

Principles of Astronomy

AST K101 (MO1), Three sem. hrs. credits
CRN: 10862
Spring 2007
Three Rivers Community College
Mohegan Campus
Norwich, CT 06360

Instructor: Bill Dopirak
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Office Hrs.
M - 9:30-10:00am, T - 5:00-6:00pm
R 5:00-6:00pm, F 12:00-1:00pm
(Or by appointment)

Required Text: Schneider, S.E. and T.T. Arny. 2007. *Pathways to Astronomy*.
McGraw-Hill: Higher Education Publishing. p.699.

Optional Materials: Starry Night[®] Pro. Star charts, Planisphere, Binoculars

Catalog Description:

This course covers the ideas that account for the earth and heavenly bodies and their characteristics. This course is designed to develop an appreciation of the beauty and order of the universe. Observational exercises, including star identifications and use of the telescope, are included.

Primary Objectives: In addition to understanding the mechanisms involved in ascertaining distance, temperature, and movements of celestial bodies, students will be able to orientate themselves with the night sky by using constellations as guides.

Attendance Policy:

Students are expected to attend class sessions regularly. If a class is missed due to circumstances beyond your control, **please**, be sure to notify your instructor and make the necessary arrangements for obtaining the lecture notes. **You will be responsible** for the material. **If 3 classes are missed, a deduction of 5-POINTS will be taking from your final grade. TEN-POINTS will be deducted from your final grade if 5 or more classes are missed.** A 5-point bonus will be added to your final grade if 100% attendance is noted.

Grade Evaluation:

There will be two exams, a mid-term and the final exam will be: **14 May 2007**. There will be (AT LEAST) twelve weekly quizzes. The lowest two quiz grades will be dropped. Exam and quiz questions will consist of multiple choice, short answers, and/or essays. Every student is responsible for at least one "Constellation Report" and a "Special Report". Your constellation report will consist of describing the stars that make up that constellation. You must sign up for your constellation (Table 1), and report on it in front of the class. Your special report will consist of a research project of your choice. More will be discussed on these throughout the semester.

Add/Drop Procedures:

Please consult the school catalog for this policy.

Suggestions for the course:

To gain a better understanding be sure to read the required reading sections **before** coming to class. Also, be prepared to participate in classroom discussions.

Grading:

Final grade will based on the following:

| | |
|---------------------------|-------|
| Exams----- | 60% |
| Quizzes----- | 20% |
| Constellation report----- | 10% |
| Research Project----- | 10% |
| | <hr/> |
| | 100% |

Final Grade:

| | |
|---------------|---------------|
| 100.0-99.0= A | 79.4-77.5= C+ |
| 98.9-93.5= A | 77.4-72.5= C |
| 93.4-90.5= A- | 72.4-69.5= C- |
| 90.4-87.5= B+ | 69.4-63.5= D+ |
| 87.4-84.5= B | 63.4-59.5= D |
| 84.4-79.5= B- | 59.4-00.0= F |

College Withdrawal Policy:

A student who finds it necessary to discontinue a course once class has met must provide written notice to the registrar. **See Registrar for dates.** After that period, a student wishing to withdraw must obtain written authorization of the instructor to receive a "W" grade on their academic record, non-punitive grade indicating termination of class participation. Students who do not withdraw, but stop attending **will receive** a grade of "F" for the final grade. **Verbal withdrawals cannot be accepted.**

Disabilities Statement:

If you have a hidden or visible disability that may require classroom or test-taking modifications, please see me as soon as possible.

Academic and Classroom Misconduct:

The instructor has the primary responsibility for control over classroom behavior and maintenance of academic integrity, and can order the temporary removal or exclusion from the classroom, and/or laboratory, of any student engaged in conduct violative of the general rules and regulation of the institution. Extended or permanent exclusion from classroom, and/or laboratory, or further disciplinary action can be effected only through appropriate college procedure. Plagiarism, cheating, or any form of academic dishonesty is **prohibited**. Students guilty of academic dishonesty directly or indirectly will receive a **zero** for an exercise or exam and may receive an **F** for the course in addition to other possible disciplinary sanctions that maybe imposed through the regular institutional procedures. Any student that believes he or she has been erroneously accused may appeal the case through the appropriate institutional procedures if their grade was affected.

Principles of Astronomy

Tentative Schedule

Spring 2007

Lecture: Mondays 6:30-9:30pm - Room 205 (MO)

| Date | Topic | Required readings in: |
|--------------|---|------------------------------------|
| | | Schneider & Arny, 2007 Unit #'s |
| 01/22 | The "New" Solar System/Numerical Values/Celestial Orientation | 1-5 |
| 01/29* | Measurable Time/Lunation/Eclipses/Angulations/Parallax | 6-10 |
| 02/05* | Historical Astronomy/Newtonian Physics/Kelper's Laws | 11-15 |
| 02/12* | Orbital Velocities and Gravitational forces/Tides | 16-20 |
| 02/19 | NO CLASS | |
| 02/26 | <i>Seaport Planetarium Field Trip, Mystic, CT</i> | |
| 03/05* | Electromagnetic Radiation/Energy and Light/Doppler Shift | 21-25 |
| 03/12* | Tools of the Trade: Types of and physics of Telescopes | 26-29 |
| 03/19 | SPRING BREAK - NO CLASS- | |
| 03/26* | Origin of the Solar System/Other Planetary Systems/Planet Earth | 30-36 |
| 04/02* | Moon/Mercury/Venus/Mars/Asteroids | 37-41 |
| 04/09* | Comparative Planetology/Jupiter & Saturn/Uranus & Neptune | 42-45 |
| 04/16* | Pluto and Beyond/Comets/Meteorites and Impact Sites | 46-48 |
| 04/23* | Our Sun/Stellar births & Deaths/Stellar Luminosity | 49-55 |
| 04/30* | Temperatures & Brightness of Stars/H-R Diagram | 56-59 |
| 05/07* | Edges Universe/Astrobiology/Search for Extraterrestrial Life | 80-84 |
| 05/14 | FINAL EXAM | |

*Quiz Day; quiz will be on previous lecture material

Syllabus Revisions:

This schedule may be subject to change as the instructor sees fit. The instructor will announce any changes in advance.

Principles of Astronomy

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Detailed Objectives

Upon completion of this course the student should be able to:

- 1) List the main constituents of our solar system, galaxy, and universe.
- 2) Describe a few of the exciting topics being investigated by modern astronomers.
- 3) Outline some key events in the history of the Universe.
- 4) Construct a scale model of the Universe that illustrates the relative distances and sizes of various celestial objects.
- 5) Discuss how time (*as we perceive it*), is influenced by distance.
- 6) Explain the foundations of anthropogenic calendars.
- 7) Understand the use of scientific notation and the metric system.
- 8) Discuss sidereal time and how it relates to a synodic month.
- 9) Describe the lunar cycle and its effects on earth.
- 10) Understand stellar parallax and parsecs.
- 11) Summarize some of the accomplishments of early Greek Astronomers.
- 12) Discuss the models of the Universe developed by Aristotle, Ptolemy, and Copernicus.
- 13) State and apply Kepler's three laws of planetary motion.
- 14) Discuss the importance of geometric principles in association with astronomy.
- 15) Discuss Newton's contributions to Astronomy, physics, and mathematics.
- 16) State Newton's three Laws and examples of each.
- 17) Describe Newton's Law of universal gravitation, and summarize the reasoning used by Newton to deduce it.
- 18) Explain how we can say that the Moon is falling towards Earth.
- 19) Compare and contrast the properties of the terrestrial and the jovian planets.
- 20) Explain why Mercury's night and day are twice as long as its year.
- 21) Explain what the "Greenhouse Effect", both stable and runaway, and apply it to the atmosphere of Venus.
- 22) Understand Earth's dynamic properties; plate tectonics and atmosphere.
- 23) Discuss the Martian landscape, atmosphere, and possible life.
- 24) Summarize Jupiter's four main moons.
- 25) Describe the appearance, origin, and nature of Saturn's rings.
- 26) List some discoveries made when Voyager II visited Uranus and Neptune.
- 27) Explain what a "Shooting Star" is.
- 28) Discuss the origin of comets, as well as their physical and orbital properties.
- 29) Summarize the methods used by astronomers to detect and study light.
- 30) Sketch the path of light rays follow in different types of telescopes.
- 31) State the main purposes of telescopes.
- 32) Calculate the relative light-gathering power of two telescopes, given their diameters.
- 33) Explain the different types of optical telescopes.
- 34) Explain why radio telescopes are much larger than optical telescopes.
- 35) Discuss the nature of electromagnetic radiation.
- 36) Define what is meant by a spectrum, and identify the electromagnetic region that visible light occupies.
- 37) Explain the nature of light and its properties.
- 38) Define wavelength, frequency, period, and speed of a wave.
- 39) State the relationship between energy and frequency (for wavelength) of a photon.
- 40) Summarize some arguments for thinking that light has both wave-like and particle-like properties.

Table 1. A compiled list of recognized constellations found in most star charts and planispheres.

| Constellation | Abbreviation | English Translation |
|----------------------|---------------------|----------------------------|
| Andromeda | And | Princess |
| Antlia | Ant | Air Pump |
| Aquarius | Aqr | Water Bearer |
| Aquila | Aql | Eagle |
| Ara* | Ara | Alter |
| Aries | Ari | Ram |
| Auriga | Aur | Charioteer |
| Boötes | Boo | Herdsman |
| Caelum | Cae | Burin (engraving tool) |
| Camelopardalis | Cam | Giraffe |
| Cancer | Cnc | Crab |
| Canes Venatici | CVn | Hunting Dogs |
| Canis Major | CMA | Big Dog |
| Canis Minor | CMi | Little Dog |
| Capricornus | Cap | Sea Goat |
| Cassiopeia | Cas | Queen |
| Centaurus* | Cen | Part Human and Part Horse |
| Cepheus | Cep | King |
| Cetus | Cet | Whale |
| Columba | Col | Dove |
| Coma Berenices | Com | Berenice's Hair |
| Corona Australis | CrA | Southern Crown |
| Corona Borealis | CrB | Northern Crown |
| Corvus | Crv | Crow |
| Crater | Crt | Cup |
| Cygnus | Cyg | Swan |
| Delphinus | Del | Dolphin |
| Dorado** | Dor | Swordfish |
| Draco | Dra | Dragon |
| Equuleus | Equ | Little Horse |
| Eridanus** | Eri | River |
| Fornax | For | Furnace |
| Gemini | Gem | Twins |
| Grus* | Gru | Crane |
| Hercules | Her | Hero (Divinity) |
| Horologium** | Hor | Clock |
| Hydra | Hya | Water Monster |
| Indus* | Ind | Indian |
| Lacerta | Lac | Lizard |
| Leo | Leo | Lion |
| Leo minor | Lmi | Little Lion |
| Lepus | Lep | Hare |
| Libra | Lib | Scales |

*southern constellation, shown in part

**southern constellation, no stars may be seen

Table 1. (cont.)

| Constellation | Abbreviation | English Translation |
|----------------------|---------------------|----------------------------|
| Lupus* | Lup | Wolf |
| Lynx | Lyn | Lynx |
| Lyra | Lyr | Lyre |
| Microscopium | Mic | Microscope |
| Monoceros | Mon | Unicorn |
| Norma* | Nor | Set Square |
| Ophiuchus | Oph | Serpent Bearer |
| Orion | Ori | Hunter |
| Pegasus | Peg | Winged Horse |
| Perseus | Per | Prince |
| Phoenix* | Phe | Immortal Bird |
| Pictor* | Pic | Painter's easel |
| Pisces | Psc | Fishes |
| Pisces Austrinus | PsA | Southern Fishes |
| Puppis* | Pup | Stern of a ship |
| Pyxis | Pyx | Mariner's Compass |
| Sagitta | Sge | Arrow |
| Sagittarius | Sgr | Archer |
| Scorpius | Sco | Scorpion |
| Sculptor | Scu | Sculptor |
| Scutum | Sct | Shield |
| Serpens | Ser | Serpent |
| Sextans | Sex | Sextant |
| Taurus | Tar | Bull |
| Telescopium* | Tel | Telescope |
| Triangulum | Tri | Triangle |
| Ursa Major | Uma | Big Bear |
| Ursa Minor | Umi | Little Bear |
| Vela* | Vel | Sails |
| Virgo | Vir | Virgin |
| Vulpecula | Vul | Little Fox |
| Apus** | Apu | No Feet |
| Carina** | Car | Keel |
| Chamaeleon** | Cha | Chameleon |
| Circinus** | Cir | Compass |
| Crux** | Cru | Southern Cross |
| Hydrus** | Hyd | Hydra |
| Musca** | Mus | Housefly |
| Norma** | Nor | Right Angle |
| Octans** | Oct | Octant |
| Pavo** | Pav | Peacock |
| Reticulum** | Ret | Crosshair |
| Tucana** | Tuc | Tuucan |

*southern constellation, shown in part

**southern constellation, no stars may be seen