Required Syllabus Information – all must be included in the course syllabus

**AST 102**
**Course Title:** Stellar Astronomy w/Lab: SC1
**Course Credits:** 4
**Course Description:** Emphasizes the structure and life cycle of the stars, the sun, galaxies, and the universe as a whole, including cosmology and relativity. Stellar phenomena including white dwarves, black holes will be explored. Incorporates laboratory experience.

**GT Pathways Requirements:**

**Guaranteed Transfer (GT) Pathways Course Statement:**
The Colorado Commission on Higher Education has approved AST 102 for inclusion in the Guaranteed Transfer (GT) Pathways program in the GT- SC1 category. For transferring students, successful completion with a minimum C– grade guarantees transfer and application of credit in this GT Pathways category. For more information on the GT Pathways program, go to http://highered.colorado.gov/academics/transfers/gtpathways/curriculum.html.

**NATURAL & PHYSICAL SCIENCES (N&PS) CONTENT CRITERIA – GT-SC1**

1. The lecture content of a GT Pathways science course (GT-SC1)
    a. Develop foundational knowledge in specific field(s) of science.
    b. Develop an understanding of the nature and process of science.
    c. Demonstrate the ability to use scientific methodologies.
    d. Examine quantitative approaches to study natural phenomena.

2. The laboratory (either a combined lecture and laboratory, or a separate laboratory tied to a science lecture course) content of a GT Pathways science course (GT-SC1)
    a. Perform hands-on activities with demonstration and simulation components playing a secondary role.
    b. Engage in inquiry-based activities.
    c. Demonstrate the ability to use the scientific method.
    d. Obtain and interpret data, and communicate the results of inquiry.
    e. Demonstrate proper technique and safe practices.

**COMPETENCIES & STUDENT LEARNING OUTCOMES FOR GT-SC1**

***Inquiry & Analysis:***

4. **Select or Develop a Design Process**
    a. Select or develop elements of the methodology or theoretical framework to solve problems in a given discipline.
5. **Analyze and Interpret Evidence**
    a. Examine evidence to identify patterns, differences, similarities, limitations, and/or implications related to the focus.

b. Utilize multiple representations to interpret the data.

6. **Draw Conclusions**
    a. State a conclusion based on findings.

***Quantitative Literacy:***

1. Interpret Information
    a. Explain information presented in mathematical forms (e.g., equations, graphs, diagrams, tables, words).
2. Represent Information
    a. Convert information into and between various mathematical forms (e.g., equations, graphs, diagrams, tables, words).

**SYSTEM REQUIREMENTS:**

**REQUIRED COURSE LEARNING OUTCOMES**

1. Recognize the distinctions between science, pseudoscience and non-science.
2. Describe the scientific method in detail.
3. Collect, organize, interpret and present data in a systematic manner, using charts, graphs, tables.
4. Analyze scientific data evidence and sources to support a theory/data critically.
5. Set up and solve problems using geometry, algebra, trigonometry and the metric system as required.
6. Describe the physical scale and timescale of the universe.
7. Apply the physics of gravity and motion as they apply to astronomy.
8. Discuss the basic properties of light and its uses in astronomy and cosmology.
9. Identify objects and classify types of objects visible in the night sky.
10. Relate principles from relativity and quantum mechanics to topics from astronomy and cosmology.
11. Summarize stellar life cycles for different mass stars.
12. Classify galaxies and explain current theories of galaxy formation and evolution.
13. Outline the origin, evolution and fate of the universe as described by current theories in cosmology.
14. Describe how the expansion of the universe was discovered and what it tells us about the past and future.
15. Explain the significance of Hubble's Law in modern cosmology.
16. Demonstrate understanding of the basic ideas of Big Bang theory and inflation.
17. List and explain the evidence for the Big Bang, including the cosmic microwave background, expansion of the universe and Big Bang nucleosynthesis.
18. Assess the evidence for dark matter and dark energy and explain their importance to the structure and fate of the universe.

**RECOMMENDED COURSE LEARNING OUTCOMES**

1. Evaluate arguments about the possibility and prevalence of extraterrestrial life.

**REQUIRED TOPICAL OUTLINE**

I. Astronomy and the nature of science
   a. Scientific method
   b. Science vs pseudoscience
   c. History of astronomy as an example of science
II. Our place in the universe
   a. Scale of space and time
III. Physics of astronomy
   a. Kepler's laws
   b. Newton's laws
   c. Conservation laws
   d. Energy
   e. Nature of light and matter
   f. Modern physics
IV. Stars
   a. Our sun
   b. Stellar properties
   c. HR diagrams
   d. Life and death of stars
V. Galaxies
   a. Classification
   b. Formation and evolution
VI. Cosmology
   a. Dark matter and dark energy
   b. Big Bang Theory
   c. Fate of universe
   d. Cosmic distance ladder

**RECOMMENDED TOPICAL OUTLINE**

I. Life in the Universe
   a. Exoplanets
   b. Astrobiology

CCCOnline Course Policies: http://www.ccconline.org/ccconline-course-policies/

Effective Implementation date: Spring 2018, 201830