# University of Houston-Downtown

**Course Prefix, Number, and Title:** PHYS 1301: Introduction to Solar System Astronomy

**Credits/Lecture/Lab Hours:** 3/2/2

**Foundational Component Area:** Life and Physical Sciences

**Prerequisites:** Credit or enrollment in MATH 1301 or MATH 1310
**Co-requisites:** None

**Course Description:** An integrated lecture/laboratory course for non- science majors. This course surveys the history of astronomy, its technologies and physical principles, the solar system and its origins. Recent discoveries and the competing theories to interpret them are discussed, as are interactions between astronomy and society such as technology sin-offs and light pollution. Students are introduced to scientific measurement and error. Indoor and outdoor experiments are integrated into the course, including the use of telescopes and photography of the moon. Recent data provided by NASA and other agencies are introduced. Up to three evening observing sessions are required for this course.

**TCCNS Number:** N/A

**Demonstration of Core Objectives within the Course:**

| Assigned Core Objective | Learning Outcome Students will be able to: | Instructional strategy or content used to achieve the outcome | Method by which students' mastery of this outcome will be evaluated |
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| Critical Thinking<br><br>Empirical & Quantitative Reasoning | Utilize scientific processes to identify questions pertaining to natural phenomena. | Cause of the Earth's Seasons – students will form and test hypotheses concerning the cause of the Earth's season's.<br><br>Comparison of the Earth and Moon – students will form and test hypotheses as to how the Earth and Moon turned out so different from each other<br><br>Contrast between the Planets in the Inner and Outer Solar System – students will form and test hypotheses about the differences between planets and moons in the inner and outer system. | Students will work in small groups to assess the various factors contributing to variations in solar heating of the Earth's surface. They will then construct hypotheses as to which factors are important in seasonal temperature variations. Competence on this activity will be demonstrated on a graded worksheet and reinforced through written examinations.<br><br>Working in small groups, students will contrast the level of geologic activity occurring on (and in) the |

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| | | | Earth and the Earth's Moon and construct hypotheses for the differences between the two planetary bodies. They will then apply their results to make predictions about the general level of geologic activity found on other planetary bodies and what criteria are the most important to evaluate. Competence on this activity will be demonstrated on a graded worksheet and reinforced through written examinations.<br><br>Working in small groups, students will contrast the properties of the planets and moons in the inner and outer solar system and construct hypotheses for the differences between the two regions of the solar system. Competence on this activity will be demonstrated on a graded worksheet and reinforced through written examinations. |
| Critical Thinking<br><br>Empirical & Quantitative Reasoning | Utilize scientific processes to develop hypotheses, collect and analyze data using quantitative and qualitative measures. | Utilize scientific processes to develop hypotheses, collect and analyze data using quantitative and qualitative measures. | Observing Retrograde Motion – students will evaluate data on the observed positions of planets. Using this plotted data, the students will describe the motion of the planet at different timescales. This is a key set of observations used to evaluate the competing hypotheses for the layout of the Universe as i was debated during the European Renaissance and wi be used as part of a later exercise on the evaluation of |

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| | | | these competing hypotheses.<br><br>Cause of the Earth's Seasons – students will form and test hypotheses concerning the cause of the Earth's season's.<br><br>Comparison of the Earth and Moon – students will form and test hypotheses as to how the Earth and Moon turned out so different from each other |
| Critical Thinking<br><br>Empirical & Quantitative Reasoning<br><br>Communication | Utilize scientific processes to effectively communicate the analysis and results using written, oral and visual communication. | The Copernicus / Aristotle Debate – students will examine evidence on the competing hypotheses for the layout of the Universe as it was debated during the European Renaissance.<br><br>Planetary Data Analysis – students will evaluate data from spacecraft observations and present their findings to the class.<br><br>Lab Reports – written lab reports | Working in teams, students will analyze the arguments for the competing hypotheses for the layout of the Universe (now understood to be the solar system), utilizing work from previous lab exercises, lectures and assigned reading. The teams will present the arguments in an oral debate format. Students will be given participation points if they are actively engaged in the debate.<br><br>Working in teams, students will analyze photographic and other data from spacecraft missions to several different planets (one planet per team). Each team will communicate their findings to the class in an oral presentation with visual component. The oral presentation will be evaluated on both scientific and communication quality using a rubric.<br><br>Students will turn in written |

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| | | | reports for all lab exercises, including the examples given in previous sections and graded according to a rubric. |
| Teamwork | Collaborate in the evaluation of the quality of scientific evidence from multiple perspectives toward the goal of reaching a shared objective. | The Copernicus / Aristotle Debate – students will examine evidence on the competing hypotheses for the layout of the Universe as it was debated during the European Renaissance.<br><br>Planetary Data Analysis – students will evaluate data from spacecraft observations and present their findings to the class. | Working in teams, students will analyze the arguments for the competing hypotheses for the layout of the Universe (now understood to be the solar system), utilizing work from previous lab exercises, lectures and assigned reading. The teams will present the arguments in an oral debate format. Students will be given participation points if they are actively engaged in the debate.<br><br>Working in teams, students will analyze photographic and other data from spacecraft missions to several different planets (one planet per team). Each team will communicate their findings to the class in an oral presentation. The oral presentation |

**Additional Course Outcomes:**

Students will be able to:

- Understand the scientific method and the use of observational evidence in constructing and testing scientific models
- Appreciate the historical development of astronomy and the discoveries and controversies which lead to the modern view of the solar system and the position of the Earth and humanity within the Universe
- Discuss the evidence for the modern theories of the origin of the solar system
- Give an account of the role of comets, meteorites and asteroids in shaping the surfaces of the of the planets
- Compare the mechanisms of surface erosion on the terrestrial planets and outer-planet moons
- Compare the interior structures and compositions of the planets

**Course Outline:**

- The Layout of the Solar System
- The Night Sky
- The Ancient View of the Universe
- The Copernican Revolution
- Motions of the Earth and Moon
- Planet Earth
- The Moon
- Impact Cratering/Mercury
- Venus
- Exploring Mars
- Jupiter King of the Planets
- Saturn and Titan
- Uranus & Neptune
- Asteroids, Comets, Meteorites and the Kuiper Belt
- The Origin and Evolution of the Solar System

**Grading/Course Content which Demonstrates Student Achievement of Core Objectives:**

***Course Grade*** ***A: 90-100*** ***B: 80-89*** ***C: 70-79*** ***D: 60-69*** ***F: 0-59***

| **Summary of Course Exams, Quizzes, Activities, and Final** | |
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| Exams given during the semester including the final | 75% |
| Online homework assignments and in-class exercises | 20% |
| Oral Presentation | 5% |