Mt. San Jacinto College
Integrated Course Outline of Record

Form B

Submitted by: Mark Maier **Date:** 10/08/2020

Department	Subject	Course Number	Title
Astronomy	Astronomy ASTR	111	Planetary Astronomy
Geology	Geology GEOL	111	Planetary Astronomy

Units/Hours

Each lecture unit requires 1 hour per week of class time, and 2 hours per week of study outside of class.
Each laboratory unit requires 3 hours per week of class time.
Each activity unit requires 2 hours per week of class time and 1 hour per week of study outside of class.

Lecture Units	Total Units
3.00	3.00

Lecture Contact Hours	Total Contact Hours
48.00 - 54.00	48.00 - 54.00

Lecture Homework Hours

96.00 - 108.00

Stand Alone:

Program Applicable

AA/AS Degree General Ed Breadth Area(s):

A NATURAL AND PHYSICAL SCIENCES

General Education Justification:

This course examines complex issues such as planetary tectonics in relationship to solar system formation, and discovers the connections and correlations among ideas in Earth and Planetary sciences (GELO1). In the class students will analyze and evaluate alternative points of view concerning planetary formation and accurately interpret evidence, JPL news statements, graphics, satellite data, questions etc. (GELO3). Students are required to apply their theoretical knowledge and skills to real-world Astronomy and Geology exposures and situations (GELO5).

Maximum Enrollment: 40

Maximum Enrollment Justification:

Justification:

Grading Method: Letter Grade or P/NP

TOP code: 1911.00

Can be Taken 1 **time(s) for credit** (max 4)

- Visual or Performing Arts course that is required to meet major requirements for UC/CSU
- Intercollegiate athletics course
- Academic/vocational competition course

Catalog Description:

(Please do not refer to transferability or degree, certificate, or employment concentration applicability. Please only describe the course).
(**75 words** or less in gray box below).

This course is an introductory course to Planetary Sciences and is an interdisciplinary scientific exploration of the solar system. Students will use the scientific method to examine properties and processes of solar system function and formation including the current hypotheses regarding the creation and evolution of the Earth and planetary bodies (moons, asteroids, comets, meteors, and the Sun).

Schedule Description:

(Please do not refer to transferability or degree, certificate, or employment concentration applicability. Please only describe the course).
(**25 words** or less in gray box below).

This course is a multidisciplinary exploration of our solar system (planets, asteroids, comets etc.)including its origin, formation and evolution.

Need for the course:

This course is meant to provide an in-depth understanding of the physical properties, processes and interpretation of the planetary system for students interested in fulfilling their science breadth requirement, whether transferring to a UC or CS University or for those with professional or personal interest. This course meets a need in the curriculum that no other course fulfills, while complementing and tying together studies in the Physical Sciences on the forefront of mankindâ€™s quest for knowledge (Astronomy, Geology, and Physics), and provides a better understanding of the expanding research, development, and future prospects in these areas. It satisfies General Education Requirements for California State Universities and Colleges Transfer Plan Areas B1, IGETC Area 5, and MSJC AA/AS Area A.

Prerequisite(s):

Prerequisites go through a separate approval process. See Forms E1-E6 for details.
(For further clarification, contact the Prerequisite Subcommittee)

-none-

Corequisite(s):

Corequisites go through a separate approval process. See Forms E1-E6 for details.

-none-

Recommend Preparation:

Recommended Preparation goes through a separate approval process. See Forms E1-E6 for details.

-none-

Other Enrollment Criteria:

-none-

Learning Objectives:

(please number each objective and express in behavioral terms)

Upon the completion of the course the student will be able to do the following:

1. Discover the basic physical and chemical concepts and components of the standard disciplines of Geology and Astronomy, which come together in current planetary studies.
2. Value the ways in which our own models for the origin and evolution of the solar system explain characteristics of newly discovered systems.
3. Compare and contrast current evidence and discoveries of solid surfaces as well as atmospheric phenomena on Earth to enrich perspectives on other worlds.
4. Compare the active geological evolution occurring on Earth and on other worlds with their own unique landscapes, rings and moons.
5. Interpret recent and close-up views of the simplest, most primitive solids: comets, asteroids and meteors.
6. Describe more complex processes forming and continuing to influence members of our own and other planetary systems.
7. Appraise discoveries which are stimulating new ways of thought in the sciences of Geology and Astronomy involved in space exploration.
8. Consider a complete and balanced yet ever changing picture of the interpretations of new discoveries and the relationship between science and society.
9. Appraise new perspectives on our own place in the universe.

Course Content:

(please number the outline of main topics and subtopics)

A. Introduction to the history of astronomy:
   1. The sun, Moon, and stars.
   2. Kepler's laws.
   3. Introduction to Newton and the laws of gravity.

B. Building blocks of stars including:
   1. Atoms, isotopes, energy.
   2. Composition and history of the sun.
   3. Past and present solar activity.

C. Chemistry and property of the planets:
   1. Mass, size and density of planets.
   2. Classification of rocks.
   3. Planetary atmospheres.
   4. Study of matter from a distance.

D. Classification of meteorites:
   1. Age of meteorites and other rocks.
   2. Primitive meteorites.
   3. Differentiated meteorites.
   4. Radioactive age dating.

E. Discovery and understanding of asteroids:
   1. Main ballet of asteroids.
   2. Close-Up understanding of asteroids.
   3. Important asteroid impacts of the past.
   4. Defending the earth against asteroids.

F. Origin and evolution of comets:
   1. History of comet's.
   2. The comet's atmosphere.
   3. The comet's nucleus and dust.

G. The surface of the Moon:
   1. Apollo expeditions.

2. Impact cratering.
3. Lunar volcanism.

H. Mercury and the earth's Moon:

1. tides and rotation.
2. Interiors of the Moon and Mercury.
3. Collision origins of the Moon and Mercury.

I. Interior and surface of the Earth:

1. The Earth's interior.
2. Plate tectonics.
3. Ocean and atmosphere.
4. Climate and weather.

J. Atmosphere and surface of Venus:

1. Venetian atmosphere and the greenhouse effect.
2. Craters and tectonics.
3. Volcanoes and planets-scale convulsions.
4. Searing surface.

K. Global perspectives of Mars:

1. Volcanoes and tectonics features.
2. Martian channels.
3. The polar regions.
4. Atmosphere, water, and ice.

L. The search for solar system life:

1. Stanley Miller and amino acids, polymers, and DNA.
2. Evolution of earth and life.
3. The search for life on Mars.

M. Jupiter and Saturn, the outer gas planets:

1. Internal fluid structure.
2. Atmospheric composition and structure.
3. Weather and climate.
4. Clouds, color, and chemistry.

N. The outer planets:

1. Atmospheres of Uranus and Neptune.
2. Pluto and its Moon.

O. Larger moons and satellites:

1. The icy moons of Callisto and Ganymede.
2. Europa, the Moon with an ocean.
3. Io, the volcanic Moon.
4. Titan, the atmospheric Moon.
5. Triton, Neptune's Maverick Moon.

P. Small satellites and planetary rings:

1. The bright rings of Saturn.
2. The narrow dark rings of Uranus and Neptune.
3. Stability of rings and satellite systems.
4. The origin of rings and small satellites.

Q. The origin of the planetary system:

1. Birth and life of a star.
2. The problem with angular momentum.
3. Evolution of a disk; condensation, accretion, and dissipation.
4. Terrestrial planets and the importance of impacts.
5. Giant planets and their rings and moons.

Methods of Instruction:

Methods of instruction may include, but are not limited to the following:

- **Method:** Lecture
  Integration: Class lecture with PowerPoint and whiteboard illustrations on chapter-assigned topics. The whiteboard illustrations work well to show the internal and external dynamics of the Earth for example, as well as other planets and astral bodies such as asteroids, comets, and meteors.
- **Method:** Outline Worksheet
  Integration: Distribution of outline worksheet for class lectures, to be filled in by the student during class discussion. The topics are listed on the worksheets helping the students to better correlate the lecture and textbook data. For example the simplest, most primitive solids (comets, asteroids and meteors) can be correlated with the geological evolution occurring on Earth and on other worlds with their own unique landscapes, rings and moons.
- **Method:** Discussion
  Integration: Daily instructor-guided analysis and classroom participation in discussion of chapter and course content to help students assess and interpret daily learning experiences. For example students will be assisted with assessing more complex processes that form and continue to influence members of our own and other planetary systems.
- **Method:** Multi-Media
  Integration: Videos, films, slides, Power-Point presentations including charts and graphs, and geological maps presented in class as audio/visual aids used to discuss and summarize the physical properties, processes and systems.
- **Method:** Field Trips
  Integration: Field Trip(s) for supplemental understanding will be at instructorsâ€™ discretion. Field trips can range from trips to a planetarium where models for the origin and evolution of the solar system can be displayed to trips to the Palomar Observatory where an understanding of new discoveries can be gleaned as well as gaining a perspective of our own place in the universe.

Methods of Evaluation:

A student's grade shall be determined by the instructor using multiple measures of performance related to the course objectives. Methods of evaluation may include but are not limited to the following:

- **Method:** Written examinations
  Integration: Written examinations in mixed format that includes multiple-choice, true/false, fill-in-the-blanks, and short answer questions. Examination questions test both the studentsâ€™ knowledge of subjects dealing with the physical nature of the solar system and their ability to analyze and evaluate selected topics.
- **Method:** Short paper
  Integration: Short answer papers written in a concise format addressing directed questions. The papers will express a synthesis of information obtained from lectures, the textbook, videos, graphs, etc. The papers can range from having students discuss the ways in which our own models for the origin and evolution of the solar system explain characteristics of newly discovered systems, to describing more complex processes forming and continuing to influence members of our own and other planetary systems.
- **Method:** Research paper
  Integration: Multiple page research paper including abstract, literature review, discussion/conclusions, and references in scientific citation style on pertinent topics such as analyzing the active geological evolution occurring on Earth and on other worlds or associating changes in the atmosphere in correlation with planet evolution. Grade for paper will be on content, the proper use of standard academic English skills, and the proper use of scientific citation style.
- **Method:** Projects
  Integration: Projects, notebooks, and presentations as deemed appropriate by the instructor. For example, a presentation on recognizing new perspectives concerning planetary astronomy and geology on our own place in the universe. Grade for projects, notebooks, and presentations will be based on content, proper use of standard academic English, and proper use of scientific citation style (citations only when applicable).

Examples of Assignments:

Students will be expected to understand and critique college level texts or the equivalent. Reading and writing, as well as out of class assignments are required. These assignments may include but are not limited to the following:

1. On one page, describe the various types of Martian landforms that seem to be the result of flowing water. What are similar features found on Earth, and what are the estimated age differences of those features on both planets? What does this indicate about the past climate differences on Mars?
2. Ascertain the information needed to answer the following: How fast must a molecule of SO_2 travel to escape from the gravitational field of Io? Compare this to the velocity required for a molecule of H_2O. How do you then explain the absence of H_2O and the presence of SO_2 on Io?
3. Distinguish among comets, main belt asteroids and near-Earth asteroids in terms of their orbits and their physical and chemical properties.
4. Describe in detail the competing processes of accretion and fragmentation in the solar nebulae.

Textbooks:

- Jeffrey Bennett (2019). *The Solar System* Pearson. ISBN: 0134990773
- Elizabeth Tasker (2017). *The Planet Factory* Bloomsbury. ISBN: 978-1-4729-1772-0

Other Resources:

- S. Palen and A. Larson. 3. Learning Astronomy by Doing Astronomy . Pearson , 06-01-2020.

Minimum Qualification

- Astronomy (Masters Required) **or**
- Earth Science (Masters Required)