

**STATE UNIVERSITY OF NEW YORK
COLLEGE OF TECHNOLOGY
CANTON, NEW YORK**



COURSE OUTLINE

ASTR 103 – STELLAR ASTRONOMY

Prepared By: Dr. David C. Bradford

**CANINO SCHOOL OF ENGINEERING TECHNOLOGY
PHYSICS
MAY 2015**

- A. **TITLE:** STELLAR ASTRONOMY
- B. **COURSE NUMBER:** ASTR 103
- C. **CREDIT HOURS:** 3
- D. **WRITING INTENSIVE COURSE:** No
- E. **COURSE LENGTH:** 15 weeks
- F. **SEMESTER(S) OFFERED:** Spring
- G. **HOURS OF LECTURE, LABORATORY, RECITATION, TUTORIAL, ACTIVITY:** 3 hours lecture per week
- H. **CATALOG DESCRIPTION:**
 This is a survey course examining the structure of the observable universe. Focus is on the formation, evolution and resulting classification of stars. Topics covered will include the history of astronomy, the sun, classification of stars, multiple star systems, birth and death of stars, gravitational collapse, pulsars, black holes, galaxies, quasars, and cosmology.
- I. **PRE-REQUISITES/CO-REQUISITES:** None
- J. **GOALS (STUDENT LEARNING OUTCOMES):**
 By the end of this course, the student will be able to:

<u>Course Objective</u>	<u>Institutional SLO</u>
a. Appreciate the scale of the universe and basic structure in relationship to the Big Bang theory.	2. Crit. Thinking
b. Give an historical perspective on the development of modern astronomy in conjunction with the development of Newtonian Mechanics and an understanding of gravity, as illustrated by the shift from a geocentric to heliocentric model of the solar system.	1. Communication 2. Crit. Thinking
c. Discuss the cosmological principle and how our understanding of physical laws allows us to probe the observable universe.	1. Communication 2. Crit. Thinking
h. Discuss special structures in the universe such as; binary star systems, globular clusters, pulsars, black holes, and quasars; in terms of how they can be used to test our understanding of the universe.	1. Communication 2. Crit. Thinking

- K. TEXTS:** Palen, Kay, Smith, and Blumenthal 2015. *Understanding Our Universe, 2nd Ed.*, W.W. Norton & Co., New York, N.Y. 101110-0017.
- L. REFERENCES:** Evolving on-line material and Stellarium planetarium program
- M. EQUIPMENT:** computers
- N. GRADING METHOD:** A-F
- O. MEASUREMENT CRITERIA/METHODS:**
- Exams
 - Quizzes
 - In-class computer based activities
 - Short answer homework
 - Final term paper
- P. DETAILED COURSE OUTLINE:** (must use the outline format listed below)
- I. Our place in the universe, the observable universe, Big Bang, and how do we know
 - A. Scale of the Solar System
 - B. Scale of the observable universe
 - C. The Big Bang and looking back in time
 - D. How do we know – the scientific method
 - E. Is Astrology science?
 - II. Looking for patterns
 - A. Why do we have seasons?
 - B. Motion of the fixed stars, constellations, and the Celestial Sphere
 - C. Phases of the Moon
 - D. Motion of the Sun and the planets defines the ecliptic and the Zodiac
 - III. Historical perspective on the co-evolution of Astronomy and Physics
 - A. Contributions by the ancient Greeks
 - B. Heliocentric and Geocentric models of the Solar System
 - C. Retrograde motion
 - D. Contributions by Ptolemy, Brahe, Copernicus, and Galileo
 - E. The Laws of Kepler and Newton
 - F. Gravity and diverging light as examples of the inverse square law
 - IV. Light and Telescopes
 - A. The wave model of light
 - B. Wave particle duality
 - C. Spectroscopy and the Doppler shift
 - D. Continuous, absorption line, and emission line spectra; and what they tell you
 - E. Reflecting and refracting telescopes
 - F. Resolution, the atmosphere, and astronomy in practice
 - V. Measuring the stars
 - A. Brightness, distance, and luminosity
 - B. Determining the temperature, size, and composition of stars
 - C. Measuring stellar masses
 - D. The H-R Diagram
 - VI. Our Sun
 - A. The structure of the Sun and hydrostatic equilibrium

- B. Fusion, the energy balance, and a stars lifetime
- VII. Evolution of low mass stars
 - A. Lifetime of a main-sequence star
 - B. Star clusters as a way to check a theory
 - C. What can we learn from binary stars?
- VIII. Evolution of high mass stars
 - A. Separate path of high mass stars
 - B. End of life, quasars, and supernovae
 - C. Black holes

Q. LABORATORY OUTLINE: N/A