ASTRO 1050 - Survey of Astronomy
Syllabus: Summer 2009

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Lecture: M-F, 11:00 am - 12:20 pm
LAB: TWR, 1:20 pm - 2:40 pm
Hours: TWR, 12:20 pm - 1:20 pm

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1. Resources

Texts:

Universe w/ Starry Night Enthusiast CD-ROM
Roger Freedman, William J. Kaufmann
Edition: 8th
ISBN: 0716795647

AND

Lecture Tutorials for Introductory Astronomy (2nd Edition) (Addison-Wesley Series in Educational Innovation)
Edward E. Prather, Tim P. Slater, Jeff Adams, Gina Brissenden, CAPER
Edition: 2
ISBN: 0132392267

Materials for class/lab:

- One bound composition Lab/Observing notebook
- Loose leaf paper
- Writing utensils
- 3-ring notebook
- Flashcards
- Scientific Calculator

Materials made available online:

We will be using a course website on the WyoSakai system. Go to the OnLnSupp page, `http://www.uwyo.edu/onlnsupp`, follow the Student Info link on the left, and read the appropriate section (WyoSakai) of the instructions.

WYOSAKAI - `http://wyosakai.uwyo.edu/xsl-portal`

An open-access Companion Web site is available at the text's website (see below). It reinforces concepts and provides self-study review quizzes, Star Charts, conceptual animations, videos, and Interactive Exercises. You will need to sign up through the website to gain access to online quizzing which is required for the course.

UNIVERSE TEXT - `http://bcs.whfreeman.com/universe8e`

Web:

Here are some Websites that I love/have found useful:

American Astronomical Society - `www.aas.org/education/`

NASA - `http://www.nasa.gov/home/index.html`

Astronomy Pic of the Day (APOD) - `http://apod.nasa.gov/apod/`

COSMOS, The SAO Encyclopedia of Astronomy - `http://astronomy.swin.edu.au/cosmos/`

Sky & Telescope, Magazine - `http://skytonight.com/`

Earth & Sky, Radio - `http://www.earthsky.org`

2. Course Objectives & Philosophy

Students: College is a time of learning and growth. Here are some qualities of successful students:

- They attend class regularly and on time.
- They do extra credit assignments when they are available.
- Their assignments are done neatly.
- If they feel they need extra help, they let their teacher know.
- They turn in all assignments.
- They pay attention in class and are courteous and polite.
- They speak up in class.
- They learn to identify what needs to be studied in greatest detail.
- They set short-term and long-term goals.
- They see their teachers before and after class.
- They learn to schedule enough time for homework.
- They enjoy being successful students.
- If they do have to miss classes (they inform their teacher as to why), they find out what they missed and make sure they understand all that was covered.
- They know they are responsible for their own success.
  - Dr. James L. Warner

If you do not currently posses these qualities, it is highly encouraged that you do so by the end of this course.

Science: Guidelines from the American Astronomical Society, the National Science Education Standards, the American Association for Advancement of Science:

- Appreciate the scientific process, how it works, the notion that physical laws are universal, the elements of scientific theories, what they do and do not tell us.

- Develop familiarity with the night sky and how its appearance changes with time ad position on Earth.
- Describe how data is collected from astronomical objects, and what quantities can be measured/inferred.
- Understand basic - yet crucial - physical laws, and the processes that govern astronomical quantities.
- Integrate concepts from related subjects to explain relationships (e.g., physics and math) between astronomical quantities.
- Infer the nature, structure and evolution of the Universe, and objects therein.

Astronomy: This is a compilation of what ideals college students should learn in an introductory astronomy class:

Yearly patterns, daily patterns and moon phases:

- The Sun, Moon, stars, clouds, birds, and airplanes all have properties, locations, and movements that can be observed and described.
- Objects in the sky have patterns of movement. The Sun, for example, appears to move across the sky in the same way every day, but its path changes slowly over the seasons. The Moon moves across the sky on a daily basis much like the Sun. The observable shape of the Moon changes from day to day in a cycle that last about a month.
- Most object in the Solar System are in regular and predictable motion. Those motions explain such phenomena as the day, the year, the phases of the Moon, and eclipses.

The Sun and Earth's seasons:

- The Sun provides the light and heat necessary to maintain the temperature of the Earth.
- The Sun is the major source of energy for phenomena on the Earth's surface. Seasons result from variations in the amount of Sun's energy hitting the surface due to the tilt of the Earth's rotation on its axis and the length of the day.

Gravity:

- Gravity is the force that keeps planets in orbit around the Sun and governs the rest of the motion in the Solar System. Gravity alone holds us the to the Earth's surface.
- Gravitation is a universal force that each mass exerts on any other mass. The strength of the gravitational attractive force between two masses is proportional to the masses and inversely proportional to the square of the distance between them.

Electromagnetism:

- Light interacts with matter by transmission (including refraction), absorption, or scattering (including reflection). To see an object, light from that object - emitted by or scattered from it - must enter the eye.
- Electromagnetic waves result when a charged object is accelerated or decelerated. Electromagnetic waves include the electromagnetic spectrum from radio waves to gamma rays. The energy of electromagnetic waves is carried in packets whose magnitude is inversely proportional to the wavelength.
- Each kind of atom or molecule can gain or lose energy only in particular discrete amount and thus can absorb and emit light only at wavelengths corresponding to these amounts. These wavelengths can be used to identify the substance.

Evolution and Structure of the Universe:

- The sun, the earth, and the rest of the solar system formed from a nebular cloud of dust and gas 4.6 billion years ago. The early earth was very different from the planet we live on today.
- The Earth is the third planet from the Sun in a system that includes the Moon, the Sun, eight other planets and their moons, and smaller objects, such as asteroids and comets. The Sun, an average star, is the central and largest body in the Solar System.

Fusion:

- stars produce energy from nuclear reactions, primarily the fusion of hydrogen to form helium. These and other processes in stars have led to the formation of all the other elements.

- Fusion is the joining of two nuclei at extremely high temperature and pressure, and is the process responsible for the energy of the sun and other stars.

Stars and stellar evolution:

- Billions of galaxies, each of which is a gravitationally bound cluster of billions of stars, now form most of the visible mass in the universe.

Evolution of the Universe:

- The origin of the universe remains one of the greatest questions in science. The "big bang" theory places the origin between 10 and 20 billion years ago, when the universe began in a hot dense state; according to this theory, the universe has been expanding ever since.
- Early in the history of the universe, matter, primarily the light atoms hydrogen and helium, clumped together by gravitational attraction to form countless trillions of stars.

3. Assessment and Grading

Type	Number of	Percentage
Quizzes	∼25	25%
Projects	2	25%
Labs	∼15	25%
Exams	4	25%

`Note:` There will be no dropping of grades, makeups or curving of grades! However, there 'might' be extra credit. There will be one quiz per chapter. There are two projects; i) a Semester Observing Project, and, ii) a group Podcast Presentation. There are approximately 15 Labs whose topics are coincident with lecture. There are four exams, one for each unit of the text.

4. Academic Honesty

The University of Wyoming has very strict regulations concerning academic dishonesty. In short, "academic dishonesty" involves cheating on an examination, a paper, or other class assignments. The penalties can be severe. Each student is expected to be aware of and to abide by the academic dishonesty policy, as specified in UW Regulation 6-802. Ignorance of what constitutes plagiarism, how to properly cite sources, or what is appropriate behavior on an examination or class assignment is not an acceptable defense against a charge of academic dishonesty. Students uncertain as to whether a particular act violates the Universitys academic dishonesty policy should consult their instructor, the head of the department, their academic advisor, the Office of Student Life, or another appropriate University official.

UW Regulation 6-802 §4 defines academic dishonesty as "an act attempted or performed that misrepresents ones involvement in an academic task in any way, or assists another student to misrepresent his or her involvement in an academic endeavor." Among the misdeeds by students that the University of Wyoming considers acts of academic dishonesty are:

1. Plagiarism: presenting the work (i.e., ideas, data, creations) of another, wholly or in part, as ones own work without customary and proper acknowledgement of sources and extent of use, unless authorized by the instructor.

2. Cheating: using information, study aids, notes, materials, devices, or collaboration not explicitly approved by the instructor. For example: doing a class assignment for someone else or allowing someone to copy ones assignment; copying from, or assisting, another student during an examination; or stealing, or otherwise improperly obtaining, copies of an examination before or after its administration.

3. Fraud: altering or inventing data, research, or citations for an academic endeavor; fabricating, forging or otherwise misrepresenting to an instructor or an institution ones past or current academic or professional activities; impersonating someone or allowing oneself to be impersonated for an examination or other academic endeavor; using a ghost writer, commercial or otherwise, for any type of assignment.

4. Violation of Standards: violations against ethical and professional standards required by individual University programs, academic courses, and clinical programs that may result in qualification for entry into a profession that maintains standards of conduct.

5. Multiple Submissions: submitting, wholly or in part, the same academic endeavor to earn credit in two or more courses without explicit approval by all concerned instructors.

6. Interference or Obstruction: interfering with academic efforts of other students to gain unfair advantage for personal academic advancement. Interference may include but is not limited to, sabotage, harassment, tampering, bribery, or intimidation of another student.

7. Complicity: assisting another person in any act of academic dishonesty as defined above.

5. Schedule of Topics, Assignments and Exams

`Note:` Subject to change. Students will be responsible for in-class assigned assignments as well.

Table 1. Tentative Topics, Assignments and Exam Schedule

Week	Chapters	Lecture Tutorials	Reading & Quizzes	Labs	Unit Exam
Unit I - Introducing Astronomy					
1	I.1 Astronomy ... Universe I.2 Knowing the Heavens I.3 Eclipses ... Moon I.4 Gravitation ... Planets	All Night Sky, Path of the Sun, Seasons, Cause/Pred Moon Phases, Kepler's, Gravity, Retrograde	Ch 1-5 DUE: Tues (5/26), 11am	P.1 Podcast Presentation 1. Math Review 2. Planetarium	
2	I.5 The Nature of Light I.6 Optics and Telescopes	EM Spec, BB Rad, Spectra, Light,	Ch 6-9 DUE: Mon (6/1), 11am	3. Orbits (Kepler's) 4. EM Spectrum	
Unit II - Planets and Moons					I. Fri (5/29)
2	II.7 Comp. Planetology I II.8 Comp. Planetology II	Sun Size, Temp. and SS Form.		5. Tel. and Atm. (LT)	
3	II.9 The Living Earth II.10 Our Barren Moon II.11 Mercury, Venus, Mars II.12 Jupiter, Saturn II.13 J&S: Satellites	ES Planets, Earth's Surf.	Ch 10-14 DUE: Mon (6/8), 11 am	6. Scale: How Big? 7. Planetary Geology 8. Jupiter's Moons	
4	II.14 Uranus, Neptune, Pluto ...	ES Planets,	Ch 16,17,19,20,22		
Unit III - Stars and Stellar Evolution					II. Wed-LAB (6/10)
4	III.16 Our Star, the Sun III.17 The Nature of Stars III.19 Stellar Ev: Post-MS III.20 Stellar Ev: Star-Death	Parsec, Parallax, Magnitudes, H-R, Binary Stars, Star Lifetimes	DUE: Mon (6/15), 11 am	9. Parallax & Angular ... 10. HR Diagram (LT)	
5	III.22 Black Holes	Parsec, Parallax,	Ch 23-26,28	11. Seven Sisters ...	
Unit IV - Galaxies and Cosmology					III. Wed-LAB (6/17)
5	IV.23 Our Galaxy IV.24 Galaxies IV.25 QSOs, AGN, γ-ray ... IV.26 Cosmology: Ev ...	Stellar Ev, MW Scales, Galaxy Class.	DUE: Mon (6/22), 11 am	12. Milky Way	
6	IV.28 Search for Extra-Ter ... P.4 Podcast Presentations P.4 Podcast Presentations P.4 Podcast Presentations	Exp. Universe		13. Galaxy Zoo 14. Exp. Universe 15. Search for Extra-Ter	
					IV. Fri (6/26)

6. Exam Study Guide Outline

`Note:` Students are responsible for **all** content in the chapters listed below. This includes, but is not limited to, i) each chapter section, ii), Boxes, iii) Cosmic Connections, iv) Guest Essays, v) assigned homework (online-Quizzes), vi) Lecture Tutorials and vii) Labs.

I. Introducing Astronomy

1. Astronomy and the Universe
   - 1-1 Astronomy and the Scientific Method
   - 1-2 The Solar System
   - 1-3 Stars and Stellar Evolution
   - 1-4 Galaxies and Cosmology
   - 1-5 Angles and Angular Measure
   - 1-6 Powers of Ten
   - 1-7 Astronomical Distances
   - 1-8 The Adventure of Astronomy
2. Knowing the Heavens
   - 2-1 Ancient Astronomy
   - 2-2 Constellations
   - 2-3 Motions of the Sky
   - 2-4 The Celestial Sphere
   - 2-5 The Seasons
   - 2-6 Precession
   - 2-7 Time and Timekeeping
   - 2-8 The Calendar
3. Eclipses and the Motion of the Moon
   - 3-1 Phases of the Moon
   - 3-2 The Moon's Rotation
   - 3-3 Eclipses and the Line of Nodes
   - 3-4 Lunar Eclipses
   - 3-5 Solar Eclipses
   - 3-6 Measuring the Earth
4. Gravitation and the Waltz of the Planets

24. Galaxies
    - 24-1 Island Universe
    - 24-2 The Distances to Galaxies
    - 24-3 Classifying Galaxies
    - 24-4 The Distance Ladder
    - 24-5 The Hubble Law
    - 24-6 Clusters and Superclusters
    - 24-7 Colliding Galaxies
    - 24-8 Dark Matter in the Universe
    - 24-9 The Evolution of Galaxies
25. Quasars, Active Galaxies, and Gamma-Ray Bursters
    - 25-1 The Discovery of Quasars
    - 25-2 Ultraluminous Galactic Nuclei
    - 25-3 Seyfert and Radio Galaxies
    - 25-4 Active Galactic Nuclei
    - 25-5 Black Holes as "Central Engines"
    - 25-6 A Unified Model
26. Cosmology: The Origin and Evolution of the Universe
    - 26-1 The Dark Night Sky
    - 26-2 The Expanding Universe
    - 26-3 The Big Bang
    - 26-4 The Cosmic Microwave Background
    - 26-5 The Universe Before Recombination
    - 26-6 The Shape of the Universe
    - 26-7 Dark Energy and the Accelerating Universe
    - 26-8 Primordial Sound Waves
27. Exploring the Early Universe - ** Group (HARD) **
    - 27-1 Cosmic Inflation
    - 27-2 The Fundamental Forces and Symmetry Breaking
    - 27-3 Matter, Antimatter, and the Uncertainty Principle
    - 27-4 Matter-Antimatter Annihilation
    - 27-5 Relics of the Primordial Fireball

27-6 The First Stars and Galaxies

27-7 The Dimensions of Spacetime

28. The Search for Extraterrestrial Life - ** Group**

28-1 Building Blocks of Life

28-2 Life in the Solar System

28-3 Meteorites from Mars

28-4 The Drake Equation

28-5 Radio Searches for Civilizations

28-6 Infrared Searches for Planets