Natural Science I: Cosmos and the Earth V55.0202
Summer 2006 Meyer 122

Monday through Thursday
9:45 – 11:20 a.m.
Instructor: Prof. Andre Adler
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Lab Section	Day	Time
2	MW	11:30 – 1:30 p.m.
3	MW	1:45 – 3:45 p.m.

Course Description

This course is an introduction to modern astronomy. Stars, white dwarfs, neutrons stars, black holes, galaxies and quasars populate the universe. The elements necessary for life on Earth formed inside of stars. Exploding stars make even heavier elements and spread them into space to mix and build new stars, planets, and perhaps life. New stars have been caught in the act of forming, while more than one hundred planets orbiting other stars have been discovered. Some stars evolve into bodies of such high density (black holes) that light can't even escape from its gravitational influence. Stars are found in large collections, galaxies; the majority of galaxies move away from us, introducing the idea of the expanding universe. The basis of modern cosmology is the Big Bang theory. The evidence for this theory will form an important part of the course.

Course Objectives

- Understand how we try to understand the natural world through observation, experimentation, and theory.
- Show how light is a messenger carrying information about the cosmos.
- Understand how the sun and other stars generate energy.
- See how stars form and evolve into white dwarfs, neutron stars and black holes.
- Classify the different types of galaxies.
- Study how galaxies may have evolved.
- Tell the story of how the universe went from being devoid of stars and consisting of hydrogen and helium to one with stars that built up the elements of the periodic table.
- Look at the evidence for dark matter and
- Provide an overview of cosmology, the expanding universe and the big bang theory.

Course texts

1. *Astronomy Today, Volume II: Stars and Galaxies*, 5th edition, Chaisson and McMillan, *Lecture-Tutorials for Introductory Astronomy*, 2004 edition, Jeffrey Adams, Edward Prather, Timothy Slater, *Starry Night sky simulation software*. These items are bundled together at the NYU Bookstore.
2. *Cosmos and Earth: Laboratory Manual*, 2005.
3. *Personal Response System Transmitter.* Your package of texts, listed in item 1, includes a coupon that will get you a partial rebate for the cost of the transmitter. As the device is used for extra credit, purchase is optional.

Lectures

Lectures are to help you learn the material, clarify what you are responsible for and to help you succeed on exams. Questions handed out each lecture and will form the basis of what you are responsible for from our twice-weekly meetings. Some of these questions are answered in your books,

but all will be discussed in class.

Course Examinations

The examinations will be based on (1) the lecture questions, (2) exercises contained in *Lecture-Tutorials for Introductory Astronomy*, and (3) homework questions from *Astronomy Today: Volume II Stars and Galaxies* that are found at the end of each chapter.

You will need to bring a calculator to both exams. The exams will be in the multiple-choice format. This format lets one easily determine the number of students who got each question correct. After the midterm exam I will put a list of problems on the blackboard that had the greatest number of incorrect responses. The cumulative nature of the final exam will be reflected in concepts from the mid-term exam that were the subject of those questions that had the most incorrect responses. The final exam will be cumulative with a design to testing you on concepts from the mid-term exam that the most students had trouble with.

Examination Schedule and Course Grade

Midterm examination:	25%
Laboratory:	40%
Final examination:	35%

Extra Credit: Personal Response System (PRS)

In order to promote interaction in lecture you will use your personal response system transmitter to respond to a series of questions each lecture. The results of each question are collected by a computer and displayed on a large screen for all to see. This will gauge the classes understanding of important topics. Also, you will receive 1/8 of a point for each question answered correctly. With about 3 questions asked per lecture, and about 24 lectures where we use the system during the semester, this means that you can add a maximum of around 9 points (depending on the number of questions asked over the course of the semester) to your grade for the course above that contributed by your lab grade, midterm and final examinations. Since this is extra credit, it cannot be made up for any reason, medical, personal or technical.

Laboratory Sessions

These weekly sessions are an important part of the course. You must be registered for one lab section. You will have to submit a lab report for each experiment performed. The lab report has to include answers to all questions and any data you may have collected. The lab report will be due in lab *one week* after the experiment has been performed. **The laboratory sessions will be held in Meyer 103 and will begin the week of May 15**. The laboratory sessions will be devoted to

1. Doing experiments described in your laboratory manual.
2. Doing exercises from the *Lecture-Tutorials for Introductory Astronomy* volume.
3. Discussing the homework problems.

You must bring the *Lecture-Tutorials for Introductory Astronomy* book to laboratory sessions devoted to those assignments.

Attendance The lab instructor will deduct points from your lab grade for arriving late or leaving early.

Absence Policy Excused absences will only be given in the case of illness (with a doctor's note) or observation of a religious holiday. You must notify your lab instructor in advance in writing if you miss a lab due to religious reasons. All other absences will be considered unexcused and will result in

a lab grade of zero. **You cannot make up a lab by attending a laboratory session that you are not registered for.**

Late Assignments Late assignments will be penalized for each day late (excluding weekends). If you wish to submit a late lab report you must do so only at your laboratory instructor's office.

Lab Instructors Each lab instructor will hold a weekly office hour where you can discuss lecture and laboratory material. Office locations and office hour schedule will be announced in lab.

Name	Email Address	Teaching Schedule
Ian Harnarine	ianhk@nyu.edu	MW, 11:30 – 1:30 p.m. MW, 1:45 – 3:45 p.m.

Homework

Homework assignments will be given out in class. Homework assignments are to help you understand the material and to prepare you for course examinations. They will not be graded, but you will be asked to show your homework to your lab instructor each week to show that you are keeping up with the coursework. Homework problems will be reviewed in laboratory sections.

Missed Exams

There are no make-up exams for students who miss the mid-term exam. If you miss an exam because of illness, you must contact Dr. Adler by phone or email **before** the start of the exam and follow up with a doctor's note. If you miss an examination, for a valid reason (illness, injury or family emergency), your grade will be based on the following allocations:

Laboratory:	40%
Final examination (cumulative):	60%

Final Exam A make-up for the final examination will be given under exceptional circumstances, which must be discussed with Dr. Adler before the examination. A doctor's note must be provided in the case of illness. In this case a grade of incomplete will be assigned and the make-up will be scheduled for the beginning of the Fall 2006 semester. Please avoid making travel plans before the date of the final exam.

Religious Holidays If you will be absent for a religious holiday during the semester, you must inform your lab instructor and Dr. Adler in advance.

Class Web Site

A Blackboard web site for this class exists and is accessible through your *NYUHome* account or by going to http://classes.nyu.edu and logging on using your netID and the same password as that of your NYU email account. You must have an active NYU email account to access the site.

Tentative Weekly Schedule of Topics, Readings and Laboratories

Date	***Lecture Topic***	***Reading***	***Weekly Lab***
M May 15	Seasonal Changes in the Night Sky/The Seasons	**1** sec 1-4	
T May 16	Kepler's Laws of Planetary Motion Newton's Laws of Motion	**2** sec 4-7	
W May 17	Interfering Waves of Electricity and Magnetism/Thermal Radiation and the Doppler Effect	**3** sec 1-5	Starry Night Software/Math Review
R May 18	Spectral Lines and Atomic Structure	**4** sec 1-2	
M May 22	Spectral Line Analysis	**4** sec 3-4	Young's Experiment/ Lecture-Tutorials
T May 23	The Sun: Energy Generation and the Interior	**16** sec 1-3	
W May 24	The Sun: Atmosphere, Activity and Neutrinos	**16** sec 4-6	Spectroscopy
R May 25	Stellar Parallax, Luminosity and Temperature	**17** sec 1-3	
M May 29	*Memorial Day*		*No Lab – Memorial Day*
T May 30	Stellar Sizes, the H-R Diagram and Masses	**17** sec 4-8	
W May 31	Stellar Evolution of Stars like the Sun	**20** sec 1-3	Midterm Exam Review
R June 1	**Midterm Exam**		
M June 5	Stellar Evolution in Star Clusters and Binary Stars	**20** sec 4-6	Inverse Square Law/Lecture-Tutorials
T June 6	Supernovae	**21** sec 1-3	
W June 7	Formation of the Elements	**21** sec 4-5	Photoelectric Effect/Lecture Tutorials
R June 8	Neutron Stars and Pulsars	**22** sec 1-3	
M June 12	Black Holes and Einstein's General Relativity	**22** sec 5-8	Principle of Equivalence
T June 13	The Milky Way Galaxy: Size and Structure Mass and the Galactic Center	**23** sec 1-7	
W June 14	Galaxy Classification and Hubble's Law Active Galaxies, Quasars and their Nuclei	**24** sec 1-5	Polarization of Light
R June 15	Dark Matter, Galaxy Evolution and Collisions	**25** sec 1-4	
M June 19	The Expanding Universe	**26** sec 1-4	Cosmic Redshift
T June 20	The Cosmic Microwave Background Radiation	**26** sec 5-7	
W June 21	Review for the Final Exam		Final Exam Review
R June 22	**Final Exam**		