

**William Paterson University  
Department of Physics  
General Astronomy - PHYS 170  
(4 Credits)**

**COURSE SYLLABUS**

Winter Session: December 26, 2009 to January 16, 2010

**Instructor:** G. Swangin  
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**COURSE OBJECTIVE:**

This online course is an introduction to astronomy concepts of the Earth, the solar system, and the universe. Historical developments in astronomy from ancient mythology to modern science will be covered. Topics include: History of Astronomy, Gravity and Light, The Solar System, The Earth-Moon System, The Formation and Evolution of Stars, Galaxies, and Frontiers of Exploration.

**STUDENT LEARNING OUTCOMES:** Students will be able to

- Effectively express themselves in written form.
- Demonstrate ability to think critically.
- Locate and use information.
- Demonstrate ability to integrate knowledge and ideas in a coherent and meaningful manner.
- Understand fundamental physical principles, theories, and methods of modern science as practiced in astronomy.
- Learn the basic observable phenomena of astronomy, and how these have had both practical applications and played a key role in advancing our understanding of the Universe.
- Explain the role of modern technology in the investigation of astronomical phenomena, and the crucial role played by technological advances in extending our knowledge of origin and behavior of the Universe.
- Explore how discoveries in astronomy have implications for how we have come to view our place in the Universe, and by comparing the Earth to other planets in our Solar System provide a physical framework for understanding the possible impacts of our activities on the Earth.

**TEXT AND SOFTWARE:**

Astronomy: A Beginner's Guide to the Universe, Fifth Edition

By Eric Chaisson and Steve McMillan

**Required Software:** Stellarium (Free program downloaded from [www.stellarium.org](http://www.stellarium.org)) used for Home Laboratory Assignments.

**GRADING:**

Your grade will be determined by the following work:

Mid-term Exam 25%

Online Quizzes 20%

Final Exam 30%

Lab Work 25%

**Standard Evaluation:**

The following grade scale will be used to assign final grades for this course:

Cumulative final grade letter grade

95-100 A

90-94 A-

87-89 B+

84-86 B

80-83 B-

76-79 C+

72-75 C

68-71 C-

64-67 D+

55-63 D

< 55 F

Remember: No makeup exams are given.

**Multimedia Course Assistance**

Selected PODCASTS (MP3) of some modules will be available online for downloads into Ipods or MP3 players,

Selected POWERPOINT PRESENTATIONS will be available online to compliment the Information contained in some modules.

## **Communication and Technical Assistance**

Every student at William Paterson has a student university e-mail address. Your university e-mail address is attached to Blackboard, and that is the one that will be used to contact you about assignments and other matters related to the course. You should check it daily.

**AOL users:** if you have AOL, you should minimize that screen and use INTERNET EXPLORER or a similar web browser, as AOL sometimes deletes the screen after so many minutes of inactive key strokes. This could be costly if you are working on an exam or paper and you lose a page or more of your work.

For technical assistance regarding Bb or problems interfacing with your pc, you must contact the computer consultants at Instructional Research & Technology through the HELP function.

## **COUSE TOPICS**

### **1. FOUNDATIONS - FROM ANCIENT TO MODERN ASTRONOMY**

This module traces the development of astronomical thought from the geocentric view of the universe to modern astronomy covering the contributions made by Copernicus, Tycho Brahe, Kepler, Galileo, and Newton. Other topics include: The significance of Newton's laws of Motion and Universal Law of Gravitation; our view of the sky from the planet Earth and the apparent motion of celestial objects; the diurnal paths of stars; and the apparent annual motion of the sun and planets.

TEXT: Page 1 to 23. Chapter 1

### **2. FOUNDATIONS II – OUR HOME IN SPACE**

The module covers the three basic motions of Earth -- rotation, revolution and precession -- from a heliocentric point of view and the adoption of Newton's laws; proofs for the Earth's motion. Other topics include: what causes seasons; our view of the sky from different places on Earth; circumpolar stars; and the midnight sun.

TEXT: Chapter 2

### **3. LIGHT THE COSMIC MESSENGER & TOOLS OF THE ASTRONOMER**

The module covers the basic properties of light and matter that enables astronomers to understand so much about the universe. Other topics include: astronomical instruments; reflecting and refractor telescopes; and radio telescopes.

TEXT: Chapter 3

#### **4. THE MOON**

The module covers study of the Moon as viewed from Earth and concludes with what we know about our nearest neighbor in space from manned and unmanned lunar missions: Among the topics covered are: aspects of the Moon; lunar phases; sidereal and synodic months; lunar tides; solar and lunar eclipses; physical properties of the Moon; lunar surface features; the geology of the Moon; origin of the Moon; unmanned and manned expeditions to the Moon.

TEXT: Chapter 5 (Section 5.6, 5.7 and 5.8)

#### **5. EXPLORING THE SOLAR SYSTEM - THE TERRESTRIAL PLANETS**

The module covers the study of the four innermost planets of the Solar System: Mercury, Venus, Earth, and Mars. Among the topics covered are: physical properties of the terrestrial planets; classifying planets; and spacecraft missions to the inner planets.

TEXT: Chapter 5. (Sections 5.1 – 5.5) and Chapter 6.

#### **6. EXPLORING THE SOLAR SYSTEM – THE JOVIAN PLANETS**

The module covers the study of inner gas giants of the Solar System, Jupiter and Saturn. Among other topics covered are: physical properties of the Jovian planets; and spacecraft missions to the outer Solar System planets. The moon systems of Jupiter and Saturn; and planetary ring systems. Other topics include the study of the outer gas giants of the Solar System, Uranus and Neptune; the physical properties of the minor Jovian planets; and spacecraft missions to the outer regions of the Solar System; and ring systems.

TEXT: Chapter 7

#### **7. SOLAR SYSTEM VAGABONDS – EXOPLANETS, COMETS, AND DEBRIS**

The module covers study of objects, including comets, that were left over from the origin of the Solar System. Among the topics covered: meteors and asteroids; the mystery of Pluto; trans-Neptunian and Kuiper belt objects;

TEXT: Chapter 4 and Chapter 8

## **8. ORIGIN OF THE SOLAR SYSTEM AND EXOPLANETS**

The module covers theories for the formation of the Solar System, and methods used in detecting other planetary systems.

Text: Chapter 4 and Chapter 8

## **9. THE SUN: OUR NEAREST STAR IN SPACE**

The module covers structure of the Sun and its effect on the planet Earth. Among the topics covered: The origin of the Sun; What makes the sun shine? The sun's visible surface; and sunspots.

TEXT: Chapter 9

## **10. STELLAR PROPERTIES: CHARACTERIZING THE STARS**

The module covers the distances and motion of stars; stellar parallax and proper motions; stellar magnitudes; spectral classification; color-temperature relationships; stellar masses and binary stars.

TEXT: Chapter 11

## **ONLINE MID-TERM EXAM January 6, 2010 (Covering Modules 1-8)**

## **11. STELLAR EVOLUTION: BIRTH, LIFE, AND DEATH OF STARS**

The module covers the lives of stars from birth to death. Among the topics covered: The HR diagram; giant and super giant stars; dwarf and neutron stars; pulsars; nova and super nova explosions; mysterious black holes in space.

TEXT: Chapter 12 and Chapter 13

## **12. THE MILKY WAY GALAXY – AN ISLAND AMONG ISLANDS**

The module covers the structural features of the Milky Way Galaxy. Other topics include: rotation of the Galaxy; stellar populations; and radio view of our home galaxy; and nebulae and star clusters.

TEXT: Chapter 14

## **Online Quiz (Modules 9, 10, and 11)**

### **13. THE GALAXIES: OTHER ISLAND UNIVERSES**

The module covers the structure of other galaxies in the universe. Other topics include: classification of galaxies; distribution of galactic systems; the local group; clusters of galaxies; Quasars; and active and radio galaxies; and “Dark Matter.”

TEXT: Chapter 15 and Chapter 16

### **14. COSMOLOGY: THE ORIGIN AND EVOLUTION OF THE UNIVERSE.**

The module covers the theories for the origin of the universe. Other topics include: evolution of galaxies; the cosmological principle; the age of the universe; the red-shift; Big Bang Theory; dark energy; space and time.

TEXT: Chapter 17 and Chapter 18.

### **ONLINE FINAL EXAM**

Please check the WPU Blackboard on a regular basis for announcements, additional assignments, and podcasts postings.