

College of San Mateo
Official Course Outline

1. **COURSE ID:** ASTR 210 **TITLE:** Fundamentals of Astrophysics
Units: 4.0 units **Hours/Semester:** 48.0-54.0 Lecture hours; 48.0-54.0 Lab hours; and 96.0-108.0 Homework hours
Method of Grading: Letter Grade Only
Prerequisite: MATH 222, or MATH 225
Recommended Preparation:
 PHYS 210, or PHYS 250

2. **COURSE DESIGNATION:**
Degree Credit
Transfer credit: CSU; UC
AA/AS Degree Requirements:
 CSM - GENERAL EDUCATION REQUIREMENTS: E5a. Natural Science
CSU GE:
 CSU GE Area B: SCIENTIFIC INQUIRY AND QUANTITATIVE REASONING: B1 - Physical Science

3. **COURSE DESCRIPTIONS:**
Catalog Description:
 Hands-on introduction to the composition, nature, and origin of the Universe, including study of the Solar System, stellar evolution, and galaxies. The laboratory portion of the course includes observation and analysis of the night sky utilizing telescopes, cameras, and other equipment at CSM's rooftop observatory. Students will learn and apply modern astronomical research techniques including astroimaging, spectroscopy, and photometry. This course is intended for students majoring in astronomy or another physical science.

4. **STUDENT LEARNING OUTCOME(S) (SLO'S):**
 Upon successful completion of this course, a student will meet the following outcomes:
 1. Describe the underlying principles of spectral line formation.
 2. Collect, analyze and catalog spectroscopic data.
 3. Describe the pulsation mechanism for Cepheid variables.
 4. Carry out basic photometric procedures including making plots of variable stars and extrasolar planets.
 5. Image solar system objects, clusters, nebulae, and galaxies.

5. **SPECIFIC INSTRUCTIONAL OBJECTIVES:**
 Upon successful completion of this course, a student will be able to:
 1. Describe the underlying principles of spectral line formation.
 2. Collect, analyze and catalog spectroscopic data.
 3. Describe the pulsation mechanism for Cepheid variables.
 4. Carry out basic photometric procedures including making plots of variable stars and extrasolar planets.
 5. Image solar system objects, clusters, nebulae, and galaxies.

6. **COURSE CONTENT:**
Lecture Content:
 1. The Celestial Sphere
 2. Telescopes
 3. Kepler's Laws of Planetary Motion
 4. Interaction of Light and Matter
 5. Binary Systems
 6. Stellar Spectra
 7. Main Sequence and Post Main Sequence Stellar Evolution
 8. Fate of Massive Stars
 9. Close Binary Systems
 10. Galactic Evolution
 11. Dark matter and dark energy**Lab Content:**
 1. Understanding darks, bias, and flats

2. Understanding CSM's research telescopes
3. Understanding CCD detectors
4. Spectral analysis of stars, including radial velocity determination
5. Photometry of extrasolar planets, binary systems and pulsating variables
6. Imaging of nebulae, star clusters and galaxies
7. Image processing and reduction

TBA Hours Content:

None

7. REPRESENTATIVE METHODS OF INSTRUCTION:

Typical methods of instruction may include:

- A. Lecture
- B. Lab
- C. Activity
- D. Directed Study
- E. Critique
- F. Discussion
- G. Experiments
- H. Field Experience
- I. Field Trips
- J. Guest Speakers
- K. Observation and Demonstration

8. REPRESENTATIVE ASSIGNMENTS

Representative assignments in this course may include, but are not limited to the following:

Writing Assignments:

Lab reports and representative homework assignments.

Reading Assignments:

Pertinent astronomical papers from Publications of the Astronomical Society of the Pacific, Astronomical Journal, Astrophysical Journal.

9. REPRESENTATIVE METHODS OF EVALUATION

Representative methods of evaluation may include:

- A. Class Participation
- B. Class Performance
- C. Class Work
- D. Exams/Tests
- E. Field Trips
- F. Group Projects
- G. Homework
- H. Lab Activities
- I. Oral Presentation
- J. Papers
- K. Portfolios
- L. Projects
- M. Quizzes
- N. Research Projects
- O. Written examination

10. REPRESENTATIVE TEXT(S):

Possible textbooks include:

- A. Carroll, B. W., and Ostlie, D. A.. *An Introduction to Modern Astrophysics*, 2nd ed. Cambridge University Press, 2017

Other:

- A. Astronomy 210 Lab Manual, CSM Astronomy Department, available for free electronically to students.

Origination Date: September 2020

Curriculum Committee Approval Date: October 2020

Effective Term: Fall 2021

Course Originator: Darryl Stanford

