Greeks/Copernicus	1, 2	PS1 (Th)
Jan 28/30	Orbital Mechanics, the Moon	3, 4	PS2 (Th)
Feb **4**/6	Light, Matter, Spectroscopy, Telescopes	5, 6	PS3 (Th)
Feb 11/13	Sol. System Overview – Planets etc.	8, 10	PS4 (Th)
Feb 18/20	Solar System Formation, Exoplanets	12	Midterm 1 (Th)
Feb 25/27	The Sun, Normal Stars	7, 13	PS5 (T)
Mar 4/6	Stellar Atmospheres/Interiors, Star clusters	14, 15	PS6 (T)
Mar 11/13	ISM, Star Formation	16, 17	PS7 (T)
Mar 18/20	**No Class - SPRING BREAK**		
Mar 25/27	Stellar Evolution, Death	17	PS8 (T)
Apr 1/3	White Dwarfs	18	Midterm 2 (Th)
Apr 8/10	Neutron Stars, Black Holes, Supernovae	18	PS9 (Th)
Apr **15/17**	Milky Way, Other Galaxies	19, 20	PS10 (Th), Term Paper (T)
Apr 22/24	Quasars etc., Galaxy Clusters	21, 22	PS11 (Th)
Apr29/May1	Cosmology, Dark Matter, The Big Bang	23, 24	PS12 (Th)
May 6	Summary/review, activities, presentations		
May 13	**Final Exam 1-3 pm**		

GRADES: Your final grade for the course will be based on the midterm/final exams and other assignments in the following proportion (total possible = 800 points):

Homework/Participation	160 points (20%)
Team Score	80 points (10%)
Term Paper	120 points (15%)
Review Article Presentation	80 points (10%)
Midterm #1	80 points (10%)
Midterm #2	80 points (10%)
Final	200 points (25%)

The final letter grade that will appear on your transcript will be determined by ***cumulative*** points you earn in the class, evaluated on a curve compared to the entire class. Letter grades will not be given for each individual assignment, but in class we will give feedback (i.e. a representative grade curve) for large-value items like mid-term exams and the term paper so that you know how you are doing compared to the rest of the class. We cannot give a representative grade for participation scores and presentations, as those are accumulated throughout the semester and the curve can only be determined at the end. If you would like feedback on your homework assignments and presentations, please come to office hours or schedule an appointment with your TA or Prof. Smith. Mistakes in grading individual assignments sometimes happen. All questions, disputes, or mistakes regarding the grading of exams and assignments must be brought to our attention within 1 week after the exam or assignment is handed back or posted, and such checks are encouraged.

EXPECTATIONS: This is an introductory course intended to provide a broad foundation in astronomy knowledge and techniques for astrophysics and physics majors. We cover everything in the Universe outside Earth, so the course will be intense and must move quickly. While no previous astronomy coursework is required, some basic understanding and proficiency in physics and math are expected. The level expected will be discussed the first few days of class. Advanced calculus is not a prerequisite, but some simple calculus will be used in the course. Students are expected to complete the assigned reading and problem sets ***before*** coming to class, and to use lecture time to ask clarifying questions and to participate in discussions.

HOMEWORK: This course requires weekly homework problem sets that will involve problems in the textbook and other handouts announced in class. You may discuss the astronomy concepts with classmates, but you must do your own work. **This is how you will learn most of the material.** The problem sets can be extensive – plan to spend several hours on each problem set. For each problem set, turn in the original handwritten problem set at the start of class on the due date. It is recommended that you make a photocopy of your assignment to keep, because we will go through some of the problems together in class after they have been turned in. Prof. Smith will call on a student from one team (see below) to explain how they did that particular problem. The team assigned to each problem will be announced in advance, but anyone from that team must be prepared to present the solution to the class (see below).

We will drop the two lowest homework problem set scores. Dropping these two scores is meant to allow flexibility for any unforeseen disasters, illnesses, family emergencies, religious holidays, sporting events, late registration in the course, the bookstore running out of books, computer malfunctions, zombie attacks, etc. For this reason, late homework will **not** be accepted. Do not request the opportunity to make up homework unless your reason is serious enough (i.e. a prolonged illness) to warrant receiving a grade of incomplete in the course.

TEAMS: Students who take this course have a range of backgrounds in physics (Freshmen, Sophomores, Juniors) and a variety of majors. To ameliorate this, you will conduct some of your coursework in "teams", where teams membership is assigned partly based on a range of background. We will aim for 3-4 people per team, but this will ultimately depend on the number of students enrolled, which may change throughout the semester. Teams will be adjusted as students add or drop the class. The main purpose of this is for students with more background in physics to help those who have not had as many courses, and to encourage you to discuss the course material. You should exchange email addresses with your teammates so that you can meet outside of class. There are three ways that work in these teams will influence your grade:

1) *Homework problems presented in class*. For each problem set, one or more teams will be assigned to each problem. We will go through these problems in class after the problem sets have been turned in, led by one or more students from a team explaining the problem at the chalkboard. Time may not allow us to go through all problems, but any member of your team must be prepared to present the problem. This means that if you are on a team responsible for a problem, you must master it to a greater level than just getting the correct solution. You must be able to explain clearly how you arrived at that solution, and you must be able to answer questions from your fellow classmates. Each student is expected to work through the problem on their own first, but for the particular problems assigned to your team, you are

permitted and encouraged to compare answers with your team. If you arrive at different answers, discuss it together and understand why. A convenient time to meet with your team might be a few minutes before or after class on the class day before the assignment is due.

2) *Teaching an Equation/Concept.* At least once during the semester, but possibly more, your team will be called upon to give a presentation to the class. In this exercise, your team will be assigned a specific important equation or brief concept that you must ***teach*** to the rest of the class. Examples are things like Kepler's 3rd Law, the Virial Theorem, Newton's Universal Law of Gravitation, the Schwarzschild radius, the Chandrasekhar mass, the Jeans mass, hydrostatic equilibrium, etc. In order to teach this concept to the class, all group members must master it, understanding where it comes from or how the equation is derived, how the relevant equation may be applied in various circumstances, and ways to explain it to your peers in a way that makes sense (including examples). Your classmates will be tested on this, so they are depending on you to teach it well. This means you must develop some expertise that is deeper than the rest of the class, because you must teach it to them and answer their questions. You must also be prepared to answer impromptu questions from Prof. Smith or your TA. Thus, you will need to consult additional resources outside your textbook. These presentations will occur throughout the semester and will be assigned early. The points awarded may vary based on difficulty and quality of presentation.

3) *Astronomy Quiz Show.* Another opportunity to earn points toward your team score will be periodic quiz show-style competitions. These will occur from time to time throughout the semester and will be unannounced. This is intended to be a fun way to review the material quickly, and to verify that you have done the reading in advance of coming to class. The only way to prepare in advance is to complete the reading assignments. The exact format may change, but there will basically be a series of short questions to test your knowledge, which you may discuss briefly as a team before responding.

TERM PAPER WRITTEN ASSIGNMENT: All students are required to submit a written project as part of the requirements for this course. The deadline for turning in your term paper is Tuesday, April 15 at 2:00 pm (start of class). This deadline essential to allow Prof. Smith and your TA to read all the term papers before the end of the semester, so **absolutely no late term papers will be accepted**. Please do not test us on this, or you will make yourself very unhappy. More detailed instructions for this assignment are available on D2L. Submit a printed hardcopy in class on the due date, and also upload a PDF file to the course website (D2L) dropbox before 2:00 pm. Failure to do either by the deadline will earn you a score of zero on this assignment.

REVIEW ARTICLE PRESENTATION: Each student must present a 10-minute in-class summary of an article from the literature on a topic of their choice. The chosen topic should be aligned with material covered in this course. Each year, a publication called ***Annual Reviews of Astronomy and Astrophysics*** publishes a series of review articles on a wide range of topics that are different each year, written by experts in the field. These are blue & black hardbound books that can be found in the Astronomy Department library, and the articles can be found free online using the NASA/ADS abstract server. You must choose an article published since the year 2000, read it, internalize it, and then prepare a short presentation of the article in class. The intent here is for you to develop expertise in some topic of current astronomical research (deeper than what is covered in

lecture), to work on your presentation skills, and for other students to learn from you. The date on which you conduct your in-class presentation will be determined by the course schedule: i.e. if you choose an article on high-redshift galaxies or cosmology, your presentation will occur later in the course when this is discussed. You must sign up for an article and presentation time by contacting Prof. Smith by email or in office hours. No two students can present the same article, and topics must be broadly distributed throughout the semester and across science topics. (You will have more freedom in your choice of article if you choose sooner.) If someone else has already chosen to cover the topic you have chosen, you must find another. Choose your article by week 4 of class or one will be assigned. Your presentation must adequately give an overview and summary of the topic in the article, discussing the state of the field, techniques of investigation, and what some of the most interesting questions are. It should not simply be a point-by-point "book report" of the article. You may feel free to use any visual aids (i.e. Powerpoint slides) or you may choose to use the chalkboard. You ***may not***, however, simply project pages of the article on the screen. To earn a high score, it should be clear that you have internalized the material and that you understand it.

LOOKING THROUGH A TELESCOPE: This is not required (and no extra credit is given), but you can attend any of the series of public evening lectures hosted by Steward Observatory: https://www.as.arizona.edu/public-evening-lecture-series **.** Following all public lectures (which are held in N210), the telescope dome outside this lecture hall will be open for viewing objects in the night sky (weather permitting). This telescope is also open for eyepiece observing every MTWTh during the semester, weather permitting. Your undergraduate grader/preceptor, C.T. Smith, is the lead observer for this telescope, but you must sign up in advance near the lobby.

DEADLINES: We will accept **no** late assignments. Homework assignments will be presented and discussed in lecture, making any late homework irrelevant. Oral reports follow the course schedule and late presentations will not be useful. Term papers are to be submitted in class (hardcopy) and submitted online (PDF), and the electronic servers will not accept submission after the deadline. If you choose to wait until a few hours before the deadline to do your assignment, you are taking a calculated risk. Should your printer break, Internet go down, or an emergency arise, these will not be valid excuses. You will not get an extension because you chose to wait until the last moment.

MAKE-UP EXAM POLICY: In general, we do not give make-up exams. If we deem that your excuse for missing an exam is truly justified, you will be given an oral make-up exam. That means you stand at the whiteboard in Prof. Smith's office for 30-45 minutes and answer quantitative problems on the spot. Also, please note that the final exam is scheduled for May 13. Take this into account when making any travel plans. Your desire to go home earlier than May 13 ***will not*** be accepted as a valid excuse. You are required to be here on May 13 or you will fail the course.

LEARNER-CENTERED EDUCATION: The University of Arizona has designated itself a "Learner-Centered University." This means that the student is expected to take an **active** role in his/her learning. This is especially true in this course, which is part of the required curriculum of your Astronomy/Physics major. Class time will be peppered with "mini-lectures" for qualitative understanding, separated by activities that will require your participation, especially your presentation of problems from the homework sets and team activities that will constitute 30% of your grade. Be prepared to interact with your classmates, ask questions, and participate in group discussions. Always read the relevant textbook chapters ***BEFORE*** coming to class. In cases where

your final class score is near a borderline between two letter grades, a student who regularly exhibits active participation may be bumped up to the next letter grade – a student who typically contributes as much to class discussion as we might expect from a lump of amorphous organic material will not see any sympathy in rounding of their course grade.

ACADEMIC DISHONESTY: Presentation of any work other than your own, in whole or in part, is considered academic dishonesty. This includes copying test answers or homework assignments, other persons taking exams or quizzes for you, plagiarism of any material on the Internet or in other publications, fabrication, borrowing another student's assignment as an "example", reference to any unauthorized materials during the exam, or turning in a project that you have previously submitted for another course. The only exception to this policy is work specifically designated as group work in **teams**, as noted above. In instances where nearly identical assignments are submitted, ***all*** parties will be held in violation of the Code of Academic Integrity, *so do not share your assignment with another student*. Any other technique that gains unfair advantage over other students is also academically dishonest. All students must be prepared to present valid picture ID if requested during any exam. Any incidents of academic dishonesty will be dealt with harshly according to the University of Arizona's Code of Academic Integrity. This can be obtained at the Dean of Students website: http://deanofstudents.arizona.edu/codeofacademicintegrity . The consequences can range from loss of credit on an assignment or automatic failure of the course, to full dismissal from the University, depending on the severity. In our class, the penalty for plagiarism, cheating on an exam, or homework fraud will be automatic failure of the course and, depending on the circumstances, expulsion from the University. It is not worth the risk.

TURNITIN.COM: If you decide to continue in this course, you are agreeing to submit any papers online as PDF files, when so instructed, which will be examined by a plagiarism-prevention program called TurnItIn.com. You should note that TurnItIn.com – always without your name and any personal information – will retain your paper as part of their database so that students who plagiarize from it now or in the future can be detected. Because of this program, the vast majority of you who do your own work and cite your sources of information properly will not have to compete with students who commit plagiarism.

STUDENTS WITH DISABILITIES: If you anticipate issues related to the format or requirements of this course, please meet with Prof. Smith. We would like to discuss ways to ensure your full participation in the course. If you determine that formal, disability-related accommodations are necessary, it is very important that you be registered with Disability Resources (621-3268; http://drc.arizona.edu) and notify Prof. Smith of your eligibility for reasonable accommodations well in advance of the first midterm. We can then plan how best to coordinate your accommodations.

BEHAVIOR IN CLASS: NO smoking, eating, drinking (except water), or pets are allowed in the lecture hall. All cell phones must be turned to silent mode or powered off completely, and must be placed ***completely out of sight***. To not interfere with students trying to listen to the lecture, you may not use a laptop in class except to take notes. You are expected to be courteous and respectful to your classmates and instructors, and we ask that you strive to be inclusive in team exercises. You should also be aware of the University's policies on disruptive and threatening behavior: http://deanofstudents.arizona.edu/disruptiveandthreateningstudents