



One College Drive, Blythe CA 92225  
(760) 921-5500

Course Control Number: CCC000179250		
Course Outline Approval Dates		
Modality	Curriculum Committee	Board of Trustees
Face-to-face		
Correspondence Ed.	4/11/19	5/14/19
Distance Ed.		

### COURSE OUTLINE OF RECORD

#### Course Information

Course Initiator: Alejandro Garcia and Nidhi R. Patel, PhD			
CB01 - Subject and Course #: AST 110			
CB02 - Course Title: Astronomy: Beyond the Solar System			
New Course: <input type="checkbox"/>		Non-Substantial: <input checked="" type="checkbox"/>	
		Substantial: <input type="checkbox"/>	
Articulation Request: <input checked="" type="checkbox"/> UC		<input checked="" type="checkbox"/> CSU	
		<input checked="" type="checkbox"/> CSU-GE	
		<input checked="" type="checkbox"/> IGETC	
Lecture Hours: 54		Laboratory Hours: 54	
		Clinical/Field Hours:	
CB06/CB07: Course Units: 4.0			
Prerequisites:			
Co-requisites:			
Advisories: Completion of MAT 095 or appropriate placement. In addition, completion of ENG 099 Basic Composition or placement in ENG 100 or ENG 101 based on AB 705 mandates.			
CB03 - TOP Code:		1911.00 - Astronomy	
CB04 - Credit Status:		D - Credit - Degree Applicable	
CB05 - Transfer Status:		A - Transferable to both UC and CSU	
CB08 - Basic Skills Status:		N - Course is not a basic skills course	
CB09 - SAM Priority Code:		E - Non-Occupational	
CB10 - Cooperative Work:		N - Is not part of Cooperative Work Experience Education Program	
CB11 - Course Classification:		Y - Credit Course	
CB13 - Approved Special:		N - Course is not a special class	
CB21 - Prior Transfer Level:		Y - Not Applicable	
CB22 - Noncredit Category:		Y - Credit Course	
CB23 - Funding Agency:		Y - Not Applicable	
CB24- Program Status:		1 - Program Applicable	
Transfer Request:		A= UC and CSU	

Please select the appropriate box(s) of the modalities in which this course will be offered, and fill out the appropriate sections for that mode.

- Face-to-Face – Section B
- Correspondence Education – Section C
- Distance Education – Section D

## **JUSTIFICATION OF NEED:**

This class is independent of AST 105 but it is recommended that it be taken after completion of AST 105. AST 110 meets IGETC 5A, 5C and CSU-GE B1, B3. AST 105 deals with the Solar System. AST 110 goes beyond the Solar System, so without this course the view of astronomy is incomplete. It presents new technologies and frontier discoveries, which are indispensable for observation. It focuses on the scientific principles upon which astronomy is based and the process used in discovery. All of this provides the student with the basics of science to lay groundwork for future studies in science.

## **CATALOG DESCRIPTION:**

Although the course is a continuation AST 105, it contains a review so that it can be taken independently. This course looks beyond the solar and examines the formation and evolution of neutron stars and black holes, the Milky Way, active galaxies, quasars, cosmology, the evolution of the universe and the possibility of intelligent life in our galaxy.

## **COURSE OBJECTIVES:**

The purpose of this course is to:

1. Explain the motions of the stars through space and how these motions are measured from Earth.
2. Explain how physical laws are used to estimate stellar sizes.
3. Improve students' understanding of the composition and physical properties of the interstellar medium.
4. Prepare students to analyze some of the observational evidence supporting the modern theory of star formation.
5. Acquaint students with the stages in the death of a typical low-mass star and describe the resulting remnant.
6. Explain the two types of supernovae, and explain how each is produced.
7. Improve students' understanding of how the universe continually recycles matter through stars and the interstellar medium.
8. Explain the properties of neutron stars and explain how these objects are formed.
9. Explain the nature and origin of pulsars and account for their characteristic radiation.
10. Acquaint students with the overall structure of the Milky Way Galaxy and enumerate the differences between the various regions.
11. Improve students' understanding of the basic properties of the main types of normal galaxies.
12. Explain the basic differences between active and normal galaxies.
13. Describe the place of pulsars and active galaxies in current theories of galactic evolution.
14. Explain how the age of the universe is determined and discuss the uncertainties involved.
15. Explain how matter emerged from the primeval fireball.
16. Discuss some of the techniques we might use to search for extraterrestrials and to communicate with them.

## **STUDENT LEARNING OUTCOMES:**

Upon successful completion of the course the student will be able to:

1. Describe the overall structure of the Milky Way Galaxy and enumerate the differences between the various regions.
2. Evaluate the chances of finding life elsewhere in the solar system.
3. Explain how stellar distances are determined.

## **A. COURSE OUTLINE AND SCOPE**

### **1. Outline of topics or content:**

1. Measuring the stars: Distances to the stars; stellar motion; luminosity and apparent brightness; stellar temperatures; stellar sizes
2. Interstellar medium: Interstellar matter; emission nebulae; dark dust clouds
3. Star formation: Star-forming regions; formation of stars like the sun; stars of other masses; shock waves and star formation
4. Stellar evolution: Leaving the main sequence; evolution of a sun-like star; death of a low-mass star; evolution of stars more massive than the sun
5. Stellar explosions: The end of a high-mass star; supernova explosions; cycle of stellar evolution
6. Neutron stars and black holes: Neutron stars; pulsars; neutron-star binaries; gamma-ray bursts; black holes
7. The Milky Way Galaxy: Our parent galaxy; measuring the Milky Way; large-scale structure of our galaxy; formation of the Milky Way; the mass of the Milky Way Galaxy
8. Normal galaxies: Hubble's galaxy classification; distribution of galaxies in space; galaxy masses
9. Active galaxies and quasars: Beyond the local realm; properties of active galaxies; quasi-stellar objects; quasars as cosmic probes; active galaxy evolution

10. Cosmology: The universe and the largest scales; the expanding universe; the fate of the universe; will the universe expand forever?

11. The early universe: Back to the big bang; the evolution of the universe; the formation of nuclei and atoms; the inflationary universe; the formation and structure in the universe

12. Life in the universe: Cosmic evolution; life in the solar system; intelligent life in the galaxy; the search for extraterrestrial life.

**2. If a course contains laboratory or clinical/field hours, list examples of activities or topics:**

As part of this course, students will be provided with lab work to be completed individually or as a cooperative group. Selected activities from Learning Astronomy by Doing Astronomy: Collaborative Lecture Activities by Palen and Larson will be provided to proctors. The project will be graded individually or as a cooperative group.

Make a model of the Milky Way Galaxy.

Simulate Bent Space using a cloth, a stone, and marbles.

Make models or drawings of the different types of galaxies: spiral, elliptical, and irregular.

**3. Examples of reading assignments:**

Use the text, library, internet, and astronomy magazines to augment the course. Examples would be the book BigBang by Simon Singh, read about the 'Great Debate' between Harlow Shapley and Heber Curtis concerning the size of the Milky Way galaxy. Read about the observations of the solar eclipse that led to verifying the General Theory of Relativity.

**4. Examples of writing assignments:**

In own words, write a whole page essay about the Great Debate you read about (see 3 above).

In own words, write a whole page essay about the observations of the solar eclipse that led to verifying the General Theory of Relativity.

**5. Appropriate assignments to be completed outside of class:**

**6. Appropriate assignments that demonstrate critical thinking:**

Do you think that the Big Bang Theory settles for good the question about the origin of the Universe?

Give your opinion about the latest unmanned mission to Mars. Will questions of extraterrestrial life be finally answered? Will more missions be necessary—perhaps manned ones?

**7. Other assignments (if applicable):**

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Check if Section B is not applicable

**B. FACE-TO-FACE COURSE SECTIONS:**

**Face-to-face education**

Is a mode of delivery in which instruction is delivered in a traditional classroom setting, with instructor and students located simultaneously in the same classroom facility.

**1. Describe the methods of instruction:**

**2. Describe the methods of evaluating of student performance.**

**3. Describe how the confidentiality of the student's work and grades will be maintained.**

**4. If the course has a lab component, describe how lab work is to be conducted and how student work is to be evaluated.**

NOTE: Students will be encouraged by instructors of this course to direct themselves to the College's Disabled Students' Programs and Services (DSP&S) department if they believe they have a learning disability.

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Check if Section C is not applicable

**C. CORRESPONDENCE EDUCATION COURSE SECTIONS (Correspondence, hybrid correspondence)**

**Correspondence education**

is a mode of delivery in which instructional materials are delivered by mail, courier or electronic transmission to students who are separated from the instructor by distance. Contact between instructor and students is asynchronous.

**Hybrid correspondence education**

is the combination of correspondence and face-to-face interaction between instructor and student.

**1. Describe the methods of instruction.**

The instructor will assign work such as essays, tests, and projects. The student will turn in the work, the instructor will review it and send it back with the appropriate corrections. The student must check his mistakes and send it back to the instructor. The process will continue until the instructor is convinced that the student completely understands the material.

**2. Describe the methods of evaluating student performance.**

A test is given every two or three chapters of the text, for a total of about 5 tests. The tests include multiple choice, fill-in-the-blanks, and short descriptive essays.

### **3. Describe how regular, effective contact between the instructor and a student is maintained.**

Regular, effective contact includes, but is not limited to, exams; quizzes; research papers; graded homework assignments; syllabus receipt; e-mails, letters, notes, phone calls, or postings on the Bridge between instructor and student.

### **4. Describe procedures that help verify the individual submitting class work is the same individual enrolled in the course section.**

Consistent with policy elements listed in the ACCJC's "Policy on Distance Education and on Correspondence Education," the College verifies the identity of a student who participates in class or coursework by using, at the College's discretion, such methods as a secure log-in and password, proctored examinations, or other technologies or practices that are developed and effective in verifying each student's identification.

### **5. Describe procedures that evaluate the readiness of a student to succeed in a correspondence or hybrid correspondence course section.**

The procedure might consist of a short assessment questionnaire prepared by the instructor and self-administered by the student. The questionnaire would evaluate areas such as working independently, adhering to timelines, and familiarity with working online and with computer technology. The student would use the resulting score to evaluate his or her readiness to take the course in a correspondence or hybrid correspondence instructional mode.

### **6. Describe how the confidentiality of the student's work and grades will be maintained.**

Instructors shall make reasonable efforts to protect the confidentiality of students' grades and graded work consistent with practices described in the Family Education Rights and Privacy Act (FERPA).

### **7. If the course has a lab component, describe how lab work is to be conducted and how student work is to be evaluated.**

As part of this course, students will be provided with lab work to be completed individually or as a cooperative group. If proctors are necessary, they will distribute the lab work and be in charge of monitoring the activity. Selected activities from Learning Astronomy by Doing Astronomy: Collaborative Lecture Activities by Palen and Larson will be provided to proctors. The project will be graded individually or as a cooperative group.

### **8. If the course requires specialized equipment, including computer and computer software or other equipment, identify the equipment, and describe how it is to be accessed by students.**

This course does not require specialized equipment.

Note: Students will be encouraged by instructors of this course to direct themselves to the College's Disabled Students' Programs and Services (DSP&S) department if they believe they have a learning disability.

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Check if Section D is not applicable

## **D. DISTANCE EDUCATION COURSE SECTIONS (online, ITV, hybrid)**

### **Online education**

is a mode of delivery in which all instruction occurs online via the Internet. Student and instructor access to email and the Internet is required. Students are required to complete class work using

email, chat rooms, discussion boards and other instructional online venues.

**Interactive television (ITV)**

is a mode of synchronous delivery in which instruction occurs via interactive television (closed circuit).

**Hybrid instruction**

is a combination of face-to-face instruction and online instruction.

**1. Describe the methods of instruction.**

**2. Describe the methods of evaluating of student performance.**

**3. Describe how regular, effective contact between the instructor and a student is maintained.**

**4. Describe procedures that help verify the individual submitting class work is the same individual enrolled in the course section.**

**5. Describe procedures that evaluate the readiness of a student to succeed in an online, ITV or hybrid course section.**

**6. Describe how the confidentiality of the student's work and grades will be maintained.**

**7. If the course has a lab component, describe how lab work is to be conducted and how student work is to be evaluated.**

**8. If the course requires specialized equipment, including computer and computer software or other equipment, identify the equipment, and describe how it is to be accessed by students.**

Note: Students will be encouraged by instructors of this course to direct themselves to the College's Disabled Students' Programs and Services (DSP&S) department if they believe they have a learning disability.

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**E. REPRESENTATIVE TEXTBOOKS AND OTHER READING AND STUDY MATERIALS:**

**List author, title, and current publication date of all representative materials.**

TEXT;

ASTRONOMY TODAY, Chaisson & McMillan, Pearson, 8th Edition, 2013 (or most recent edition)

LABORATORY:

Learning Astronomy by Doing ASTRONOMY (Collaborative Lecture activities), Stacy Palen & Ana M. Larsen, 2015 (or most recent edition)

**SIGNATURES**

**COURSE INITIATOR:** \_\_\_\_\_

**DATE:** \_\_\_\_\_

**DIVISION CHAIR:** \_\_\_\_\_

**DATE:** \_\_\_\_\_

**LIBRARY:** \_\_\_\_\_

**DATE:** \_\_\_\_\_

**CHAIR OF CURRICULUM COMMITTEE:** \_\_\_\_\_

**DATE:** \_\_\_\_\_

**SUPERINTENDENT/PRESIDENT:** \_\_\_\_\_

**DATE:** \_\_\_\_\_