

## ASTR4030/6030 – COSMOLOGY

Spring 2022 – Dr. Magnani

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Web Page: [www.physast.uga.edu/~loris/astr4030/prob.html](http://www.physast.uga.edu/~loris/astr4030/prob.html)  
Class Hours: MWF 03:00 PM – 03:50 PM in room 327  
Office Hours: MW 4:00 PM – 5:00 PM (or by appointment)  
Call Number: 4030: 60886  
6030: 60887

### Textbook:

*Introduction to Cosmology, 2<sup>nd</sup> Ed.* – Barbara Ryden (Addison Wesley). You may use the first edition of the book, if you find it. However, I will assign problems from the second edition and these are some of the things that may have changed between editions. You are responsible for doing the problems based on the second edition.

This course is an upper-level astronomy course dealing with the modern astrophysical theory of the beginning and evolution of the Universe. The science of cosmology is the branch of astrophysics that deals with these issues. We will gain an introductory understanding of the modern ideas on how the Universe began and developed. We will cover the basics of the Big Bang Theory, multi-parameter cosmological models, the cosmic microwave background radiation, cosmic inflation, and nucleosynthesis of the lightest elements. We will have a very brief intro to the mathematics of General Relativity, enough to allow us to see where the Friedmann equation comes from. I assume you have at least two years of Calculus and at least one semester of upper level Mechanics, Electromagnetic theory, and Thermodynamics in your background. ASTR 4010 and 4020 are recommended, but not required for this course. Weekly information about the course, homework assignments, etc., will be posted on the website.

**Class Attendance:** In-person attendance is not required but is strongly encouraged. There is no online component to the class. You are responsible for anything discussed in class. If you should miss a class and wish to find out what was discussed, consult with classmates or the instructor.

**Homework:** 5 to 10 homework problems will be assigned for each chapter that we cover. Due dates for each homework assignment will be on the course web page. You may work with other students in the class on the homework, but, if you choose to do so,

you must write on your submitted work who(m) you worked with. There is no penalty for working with others, but I will assign the same exact grade to all the people who worked on the problems together. I will not grade all the problems assigned, but will choose one or two problems from each homework assignment to grade. Your performance on the chosen problem(s) that is(are) graded will dictate your final homework grade. For every two days that any homework assignment is late, one point (out of a total of ten points) will be deducted from the final score for that homework.

**Grading:** There will be three midterms; see the schedule below for the tentative dates. The final exam for this course is cumulative and will be on Wednesday, May 11<sup>th</sup>, from 3:30 PM till 6:30 PM. the midterms count 20% each for a total of 60% of the final score, the homework counts for 15%, and the final 25%. If you miss a midterm exam, you will have to schedule a makeup exam within one week of the original exam date. If you miss the final exam, you must make it up the next day.

### GRADING POLICY

At the end of the semester, your overall grade will be determined from your exams and homework. Your final letter grade will be converted to a letter grade using the following scale:

A	corresponds to 92.00 – 100.00
A-	corresponds to 87.00 – 91.99
B+	corresponds to 84.00 – 86.99
B	corresponds to 80.00 – 83.99
B-	corresponds to 76.00 – 79.99
C+	corresponds to 72.00 – 75.99
C	corresponds to 68.00 – 71.99
C-	corresponds to 60.00 – 67.99
D	corresponds to 50.00 – 59.99
F	corresponds to less than 50.00

### STUDENT RESPONSIBILITIES

Please make a reasonable attempt to arrive on time. If you must leave earlier than the scheduled end of class, please try to do so quietly and discreetly. Class disruptions or distracting behavior will not be tolerated.

You are responsible for all topics discussed in class, as well as class announcements. Although attendance is not mandatory, it is in your best interest to attend every class and absence from class does not excuse you from the above responsibilities.

You are encouraged strongly to read any material that is handed out in a given class, or posted on the course website, for the following class. If the schedule of readings changes significantly from that detailed below, then those changes will be announced in class. Ask for clarification on anything you find unclear, ambiguous, or unspecified. This includes both course policies and astronomical topics. Errors in this syllabus will be corrected and posted on the webpage for this course (see above).

Know the rules concerning withdrawals and incompletes, published in the UGA *Undergraduate Bulletin*. Note that I will NOT withdraw you from the course for excessive absences.

All students are responsible for knowing, understanding, and abiding by the academic honesty policy of the University of Georgia, which can be found online at <http://honesty.uga.edu>

If you have any questions about this policy and how it pertains to your work in this course, please ask me for clarification.

If you have any questions or concerns about this syllabus, please contact me.

### ***Tentative Class Schedule & Readings:***

#### Week of      Topic/Readings

January 9 – Introduction – Chapter 1; Fundamental Observations – Chapter 2

January 16 – Fundamental Observations – Chapter 2

January 23 – Newton Versus Einstein – Chapter 3

January 30 – A Little General Relativity – notes posted on website

February 6 – Cosmic Dynamics – Chapter 4

February 13 – Model Universes – Chapter 5

**First midterm: February 16 – Ch. 1 – 3**

February 20 – Lambda and Quantum Mechanics – notes posted on website

February 27 – Model Universes – Chapter 5

March 6 – **Spring Break!**

March 13 – Measuring Cosmological Parameters – Chapter 6

March 20 – Measuring Cosmological Parameters – Chapter 6

**Second Midterm: March 23 – Ch 4 and 5**

**Withdrawal Deadline – Thursday, March 24<sup>th</sup>**

March 27 – Measuring Cosmological Parameters – Chapter 6

April 3 – Dark matter – Chapter 7; The Cosmic Microwave Background – Chapter 8

April 10 – The Cosmic Microwave Background – Chapter 8

April 17 – Nucleosynthesis in the Early Universe – Chapter 9

**Third midterm: April 18 – Ch. 6 - 8**

April 24 – Inflation and the Very Early Universe – Chapter 10

May 1 - Inflation and the Very Early Universe – Chapter 10

May 4 – Wednesday; Reading Day

**FINAL – Wednesday, May 11<sup>th</sup> ; 3:30 – 6:30 PM – Cumulative**