

Astronomy 340 - Fall 2018

“Origin of the Universe”

SYLLABUS

Instructor

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Office hours: Mon 11am-12pm or by appointment

Class Schedule

Lectures on Tuesday and Thursday from 12:30pm to 1:45pm

Room ATL 2400

No open laptops are allowed during the lectures. If you feel you need to use one please talk to me.

Course Web Page

The web site for this course can be found at

http://www.astro.umd.edu/~ricotti/NEWWEB/teaching/ASTR340_18.html

It will contain links to course information, assignments and schedule of lectures and exams. I will also use ELMS to post grades, Homework and lecture notes.

Course Description

The course is an introduction to modern Cosmology intended primarily for non-science majors. We will study the progression of our knowledge about the origin and evolution of the universe through history, with particular emphasis on modern cosmological results. Topics include: early cosmological models, geocentric vs. heliocentric theory, curvature of space, Hubble's Law, Big Bang Theory, microwave background radiation, evolution of stars and galaxies, dark matter, active galaxies, quasars and the future of the universe. Modern Cosmology uses the laws of Physics to construct models of the universe that describe how it evolved from simple initial conditions. The current cosmological paradigm has been quite successful at explaining many of the amazing aspects of the Universe around us. In order to do so, however, cosmologists introduced new concepts such as

“dark matter” and “dark energy”. What physics are behind these concepts, and whether such hypotheses will stand the test of time, is the subject of much current research.

Course Prerequisite

The course is intended for non-science majors and assumes high-school-level algebra, and either ASTR 100 or 101 as a prerequisite. *However, expect the homework and exams to be challenging if you have little practice or you are rusty at problem solving.*

Mathematics, not English, is the language of the natural world; that is why it is used in science. Because this is a general course I will endeavor to introduce concepts using the simplest possible math, explaining them in words and graphs before resorting to equations. Some math, however, is unavoidable and, I would argue, desirable. See also the official UMD info on this course.

Required Texts

- Foundations of Modern Cosmology 2/e, by John F. Hawley and Katherine A. Holcomb. Oxford University Press, ISBN 0-19-853096-X
Authors' website for the textbook: "<http://astsun.astro.virginia.edu/~jh8h/Foundations/>"

I will post lecture notes on ELMS. See also the course web page.

Course Assignments and Grading

Final grades for this course will be computed based on cumulative points in the areas below, according to the weights listed:

- Homework 30%
- Midterm exam 25%
- Final exam 30%
- Class participation/quizzes 15%

Final letter grades will be curved, based on the total points received. The letter grades are assigned as:

- A 85-100% of total possible points
- B 70-84% of total possible points
- C 55-69% of total possible points
- D 40-54% of total possible points
- F below 40% of total possible points

with +/- within A, B, and C. There will be no extra credit. You can (and usually will) get a better grade depending on the average performance of the class.

Homework will be assigned 6 times during the semester, due the following week, and must be turned in at the beginning of class. This is 30% of your grade (5% per homework), so do not forget to turn it in. The only late homework accepted will be for excused,

documented absences (see below). If, for whatever reason, the University is officially closed on the due date for an assignment, the due date will be moved to the next lecture.

Points will not be given for any “extra credit projects.” It is important to timely complete all the regular assignments to get the most you can out of the class!

Class participation: Although computer notes will be made available for each lecture, it is important to attend the lectures. There is a strong correlation between class attendance and performance in the exams. Moreover, sitting in the back while reading the newspaper, surfing the Internet, or texting during a lecture is not particularly useful. Paying attention, and asking/answering questions to ensure that information is effectively and accurately transferred between teacher and student is ideal. I will not verify attendance to each lecture, but I will occasionally hand out quizzes that will be part of your grade. I will also remember whether you ask questions or answer my questions during lecture, and I will give you credit for your participation.

Midterm exam: There will be one in-class examination on Oct 18 during the normal class time (to be confirmed). This exam will be closed book. The exam will consist of a section of short answer questions, followed by longer essay and problem solving questions.

Final exam: As per the University rules, the final exam for this course will be held on Dec 17 between 1:30am and 3:30pm in ATL 2400. The final exam **will cover all material discussed** in this course. The format of the final exam will be the same as the midterm exam, with a section of short answer questions and a section of longer essay or problem solving questions.

Students who are ill or have another valid excuse must explain the circumstances to the instructor before the due date of an assignment or exam, and then complete the work within the following week, in order to get full credit. Any illnesses or emergencies need to be properly documented.

Uniform course policies: The University of Maryland has a uniform set of course policies that are respected by all courses on campus. They are found in: <http://www.ugst.umd.edu/courserelatedpolicies.html>. Please read them for your own information. What is below is just a summary of some of them.

Religious observances: It is the student responsibility to inform the instructor of any intended absences for religious observances in advance. That prior notification is especially important in connection with final examinations, since failure to reschedule a final examination before the conclusion of the final examination period may result in loss of credits during the semester.

Open Laptops: Partially to discourage distracting behavior such as Internet surfing or email checking I will not allow open laptops during lectures. If you need your laptop to take notes, come talk to me and be prepared to sit in the first two rows.

Students with Special Needs

Students with a documented disability who wish to discuss academic accommodations should contact me as soon as possible.

Academic Integrity: The University of Maryland, College Park has a nationally recog-

nized Code of Academic Integrity, administered by the Student Honor Council. University standards regarding academic integrity apply to all work performed for credit in this course, and as a student you are responsible for upholding these standards. Particulars of the University's Code are printed in the Undergraduate Catalog, and a description of what constitutes academic dishonesty is also given in the on-line Schedule of Classes. In brief, the Code requires that you must never engage in acts of academic dishonesty at any time. Acts of academic dishonesty include cheating, fabrication, plagiarism, or helping another person to do any of these things. Violation of the Code carries very serious consequences; for more information, please visit <http://www.shc.umd.edu>.

The rules regarding academic integrity apply to homework as well as to exams. As a part of these rules, you must give credit to any book, published article, or web page that you have used to help you with a particular assignment. These rules also apply to unpublished sources of information. In particular, students are encouraged to discuss assignments and other class material with each other, but every student must personally think through and write up his or her own answers to the homework questions.

To further exhibit your commitment to academic integrity, remember to sign the Honor Pledge on all examinations and assignments:

"I pledge on my honor that I have not given or received any unauthorized assistance on this assignment/examination."

Course Evaluations: Your participation in the evaluation of courses through CourseEvalUM is a responsibility you hold as a student member of our academic community. Your feedback is confidential and important to the improvement of teaching and learning at the University as well as to the tenure and promotion process. CourseEvalUM will be open for you to complete your evaluations sometime in November. Please go directly to the CourseEvalUM website to complete your evaluations around that time. The process should take less than 20 minutes, and the sooner it is done the less will it get in the way of studying for the finals. By completing all of your evaluations each semester, you will have the privilege of accessing online, at Testudo, the evaluation reports for the thousands of courses for which 70% or more students submitted their evaluations.

Tentative Course Outline

Class	Date	Lecture	Reading
Part I: History of Cosmology			
#1	Aug 28	Introduction to the course	Ch.1
#2	Aug 30	Geocentric cosmology and astronomy	Ch.2
#3	Sep 04	Renaissance empiricism and the heliocentric model	Ch.2
#4	Sep 06	The Universe of physical law	Ch.3
#5	Sep 11	The age of the Earth and the Cosmos	Ch.3
Part II: Relativity			
#6	Sep 13	Principles of space and time	Ch.6
#7	Sep 18	Special relativity	Ch.7
#8	Sep 20	Special relativity	Ch.7
#9	Sep 25	Special relativity	Ch.7
#10	Sep 27	General relativity	Ch.8
#11	Oct 02	General relativity	Ch.8
#12	Oct 04	Black Holes	Ch.9
Part III: Modern Cosmology			
#13	Oct 09	The Universe beyond our Galaxy	Ch.10
#14	Oct 11	Cosmological expansion	Ch.10
#15	Oct 16	Geometry and evolution of the Universe	Ch.11
–	Oct 18	<i>Midterm Exam:ATL 2400, 12:30pm–1:45pm</i>	–
#16	Oct 23	Geometry and evolution of the Universe	Ch.11
#17	Oct 25	The Big Bang and early Universe	Ch.12
#18	Oct 27	The Big Bang and early Universe	Ch.12
#19	Nov 01	The Big Bang and early Universe	Ch.12
Part IV: Contemporary Cosmology			
#20	Nov 06	Measurement of cosmological parameters	Ch.13
#21	Nov 08	Measurement of cosmological parameters	Ch.13
#22	Nov 13	Cosmic background radiation	Ch.14
#23	Nov 15	Cosmic background radiation	Ch.14
#24	Nov 20	Dark matter and cosmic structure formation	Ch.15
–	Nov 22	Thanksgiving	
#25	Nov 27	Cosmic structure: observations	Ch.15
#26	Nov 29	Cosmic structure: simulations	Ch.15
#27	Dec 04	Cosmological inflation	Ch.16
#28	Dec 06	Review session	–
–	Dec 17	<i>Final exam: ATL 2400, 1:30pm–3:30pm</i>	–