



Gifted LearningLinks Program Course Syllabus

Instructor name: L. Hoffman
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Course Title: Astrophysics Honors

Session Date: 2010-2011, Monthly Enrollment

Course Description:

Black Holes, Neutron Stars, and Supernovae, oh my! This interdisciplinary course combines math, physics, and astronomy to uncover the secrets of the universe. Students in Astrophysics Honors will explore a wide range of subjects in modern astrophysics, from celestial mechanics to the history of astronomy, from nuclear fusion and fission to the birth and death of stars, and from the Big Bang to theories on the fate of the universe. Students will learn about the basic structures in the universe and how these structures have evolved over time. Activities will include readings, online class discussion, problem solving and laboratory activities, as well as an individual project on an astrophysical phenomenon.

Outcomes: Upon successful completion of this course, students will:

- a. Know and understand the basic principles of the history of Astronomy, Optical Instruments, Comparative Planetology, Stellar Structure & Evolution, and the history and fate of the Universe.
- b. Analyze astronomical data and draw conclusions from this data
- c. Evaluate current research in astronomy and astrophysics

Resources and Materials:

- a. Chaisson & McMillan. Astronomy Today 6/E, Benjamin Cummings, 2007. ISBN: 978-0132400855.
- b. Seeds/Holzinger. Student Observation Guide with Lab Exercises, Prentice-Hall, 1995. ISBN: 978-0136441960.
- c. Carroll, Bradley & Ostlie, Dale. (optional) Modern Astrophysics, Benjamin Cummings, 1993. ISBN: 978-0201547306
- d. Popular (e.g. Scientific American) research articles relevant to current course material will be linked to the website as the course goes along.
- e. Scientific Calculator, compass, protractor, ruler, notebook/problem book

***Note:** While a staff member (which includes but is not limited to instructors, teaching assistants, residential staff, office staff) may use or refer students to third-party web sites for instructional purposes, s/he is required to review thoroughly any such web sites for inappropriate content before referencing them. This includes clicking on all links contained in any such web site, reviewing the materials contained on every page within a web site, and ensuring that the web site does not provide links to other inappropriate web sites. If there is any doubt about whether something is appropriate, a staff member is*

instructed to err on the side of caution and not use the web site or check with a CTD supervisor. If a referenced third-party web site is later determined to contain inappropriate content, the staff member may be subject to discipline.

Schedule: NOTE: Check online for details on these readings and assignments!!

SEMESTER ONE				
	Topic/Focus	Activities & Reading Assignments	What do I need to post to the Discussion Board?	What do I need to turn in?
Week 1	Orientation to Online Learning	Astronomy Today (AT) Ch. 1	Ch. 1 Reading Reflections (RR)	Ch. 1 HW
Week 2	History of Astronomy	AT Ch. 2 Lab 1: Pop-up Celestial Globe Lab 2: Using a Celestial Globe	Ch. 2 RR	Ch. 2 HW Lab Reports
Week 3	Celestial Mechanics including Kepler's Laws & Universal Gravitation	AT Ch. 2 Lab 19: Properties of the Ellipse Lab 20: Kepler's Laws & Comets		Lab Reports
Week 4	Intro to Optics & Telescopes	AT Ch. 5 Lab 4: Introduction to Telescopes Lab 6: Star Charts for Use at the Telescope	Ch. 5 RR	Ch. 5 HW Lab Reports
Week 5	Coming of Age in the Milky Way	Coming of Age in the Milky Way	Coming of Age in the Milky Way RR	
Week 6	Observational Astronomy – Coordinates & Time	Labs 10-12: Local Mean Time, Sidereal Time, Solar Time		Lab Reports
Week 7	Observational Astronomy – Celestial Coordinates	Labs 13-16: Constructing and using Starfinders, Locating Celestial Objects		Lab Reports
Week 8	Observational Astronomy – Individual Project	Lab 17: Shadow Stick Astronomy		Lab Report

Week 9	Intro to Comparative Planetology	AT Ch. 6	Ch. 6 RR	Ch. 6 HW
Week 10	Earth	AT Ch. 7	Ch. 7 RR	Ch. 7 HW
Week 11	The Moon & Mercury	AT Ch. 8 Lab 21: The Orbit of Mercury	Ch. 8 RR	Ch. 8 HW Lab Report
Week 12	Venus & Mars	AT Ch. 9 & 10 Lab 22: Retrograde Motion of Mars	Ch. 9/10 RR	Ch. 9/10 HW Lab Report
Week 13	Jupiter & Saturn	AT Ch. 11 & 12 Labs 23&24: Telescopic Observation of Jupiter/Saturn	Ch. 11/12 RR	Ch. 11/12 HW Lab Reports
Week 14	Uranus, Neptune, & Pluto	AT Ch. 13	Ch. 13 RR	Ch. 13 HW
Week 15	Origin of the Solar System	AT Ch. 14	Ch. 14 RR	Ch. 14 HW
Week 16	Formation of Planetary Systems	AT Ch. 15	Ch. 15 RR	Ch. 15 HW
Week 17	Radiation	AT Ch. 3 Lab 30: Blackbody Radiation	Ch. 3 RR	Ch. 3 HW Lab Report
Week 18	Spectroscopy	AT Ch. 4 Labs 7-9: The Spectroscope, Diffraction of Light, Atomic Spectra CLEA Spectra	Ch. 4 RR	Ch. 4 HW Lab Reports
SEMESTER TWO				
	Topic/Focus	Activities & Reading Assignments	What do I need to post to the Discussion Board?	What do I need to turn in?
Week 19	The Sun	AT Ch. 16 Lab 31: Flow of Energy out of the Sun	Ch. 16 RR	Ch. 16 HW Lab Report
Week 20	Stellar Characteristics	Lab 32: Opacity (a game of photons) Labs 28 & 29: Apparent & Absolute magnitudes, and parallax		Lab Reports

Week 21	Stellar Characteristics	AT Ch. 17 Readings from Carroll & Ostlie Labs 33 & 34: Spectral Classification of Stars & the H-R Diagram	Ch. 17 RR	Ch. 17 HW Lab Reports
Week 22	The Interstellar Medium	AT Ch. 18 Lab 37: Distance to a Planetary Nebula	Ch. 18 RR	Ch. 18 HW Lab Report
Week 23	Stellar Formation	AT Ch. 19 Readings from Carroll & Ostlie Lab 35: H-R Diagram for NGC 6819	Ch. 19 RR	Ch. 19 HW Lab Report
Week 24	Stellar Evolution	AT Ch. 20 Readings from Carroll & Ostlie Lab 38: Observing Delta Cephei Lab 39: Stars in Orion	Ch. 20 RR	Ch. 20 HW Lab Reports
Week 25	Deaths of Stars	AT Ch. 21 Lab 36: Supernova 1987a Lab 40: Motion of Stars	Ch. 21 RR	Ch. 21 HW Lab Reports
Week 26	Elegant Universe	Elegant Universe	Elegant Universe RR	
Week 27	Neutron Stars & Black Holes	AT Ch. 22	Ch. 22 RR	Ch. 22 HW
Week 28	Brief History of Time	Brief History of Time	Brief History of Time RR	
Week 29	The Milky Way	AT Ch. 23 Lab 41: Spiral Arms Near the Sun	Ch. 23 RR	Ch. 23 HW Lab Report
Week 30	Universe in a Nutshell	Universe in a Nutshell	Universe in a Nutshell RR	
Week 31	Galactic Structure	AT Ch. 24	Ch. 24 RR	Ch. 24 HW
Week 32	Quasars and other Exotic Objects	AT Ch. 25	Ch. 25 RR	Ch. 25 HW
Week 33	Cosmology	AT Ch. 26 Begin reading "First Three Minutes"	Ch. 26 RR First Three Minutes RR	Ch. 26 HW Lab Report

		Lab 42: Expansion of the Universe		
Week 34	First Three Minutes	Finish reading First Three Minutes		
Week 35	Fate of the Universe	AT Ch. 27	Ch. 27 RR	Ch. 27 HW
Week 36	Life in the Universe	AT Ch. 28	Ch. 28 RR	Ch. 28 HW

Student Evaluation and Grading Policies for Credit Courses Only:

a. CTD Grading scale

A+ 97-100	B+ 87-89	C+ 77-79	D+ 67-69	F Below 60
A 93-96	B 83-86	C 73-76	D 63-66	
A- 90-92	B- 80-82	C- 70-72	D- 60-62	

b. Breakdown of final grade:

- Homework – 25%
- Laboratory – 25%
- Online Discussion & Reflections – 20%
- CLEA Project – 15%
- Final Exam – 15%

Instructor Biography: Loren is a postdoc in astrophysics here at NU, who runs N -body simulations of merging galaxies for a living. Some material from her research will be incorporated into the course when we get to scales as big as galaxies and the Universe (around week 28).

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