

# AST 204 – Topics in Modern Astronomy (QR)

Spring 2008

## 1 General Information

Lectures: Mondays & Wednesdays, 3:00 p.m. – 4:20 p.m.

Location: Room 145 Peyton Hall (also known as “The auditorium”)

Instructors:

- Jill Knapp  
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Office hours: Tuesdays , 1:00 p.m. – 3:00 p.m.

Mandatory textbook: *An Introduction to Modern Astrophysics 2nd Edition* (2006) by Carroll & Ostlie

(Some copies of this book are on reserve in the Astrophysics Library.)

## 2 Introduction

This course presents a broad introduction to the science of astronomy, including an overview of planets, stars, galaxies and cosmology. The intent of the course is to give students a solid background in the primary physical concepts relevant to astronomy, and a broad exposure to the astronomical universe. By using well-known physical laws to interpret astronomical observations, students will learn how astronomers have answered some of the most fundamental questions about our Universe, such as: “How old is the Sun?”, “How do stars shine?”, “How far away are the most distant objects in the Universe?”, as well as, “When and how did the Universe begin?”. A working knowledge of algebra, geometry and calculus is *essential* for this class. Therefore, this course is for **science majors**, or those with a strong interest in science.

## 3 Prerequisites

Students should have a solid background in freshman physics and maths, including calculus. Recommended Princeton courses are PHYS 103 and 105, and MATH 104. However, the course will be relatively self-contained, that is most of the necessary physics will be quickly reviewed in the lectures before it is applied to astrophysical problems. Thus, students with AP physics and strong math skills who are willing to work a little harder should be able to handle the material. If you are in doubt about your physics and/or math background, please ask any of us.

## 4 Course Structure

The two weekly lectures will contain the bulk of the course material and provide a forum for general questions. In addition to this, reading from Carroll & Ostlie (thereafter, CO), and from documents handed out in class will be assigned on a weekly basis. However, some material in the lectures may not be in the assigned reading, and, to a limited extent, *vice versa*. You are responsible for *all* material, be it presented in class, or assigned as reading.

There are no precepts in this course, although we will organize special review sessions before the mid-term and final exams, and always welcome questions (by e-mail or in person is strongly preferred).

A field trip to the Hayden Planetarium in New York City is planned for the afternoon of Friday, February 29th. We will get a guided tour and a special lecture by the director of the Planetarium, Neil deGrasse Tyson, and attend the Space Show. Admission will be free, but you will have to find your own way to the City (a large group usually travels together on the train). Attendance will not be required, but is highly encouraged.

There will also be evening observing sessions using telescopes in Peyton Hall. More details TBA.

## 5 Online Material

All material, including lecture notes, will be posted on Blackboard the day it is given out in class. You are responsible for checking what is available on Blackboard on a regular basis. If you don't know how to use Blackboard, it's a good time to learn!

Lecture notes will also be available at: <http://www.astro.princeton.edu/~gk/A204/>.

Grades will also be posted on Blackboard when they become available. You are responsible for making sure that your grades on Blackboard match the grades on the corresponding papers.

## 6 Homeworks, Exams and Grading

Your final grade will be based on homework assignments, the mid-term exam and the final exam. These factors will be combined in the following percentages to determine your class grade:

- 20% weight on the mid-term exam,
- 40% on homework,
- 40% on the final exam.

The mid-term exam will be a take-home exam and will cover all material presented up to that point. More details will be given in due time.

Homework will be assigned every ten days, one week before it is due, and will have to be turned in in class on the designated day (unless otherwise agreed with one of the instructors *before* that day). Solutions will be posted on Blackboard on that same day, and no homework will be accepted after that. We will try hard to return graded homework one week after it is due. Students are encouraged to work together on the problem sets, but your write-up and wording should be your own. We ask that you indicate on your papers who you worked with.

The final exam will be cumulative, drawing on all material covered in the entire course. It will be given at the time, and in the room, listed in the University exam schedule.

## 7 Detailed Schedule

A detailed schedule is provided on the next page. It is our *current* best estimate of how the semester should be organized, but it may be slightly amended when needed, in which case we would of course let you know.

Date	HW	Lecturer	Title	Reading
Feb. 4		JK	Introduction & The Expanding Universe	27.1-2
Feb. 6	HW1 out	JK	Redshift and the CMB	29
Feb. 11		JK	Special Relativity I: Spacetime and Geometry	4
Feb. 13	HW1 due	JK	SR II: Lorentz Transforms, Tensors and the Metric	4
Feb. 18	HW2 out	AF	General Relativity and the Curvature of Spacetime	TBA
Feb. 20		AF	Inflation & Grand Unification	TBA
Feb. 25	HW2 due	AF	Cosmic Microwave Background Anisotropies I	TBA
Feb. 27	HW3 out	AF	Cosmic Microwave Background Anisotropies II	TBA
<b>Feb. 29</b>			<b>Field trip to the Hayden Planetarium</b>	
Mar. 3		JK	Fluctuations, Gravity, and the Development of Structure	30.1
Mar. 5	HW3 due	JK	Dark Matter and Galaxy Formation	26
Mar. 10	Mid-term out	JK	The Visible Universe: Baryonic Matter	26
Mar. 12		JK	The Large-Scale Structure of the Universe	27
<b>Mar. 14</b>	<b>Mid-term due</b>		<b>Mid-term Exam due by 5:00 p.m.</b>	
<b>Mar. 17</b>			<b>Spring Break</b>	
<b>Mar. 19</b>			<b>Spring Break</b>	
Mar. 24		JK	Clusters, Intracluster Gas, SZ effect, and Voids	27.3
Mar. 26	HW4 out	JK	Hubble Sequence, Galaxies and LSS, Quasars and AGNs	25, 28
Mar. 31		RR	Dynamics of Galaxies	TBA
Apr. 2	HW4 due	RR	The Interstellar Medium	TBA
Apr. 7	HW5 out	RR	How Stars Shine: Overview of Stellar Structure	TBA
Apr. 9		RR	Star Formation and Pre-Main Sequence Evolution	TBA
Apr. 14	HW5 due	RR	Main Sequence Evolution	TBA
Apr. 16	HW6 out	RR	Post-Main Sequence Evolution & Supernovae	TBA
Apr. 21		RR	White Dwarfs, Neutron Stars & Black Holes	TBA
Apr. 23	HW6 due	RR	Accretion Disks in Astrophysics	TBA
Apr. 28	HW7 out	RR	Overview of the Solar System & Extrasolar Planets	TBA
Apr. 30		RR	Formation of Planets	TBA
<b>May 2</b>	<b>HW7 due</b>		<b>HW7 due by 5:00 p.m.</b>	

The numbers given in column “Reading” correspond to chapters in the **2nd Edition** of Carroll & Ostlie.