College of San Mateo
Official Course Outline

1. **COURSE ID:** ASTR 200 **TITLE:** Introduction to Astrophysics
   Units: 3.0 units **Hours/Semester:** 48.0-54.0 Lecture hours
   Method of Grading: Letter Grade Only
   Prerequisite: Completion of or concurrent enrollment in PHYS 220 or PHYS 270. Completion of or concurrent enrollment in ASTR 125.

2. **COURSE DESIGNATION:**
   Degree Credit
   Transfer credit: CSU; UC
   CSU GE:
   CSU GE Area B: SCIENTIFIC INQUIRY AND QUANTITATIVE REASONING: B1 - Physical Science
   IGETC:
   IGETC Area 5: PHYSICAL AND BIOLOGICAL SCIENCES: A: Physical Science

3. **COURSE DESCRIPTIONS:**
   Catalog Description:
   Designed for students who want to take a course more advanced than the introductory survey courses in astronomy. This course covers the fundamentals of photometry, spectroscopy, and stellar astrophysics. Topics include study of pulsating and cataclysmic variable stars, contact binaries, and galactic cannibalism. Emphasis is on a thorough understanding of basic astrophysics.

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 as applied to stars and stellar systems.
   2. Evaluate the significance of the inner Lagrangian point in the mass transfer within a contact binary.
   3. Describe the pulsation mechanism for Cepheid variables

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 as applied to stars and stellar systems.
   2. Evaluate the significance of the inner Lagrangian point in the mass transfer within a contact binary.
   3. Describe the pulsation mechanism for Cepheid variables

6. **COURSE CONTENT:**
   Lecture Content:
   - Binary Stars and Stellar Parameters
   - Spectral line intensities
   - The Sun
   - Classification of Stellar Spectra
   - Spectroscopic Binaries
   - Contact Binaries
   - Stellar Pulsation (Cepheids and RR Lyraes)
   - Degenerate Remnants of Stars
   - Post Main-Sequence Stellar Evolution
   - Variable Stars

7. **REPRESENTATIVE METHODS OF INSTRUCTION:**
   Typical methods of instruction may include:
   A. Lecture
   B. Observation and Demonstration
   C. Other (Specify): Lectures in the Planetarium – The informational content of Astronomy 200 is conveyed by interactive lectures in the planetarium. Various modes of communication, such as webaccess and the latest electronic techniques, as appropriate. are used to facilitate such interactions. These lectures can be in Powerpoint format and uploaded to webaccess, for easy access by the student. The latest astrophysical problems are discussed. CSM's GOTO HYBRID star projector is used extensively and enables students to see the effects of precession, diurnal motion, and galactic motion. Required Homework Assignments –

There are weekly homework assignments that enable the student to further hone their skills in understanding the course material. These assignments are designed to enable the student to think critically in arriving at the answers.

8. **REPRESENTATIVE ASSIGNMENTS**

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

Writing Assignments:

Students will do homework problems at the end of the relevant chapters. Here is a past example:

Homework 2

From chapter 3:

3.8 The average person has 1.4m^2 of skin at a temperature of ~ 306 K (92^{o}F). Consider the average person to be an ideal radiator standing in a room at a temperature of 293 K (68^{o}F).

a) Calculate the energy per second radiated by the average person in the form of BB radiation, in watts.

b) Determine the peak wavelength λ_{max} of the BB radiation emitted by the average person. In what region of the EM spectrum is this wavelength found?

c) A BB also absorbs energy from its environment, in this case from the 293 K room. The equation describing the absorption is the same as the equation describing the emission of BB radiation, Eq (3.16). Calculate the energy per second absorbed by the average person, in watts.

d) Calculate the net energy per second lost by the average person via BB radiation.

3.9 Consider a model of the Dschubba (δ Sco), which the center star in the head of Scorpius. Assume that Dschubba is a spherical BB with a surface temperature of 28,000 K and a radius of 5.16 x 10^9 m. Dschubba is 123 pc from Earth. Determine the following:

a) Luminosity
b) Absolute bolometric magnitude
c) Apparent bolometric magnitude
d) Distance modulus
e) Radiant flux at the star's surface
f) Radiant flux at Earth's surface and compare this with the solar constant.
g) Peak wavelength λ_{max}

Reading Assignments:

Students would read chapters and sections relevant to the material. An example:

Chapter 7 Binary Systems and Stellar Parameters - Section 7.1 The Classification of Binary Stars, Section 7.2 Mass Determination Using Visual Binaries.

Chapter 15 The Fate of Massive Stars - Section 15.1 Post-Main-Sequence-Evolution of Massive Stars, Section 15.2 The Classification of Supernovae

9. **REPRESENTATIVE METHODS OF EVALUATION**

Representative methods of evaluation may include:

A. Exams/Tests
B. Homework
C. Quizzes
D. Research Projects

10. **REPRESENTATIVE TEXT(S):**

Possible textbooks include:

A. Carroll, B. W., and Ostlie, D. A.. *An Introduction to Modern Astrophysics*, 2 ed. .: Pearson, 2007

Possible periodicals include:

A. . *Astrophysical Journal*, Astrophysical Journal Volume 2015

Origination Date: January 2015
Curriculum Committee Approval Date: November 2015
Effective Term: Fall 2016
Course Originator: Darryl Stanford