Astronomy 4: Black Holes and Cosmic Catastrophes

Fall 2012

Lectures: TTh 9:30 am - 10:45 am, Kinsey Pavilion 1240B

Discussion Section 1A: Th 2:00-2:50 pm, 1246 Public Affairs
Discussion Section 1B: Th 3:00-3:50 pm, 1246 Public Affairs
Discussion Section 1C: Fr 9:00-9:50 am, 5128 Math Sciences

Homepage: http://www.astro.ucla.edu/∼aes/AST4
CCLE Homepage: http://ccle.ucla.edu/course/view.php?name=12F-ASTR4-1

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	Friday, 2-4 pm; Location: 3-534 PAB

Text: The Cosmic Perspective: Stars, Galaxies & Cosmology, 6th Edition (2008), by Bennett, Donahue, Schneider, & Voit. The textbook may be purchased new, used, or in digital form. The "Mastering Astronomy" CD is not required.

Calculators: A simple one is **highly** recommended, though not required.

1 Introduction

We experience the effects of gravity in our everyday lives. This important force shapes our Sun and its evolution, along with all stars and their exotic end-states, galaxies, and the universe itself. In Astronomy 4, we study the effects of gravity and other competing forces on the nature of stars, black holes, galaxies, and the universe as a whole, including an introduction to special and general relativity.

2 Prerequisites

We will review all the basic physical concepts required for understanding the material in the course. However, we expect that students should feel comfortable performing *basic* calculations at the level of high-school algebra and, occasionally, geometry.

3 Grading

Final grades will be based on homework assignments (a total of 8 given during the quarter), the midterm exam, and the final exam. These factors will be combined in the following percentages to determine your class grade:

- 30% homework
- 30% midterm exam
- 40% final exam

Homework will be assigned roughly every week and is to be turned in at the beginning of class on the designated day. Homework turned in after the beginning of class on the due date will be considered late. Late homework may be turned in up to 1 week after the due date, at a penalty of 20% reduction in score. After one week, we will return graded homework. No homework is accepted after that.

The midterm exam is scheduled for Thursday, October 25th. It will test all material covered up to that point, and will be given during the regular class lecture time. It will contain a combination of multiple choice, true/false, and matching questions.

The final exam is scheduled for Monday, December 10th, from 11:30 am to 2:30 pm. It will be cumulative, drawing on all material covered in the course, and containing a combination of multiple choice, true/false, and matching questions.

Schedule of Lectures

No.	Date		Title	Chapter
1	Sep.	27	General introduction. Scale of the Universe. Our place in it.	1
2	Oct.	2	Motion, force & energy.	4
3		4	Gravity!	4
4		9	Light and Thermal Radiation.	5
5		11	Matter and Energy Levels.	5
6		16	The Sun.	14
7		18	Properties of Stars.	15
8		23	More Properties of Stars, Star clusters.	15
		25	**Midterm Exam, in class**	
9		30	Evolution of Low- and High-mass Stars.	17
10	Nov.	1	End states of stars.	18, S4
11		6	More End States of Stars, Supernova Explosions.	17, 18
12		8	Pulsars, Black Holes.	18
13		13	Special Relativity.	S2
14		15	General Relativity and Black Holes.	S3
15		20	AGNs, QSOs, and Supermassive Black Holes.	20, 21
		22	**Thanksgiving, no class**	
16		27	Gravity in our own Milky Way.	19
17		29	The Galactic Center; Galaxies and the Distance Ladder.	19, 20
18	Dec.	4	The Expansion of the Universe.	20, 22
19		6	Dark Matter, Dark Energy, the Origin and Fate of the Universe.	22, 23
		10	**Final Exam**	