

Office of Academic Affairs
Tarleton State University
December, 2007

Master Course Syllabus Outline

Department: Mathematics, Physics, and Engineering

Course Prefix: PHYS403

Official Course Title: Introduction to Astronomy and Astrophysics

I. Catalog Description: A laboratory science course of study in the topics of astronomy and astrophysics, including Planetary Astronomy, Stellar Astrophysics, Galactic Astronomy, Cosmology and Astrobiology.

II. Prerequisites: MATH 120, PHY122 or concurrent registration

III. Expanded Course Description: PHYS403 is intended for science majors who have a background in mathematics and physics. In this course, physical principals are used to study the motion of stars and planets with the help of spherical trigonometry, formation and evolution of the solar systems and its planetary bodies. In depth study of the physical properties of stars, determination of stellar parameters, life cycles of stars, different kinds of variable stars and their use in understanding the physics of stars. The course will cover the topics that relate to physical properties of galaxies, morphology of galaxies and its evolution through active galaxies. The course presents a rudimentary understanding of special and general theory of relativity, different cosmological models, dark matter, dark energy and observations and experiments that relate to cosmology. This course will also present an overview of the origins of life, search for habitable planets and the existence of extraterrestrial intelligence. Throughout the course material, important development and inventions in ground and space based instrumentation and its ramifications will be presented. Students will learn the basic skills in observational astronomy through the use modern ground based telescopes and data available in the public domain from the various space based telescopes.

IV. Intended Student Learning Outcome:

After completing this course the student will have:

1. Developed an interest in studying current astronomical events and topics as a life-long learning activity.
2. Developed the basic understanding and appreciation of the methodology and techniques to study astronomy including:
 - a. The importance of physical principles and physical thinking,
 - b. The integration of other sciences (geology, chemistry, biology...),
 - c. The technology of astronomical observation and instrumentation
3. Acquire an understanding of various celestial subjects including
 - a. The scale, structure and diversity of the universe.

- b. Measurement of important physical properties such as mass, age and distance.
 - c. Life cycle of stars,
 - d. Chemical elements,
 - e. Red-shift,
 - f. Universal expansion.
4. Developed an understanding and appreciation of astrobiology including
 - a. The nature and distribution of habitable environments in the Universe,
 - b. Past and present habitable environments and signs of life elsewhere in our Universe,
 - c. The Origins of life,
 - d. Search for extraterrestrial intelligence,
 - e. Principles that will shape the future of life on earth and beyond.
 5. Develop skills in:
 - a. Astronomical problem solving
 - b. Naked eye astronomy
 - c. The use and operation of a modern telescope
 - d. Astronomical data acquiring with a modern telescope
 - e. Basic astronomical image processing and working with image processing tools.
 - f. Using the astronomical database and literature available in the public domain and on the internet and the library.
 - g. Critical evaluation of media report on astronomical topics,
 - h. Working and learning in groups,
 - i. Writing about astronomy,

Topical outline

1. Celestial Mechanics and the Solar System
 - a. Celestial Mechanics and the Solar System
 - b. The Solar System in Perspective
 - c. The Dynamics of Earth
 - d. The Earth-Moon System
 - e. The Terrestrial Planets
 - f. The Gaseous Planets
 - g. Small Bodies and the Origin of the Solar System.
 - h. Recent discoveries and New Theories
2. The Stars
 - a. Electromagnetic Radiation and Matter
 - b. Telescope and Detectors
 - c. The Sun: A Model Star
 - d. Stars: Distances and Magnitudes
 - e. Stars: Binary Systems
 - f. Stars: The Hertzsprung-Russell Diagram
 - g. Recent Discoveries and New Theories
3. The Milky Way Galaxy

- a. Our Galaxy: A Preview
 - b. Galactic Rotation: Stellar Motions
 - c. The Evolution of Stars
 - d. Star Deaths
 - e. Variable and Violent Stars
 - f. The Interstellar Medium and Star Birth
 - g. The Evolution of Our Galaxy
 - h. Recent Discoveries and New Theories
4. The Universe
- a. Galaxies Beyond the Milky Way
 - b. Hubble's Law and the Distance Scale
 - c. Large-Scale Structure in the Universe
 - d. Active Galaxies and Quasars
 - e. Cosmology: The Big Bang and Beyond
 - f. The New Cosmology
5. Astrobiology
- a. Origins of Life
 - b. Search for Extra-solar and habitable Planets
 - c. NASA Astrobiology program

V. Academic Honesty:

Cheating, plagiarism (submitting another person's materials or ideas as one's own), or doing work for another person who will receive academic credit are all impermissible. This includes the use of unauthorized books, notebooks, or other sources in order to secure or give help during an examination, the unauthorized copying of examinations, assignments, reports, or term papers, or the presentation of unacknowledged material as if it were the student's own work. Disciplinary action may be taken beyond the academic discipline administered by the faculty member who teaches the course in which the cheating took place.

VI. Students with Disabilities Policy:

It is the policy of Tarleton State University to comply with the Americans with Disabilities Act (ADA) and other federal, state, and local laws relative to the provision of disability services. Students with disabilities attending Tarleton State University may contact the Office of Disability Services at (254) 968-9478 to request appropriate accommodation. Furthermore, formal accommodation requests cannot be made until the student has been officially admitted to Tarleton State University.