

ASTRONOMY 108: Descriptive Astronomy

Spring 2010

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Class Time and Location: M, W, F 1:00 to 1:50 AM in SCI1 121

Final Exam: Monday May 17, 2010 11:00 to 1:30 AM

Required Text: **Astronomy: A Beginner's Guide to the Universe**, Sixth Edition, by Eric Chaisson and Steve McMillan

The text includes the MasteringAstronomy student access kit. MasteringAstronomy is an online homework system that we will be using this semester. The online homework is designed to reinforce concepts from class and readings and access to this system will be required for the course. While text books are expensive, they are also a critical component to getting the most out of a class such as this. If you choose to purchase an earlier less expensive edition of the current text, you should keep in mind that you (not the instructor) are responsible for dealing with differences between the editions of the text. You may also have to get a MasteringAstronomy student access kit separately (~\$30 online at www.masteringastronomy.com).

Science Discovery Center: <http://www.oneonta.edu/organizations/sdc/>

The Science and Discovery Center of Oneonta is located in the basement of the Physical Science Building on the SUNY Oneonta Campus. This highly regarded interactive science *museum* provides you a unique opportunity to observe, feel and experience many of the principles and concepts that we will be discussing in this course. While we will use this facility for demonstrations and assignments, I highly recommend that you also visit the Science and Discovery Center on your own time.

Course Description:

ASTR 108, Descriptive Astronomy, 3 s.h.: Survey study of our solar system, stars, the Galaxy, other galaxies and the universe; methods and problems of astronomy. Does not include laboratory. Not open to students enrolled in or who have completed ASTR 110. (LA, N2, N, T)

SUNY General Education Science Learning Outcomes Defined (N2/NL2): Students will demonstrate an understanding of the methods scientists use to explore natural phenomena, including

observation, hypothesis development, measurement and data collection, experimentation, evaluation of evidence, and employment of mathematical analysis, and application of scientific data, concepts, and models in one of the natural sciences.

Course Objectives:

1a) Students should understand the relationship between observation, theory and experimental validation that comprise the scientific method by which we achieve our current understanding of astronomical phenomena. Further, students should try to appreciate the overall importance of this process and the dedication, imagination, ingenuity, luck, frustration and pleasure that are part of the process.

1b) Students should gain an understanding of the physical principles that are used to understand and interpret astronomical phenomena.

1c) Students should learn some basic observational and experimental facts about astronomical objects and the *current* models that are used to explain and interpret these facts.

2) Students should develop skills and confidence in critical and logical analysis so that they become effective and independent problem solvers. (Here students should become familiar with the examination and interpretation of observations; calculation and estimation of physical quantities for comparison with observation, theory, and other quantities; scaling for insight into the relative sizes of astronomical objects; various geometric techniques for visualizing the location and motion of astronomical objects.)

3a) Students should gain familiarity with reliable sources of astronomical information (including traditional, technological, and internet) and develop skills for assessing the reliability of additional sources of astronomical information.

3b) Students should develop the confidence to use reliable sources of astronomical information to independently examine and enjoy the night sky with the naked eye (small telescope or binoculars).

Evaluation:

Your score for the course will be determined according to the following distribution.

Attendance/Activities	10 %
Homework	30 %
Exam I	20 %
Exam II	20 %
Exam III (Final Exam)	20 %
Optional Extra Credit	10 %

In the strictest possible case, your course grade will be related to your score in the following manner:

100 >A> 93 >A-> 90 >B+> 87 >B> 83 >B-> 80 >C+> 77 >C> 73 >C-> 70 >D+> 67 >D> 63 >D-> 60 >E

However, if the instructor determines that grading on an overall curve is warranted, your final grade may be higher than indicated by the above relationship.

Participation: It is reasonable for students to expect to spend two to six hours per week outside of class on the material (reading, homework and possible group activities). Your work outside of class will be evident in your homework and exam grades. While work outside of class is extremely important, diligent work in class will help you master the material more efficiently and enhances your work outside of class. Consequently, students are expected to be in attendance, on time and attentive. Students are expected to participate in class by **asking** and answering questions and providing their own insights related to physical principles and phenomena that are being discussed. Attendance will be taken on ten randomly chosen days through the semester. The fraction of these days that you attend will be multiplied by 100 to determine your numerical attendance grade.

Homework: In addition to reading and in-class assignments, periodically (about weekly) homework will be given through the MasteringAstronomy online homework system. Each homework assigned will be graded automatically. To determine your overall homework grade, I will drop the lowest grade of any individual homework and average the remaining individual homework grades. If I determine that a curve is warranted on the overall homework grade, your overall homework grade may be slightly higher. The goal of the MasteringAstronomy on-line homework assignments is to reinforce and practice concepts from class and readings. You should expect to do well (80% or above) on your overall homework grade if sincerely try to attain the answer to each question on your own and complete each assignment. While you may generally discuss questions with classmates, you must provide specific answers to homework questions on your own. Even if you get questions wrong, the hints that you will find in MasteringAstronomy should help you master the material.

Exams: Three (approximately 45 minute) examinations including the final examination will be given. These examinations are not cumulative except as the course material naturally builds on itself. Exams will be in a multiple choice format with answers to be marked in #2 pencil on a separate answer sheet for machine scanning. Exams will be based on lectures, reading assignments, recitation exercises, and homework assignments.

Mathematics: It is impossible to teach a physical science class without encountering some math along the way. Although advanced mathematics will not be used in the course, some exercises will be geared towards developing quantitative, graphing and analytical skills. These skills can be extremely valuable in your personal endeavors and are also desirable to employers in a large number of areas. However, the mathematics encountered on an examination will be no more than basic addition, subtraction, division and multiplication (which may be combined in a straight forward formula). Calculators are not required but may be helpful during some exercises and on exams.

Missed Work: A makeup of an exam may be allowed for an authorized absence or with the advanced permission of the instructor. While late homework will be accepted, it may be penalized 10% per day late.

Extra Credit: Extra credit is available by attending up to two of the Astronomical Public Telescope Observing Sessions (see schedule below) or ASTR108 Planetarium Shows (TBA) and by submitting a two page word processed paper describing the program and celestial objects observed no later than one

week after the particular session you attended. Up to 5% per session may be obtained for up to 2 sessions. The actual amount of extra credit received will be based upon your grade on the paper.

Public Observing Schedule

Wed, Feb. 10, 2010 - @ the Observatory	Andromeda Galaxy, Orion Nebula, Mars and Pleiades - 9:00 PM
Wed, March 10, 2010 - @ the Observatory	Saturn, Mars, Nebulae, and Open Clusters - 9:00 PM
Wed, April 21, 2010 - @ the Observatory	Waxing Crescent Moon, Mars and Saturn - 9:00 PM
Wed, May 5, 2010 - @ the Observatory	Saturn, Double Stars, Globular Clusters and Galaxies - 9:00 PM

Tentative Schedule for Spring 2010 Semester

Below is a *tentative* schedule of the topics that will be covered and the corresponding reading. You will note that the topics are divided into three sections that could roughly be called Historical Astronomy, the Solar System, and Stellar Astronomy. While we may not be able to cover all of the topics listed in each section, the time allotted for each section and the corresponding exam dates are firm.

In the schedule, the topics in italics and preceded by “R” are recitation exercises. On these days (most Wednesdays and Valentines Day) you should expect a hands on, in class activity that is designed to emphasize and clarify some of the course material. Unless otherwise indicated, these activities will be due at the end of the class period.

DATE	TOPIC	READING
	Section I: The Sky, Celestial Motions, Historical Astronomy	
W 1/20	Course Guidelines Our Place in the Universe	Chapter 0
F 1/22	Observing the Night Sky: Locating Objects	Chapter 0
M 1/25	Motion of the Night Sky	Chapter 0
W 1/27	<i>R: Locating Objects in the Night Sky (Tracking Objects?)</i>	
F 1/29	Motion of the Night Sky	Chapter 0
M 2/1	Observing Distances	Chapter 0
W 2/3	<i>R: Celestial Sphere (Ecliptic)</i>	
F 2/5	Renaissance Astronomy	Chapter 1
M 2/8	Renaissance Astronomy/ Newton – Motion and Gravity	Chapter 1
W 2/10	<i>R: Gravitational Motion of Celestial Objects</i>	
F 2/12	Newton – Motion and Gravity	Chapter 1
M 2/15	What We Learn From Light	Chapter 2
W 2/17	EXAM 1	
	Section II: Properties and Origin of the Solar System	
F 2/19	<i>R: Our Solar System on a Scale We Can Appreciate</i>	
M-F 2/22- 2/26	Break	
M 3/1	The Origin of the Solar System	Chapter 4
W 3/3	The Earth	Chapter 5
F 3/5	<i>R: Lunar Motion and Phases</i>	Chapter 0 and 5
M 3/8	The Moon	Chapter 5
W 3/10	The Terrestrial Planets	Chapter 6
F 3/12	<i>R: Simulating Our Solar System</i>	
M 3/15	The Terrestrial Planets and The Jovian Planets	Chapter 6 and 7
W 3/17	The Jovian Planets (and Beyond?)	Chapter 7
F 3/19	<i>R: Meteors, Asteroids, and Comets</i>	Chapter 4 and 8
M 3/22	The Sun	Chapter 9
W 3/24	<i>R: The Sun Earth Connection</i>	Chapter 9
F 3/26	Aurora	Chapter 5 and 9
M 3/29	EXAM 2	
	Section III: Stars, Galaxies, and the Universe	

W 3/31	<i>R: The Universe on a Scale We Can Appreciate</i>	
F 4/2	Stellar Properties, Binary Stars	Chapter 10
M-F 4/5-4/9	Break	
M 4/12	Stellar Properties and the HR Diagram	Chapter 10
W 4/14	<i>R: The HR Diagram</i>	
F 4/16	Stellar Nebulae and Formation	Chapter 11
M 4/19	Stellar Formation and Star Clusters	Chapter 12
W 4/21	<i>R: Star Cluster Ages</i>	
F 4/23	Stellar Evolution	Chapter 12
M 4/26	Neutron Stars and Black Holes	Chapter 13
W 4/28	The Milky Way Galaxy	Chapter 14
F 4/30	Galaxies and Galaxy Clustering	Chapter 15
M 5/3	<i>R: Cosmological Expansion (Hubble's Law?)</i>	
W 5/5	Galaxies and Dark Matter	Chapter 16
F 5/7	Cosmology	Chapter 17
M 5/10	<i>R: Extra Solar Planets</i>	
W 5/12	Study Day	
M 5/17	FINAL EXAM (11:00 AM to 1:30 PM. The exam will be given in Science 1 Room 121 unless otherwise announced in class.)	

Questions: Attendance is expected, how should attendance be reflected in the grade?

Sunil 10 random attendance days students sign in at the front of the class on three or four sheets to observe single signatures. How does this attendance figure into the final score?

Describe how your recitation exercises are run? Handout question and answers or step by step with lecture. How were the recitation exercises graded?

Can you recommend two videos for each of the three sections that may be used in case of absence.

How were exams run? Have you ever checked ID's? What about random ID checks when students are handing in their papers? What is the procedure for scan exams?

Can I still submit a statement of area of expertise and interest for the astronomy web site? How can I access the web page?

Do you have the schedule for public sessions this spring? Would be a good idea for me to be trained (by Steve?) on the telescope.

Should I use homework and quizzes... how did you evaluate these materials?

Whether working with students individually or as a class, I have three basic goals for my students. I want each student to achieve a solid comprehension of and appreciation for the physical principles that we use to examine and understand nature. Additionally, I would like students to develop skills and confidence in critical and logical analysis so that they become effective and independent problem solvers. Finally, I believe that students should gain practical experience, particularly with computers. I have found that lectures and complementary assignments, individual and group discussions, laboratory classes, and independent research projects provide opportunities to attain these goals.