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2021

### AST 101: Introductory Astronomy

CUNY School of Professional Studies

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# CUNY School of Professional Studies

## **AST 101: INTRODUCTORY ASTRONOMY**

General Education

Required Core C Life and Physical Sciences

No pre- or co-requisites

### **COURSE DESCRIPTION**

An exploration of our solar system's creation and the planets in our solar system using the latest scientific information, recent probe data, and new discoveries in the science of extra-solar planetary astronomy. *This course is based in part upon materials developed by the American Museum of Natural History and is used with permission by the School of Professional Studies for this course.*

### **REQUIRED COMMON CORE AREA LEARNING OUTCOMES: C. LIFE AND PHYSICAL SCIENCES**

Students will:

1. Identify and apply the fundamental concepts and methods of a life or physical science.
2. Apply the scientific method to explore natural phenomena, including hypothesis development, observation, experimentation, measurement, data analysis, and data presentation.
3. Use the tools of a scientific discipline to carry out collaborative laboratory investigations.
4. Gather, analyze, and interpret data and present it in an effective written laboratory or fieldwork report.
5. Identify and apply research ethics and unbiased assessment in gathering and reporting scientific data.

*This course will address Learning Outcomes 1, 2, 3, 4, 5*

### **DISCIPLINE-SPECIFIC LEARNING OBJECTIVES**

Students will:

1. Explain the differences between the terrestrial and jovian planets, and of how those differences came to be.
2. Demonstrate knowledge of the current best scientific explanation of the origin and evolution of the solar system.
3. Use simple astronomical observations of the night sky to measure the properties of celestial objects, and use that data to produce charts and graphs and solve problems.
4. Identify the basic laws of physics that pertain to the study of the bodies of the solar system.
5. Summarize recent discoveries about solar system bodies and extra-solar planetary systems.

## REQUIRED TEXTS AND SOFTWARE

This is a Zero Textbook Cost (ZTC) course. The required textbook, and all required readings will be provided free of charge through the course site.

Fraknoi, Andrew, David Morrison and Sidney Wolff eds. *Astronomy*. [Download for free](#).

Required software: Stellarium Software, [download for free](#).

## ASSIGNMENTS AND GRADING

<u>ASSIGNMENTS</u>	<u>Percent</u>	<u>Points</u>
Discussion Board (5)	20%	40 each
Lab Assignments (3)	20%	50, 70, 80
Chapter Assignment Problem Sets (10)	20%	20 each
Quizzes (5)	20%	40 each
Final Lab (Partners) Project	20%	100 each
<b>Totals:</b>	<b>100%</b>	<b>1000 points</b>

## GRADING DISTRIBUTION

A	93-100
A-	90-92.9
B+	87-89.9
B	83-86.9
B-	80-82.9
C+	77-79.9
C	73-76.9
C-	70-72.9
D	60-69.9
F	Below 60

## ASSIGNMENTS

### Discussion Board 20%

Five discussion board forums during the semester will provide students with an opportunity to apply concepts that they are learning to the world around them. Topics are drawn directly from the reading materials and highlight fundamental concepts and methods of astronomy. Students will be graded on the quality of their own responses to the initial discussion prompt and to their responses (minimum of two per week) to their classmates' posts. *Discussion Boards assess Required Core LO C1.*

### Lab Assignments 20%

Students will complete lab activities on their own using Stellarium open source desktop planetarium

software. Stellarium allows students to explore the night sky at will, engaging in the investigation of celestial motion from the convenience of their own computer. *Labs assess LOs Required Core C1, C2, C3, C4*

**Chapter Assignment Problem Sets** 20%

Problem Sets prompt students to reconsider some of the material just presented and to test their mastery of key concepts. *Problem sets assess all Required Core C LOs.*

**Quizzes** 20%

Quizzes assess mastery of material in the textbook and on the course website. *Quizzes address all Required Core C LOs*

**Final Project** 20%

Students will form pair groupings and work on creating two complete, science lab reports on two topics chosen by the professor. *Final Project address Los Required Core C1, C3, C4, C5*

## **ACCESSIBILITY AND ACCOMMODATIONS**

The CUNY School of Professional Studies is firmly committed to making higher education accessible to students with disabilities by removing architectural barriers and providing programs and support services necessary for them to benefit from the instruction and resources of the University. Early planning is essential for many of the resources and accommodations provided. For more information, please see: [Disability Services on the CUNY SPS Website](#).

## **ONLINE ETIQUETTE AND ANTI-HARASSMENT POLICY**

The University strictly prohibits the use of University online resources or facilities, including Blackboard, for the purpose of harassment of any individual or for the posting of any material that is scandalous, libelous, offensive or otherwise against the University's policies. Please see: "[Netiquette in an Online Academic Setting: A Guide for CUNY School of Professional Studies Students.](#)"

## **ACADEMIC INTEGRITY**

Academic dishonesty is unacceptable and will not be tolerated. Cheating, forgery, plagiarism and collusion in dishonest acts undermine the educational mission of the City University of New York and the students' personal and intellectual growth. Please see: [Academic Integrity on the CUNY SPS Website](#).

## **TUTORING**

CUNY SPS offers all students a variety of tutoring services, free of charge, both online and in person. Please see: [Tutoring](#).

## **HELP DESK**

For assistance with access to CUNY SPS and CUNY computing resources, please see the [Help Desk](#) website for contact details and semester hours.

## **STUDENT SUPPORT SERVICES**

If you need any additional help, please visit [Student Support Services](#)

**COURSE SCHEDULE**

Week	Unit Topic	Assignments	Required Core Learning Outcomes
1	Course Introduction Science and the Universe	<ul style="list-style-type: none"> <li><input type="checkbox"/> Objective: To assess knowledge of how gravity allows for orbital motions and how Earth’s rotation, and axis shifts affect the seasons. Show how the relative motions of Earth, Sun and the Moon lead to eclipses.</li> <li><input type="checkbox"/> Post Welcome on Discussion Board</li> <li><input type="checkbox"/> Read Week One Lecture Material “The System as a Whole”</li> <li><input type="checkbox"/> Textbook reading: Chapters 1 + 4</li> <li><input type="checkbox"/> Problem set</li> <li><input type="checkbox"/> Acquire text and <a href="#">Stellarium Lab</a> software</li> <li><input type="checkbox"/> Stellarium Lab #1: Retrograde Posted, along with walkthrough video.(Due: End of Week 2)</li> </ul>	C1, C2, C3, C4
2	Observing the Sky: The Birth of Astronomy	<ul style="list-style-type: none"> <li><input type="checkbox"/> Objective: To asses knowledge of the scientific method stemming from the scientific revolution. How scientific ideas about our place in the universe affected our concept of the solar system and the motions of the planets.</li> <li><input type="checkbox"/> Read Week Two Lecture Material James Burke : The Day The Universe Changed: "Infinitely Reasonable"</li> <li><input type="checkbox"/> Textbook reading: Chapters 2 + 3</li> <li><input type="checkbox"/> Post on Discussion Board</li> <li><input type="checkbox"/> Submit Stellarium Lab #1:Copernicus and Retrograde</li> </ul>	C1, C2, C3, C4

Week	Unit Topic	Assignments	Required Core Learning Outcomes
3	Radiation and Spectroscopy	<ul style="list-style-type: none"> <li><input type="checkbox"/> Objective: To assess knowledge of what the major regions of the electromagnetic spectrum are, and how we can determine the temperature of an object by observing the radiation that it emits. Explain the kinds of information that can be obtained by analyzing the spectra of astronomical objects.</li> <li><input type="checkbox"/> Read Week Three Lecture Material</li> <li><input type="checkbox"/> <a href="#">Spectroscopy Part 1</a></li> <li><input type="checkbox"/> <a href="#">Spectroscopy Part 2</a></li> <li><input type="checkbox"/> <a href="#">Spectroscopy Part 3</a></li> <li><input type="checkbox"/> Textbook reading: Chapter 5</li> <li><input type="checkbox"/> Problem Set</li> <li><input type="checkbox"/> Quiz #1</li> <li><input type="checkbox"/> Stellarium Lab #2 Kepler and the Laws of Motion of the Planets (Due End of Week 5)</li> </ul>	C1, C2, C3, C4
4	Astronomical Instruments	<ul style="list-style-type: none"> <li><input type="checkbox"/> Objective: To assess knowledge of the difference between telescope designs and functions.</li> <li><input type="checkbox"/> Read Week 4 Lecture Material Large Telescopes and the Great Observatories</li> <li><input type="checkbox"/> Textbook reading: Chapter 6</li> <li><input type="checkbox"/> Problem Set</li> <li><input type="checkbox"/> Stellarium Lab #2 Kepler and the Laws of Motion of the Planets (Due End of Week 5)</li> </ul>	C1, C2, C3, C4
5	Other Worlds: An Introduction to the Solar System	<ul style="list-style-type: none"> <li><input type="checkbox"/> Objective: To assess knowledge of the difference between telescope designs and functions.</li> <li><input type="checkbox"/> Read Week 4 Lecture Material Large Telescopes and the Great Observatories</li> <li><input type="checkbox"/> Textbook reading: Chapter 6</li> <li><input type="checkbox"/> Problem Set</li> </ul>	C1, C2, C3, C4, C5

Week	Unit Topic	Assignments	Required Core Learning Outcomes
		<ul style="list-style-type: none"> <li><input type="checkbox"/> Stellarium Lab #2 Kepler and the Laws of Motion of the Planets (Due End of Week 5)</li> </ul>	
6	Earth as a Planet	<ul style="list-style-type: none"> <li><input type="checkbox"/> Objective: To assess knowledge of the difference between telescope designs and functions.</li> <li><input type="checkbox"/> Read Week 4 Lecture Material Large Telescopes and the Great Observatories</li> <li><input type="checkbox"/> Textbook reading: Chapter 6</li> <li><input type="checkbox"/> Problem Set</li> <li><input type="checkbox"/> Stellarium Lab #2 Kepler and the Laws of Motion of the Planets (Due End of Week 5)</li> </ul>	C1, C2, C3, C4
7	Cratered Worlds	<ul style="list-style-type: none"> <li><input type="checkbox"/> Objective: To assess knowledge of the similarity and differences between the Moon and Mercury. How does each celestial object behave in its orbit, and their physical similarities and differences.</li> <li><input type="checkbox"/> Read/View Week 7 Lecture Materials: AMNH Video 1 "our Moon," AMNH Video 2 "MESSENGER's Orbit," "The MESSENGER Mission to Mercury: First Orbital Study of the Innermost Planet (AMNH ESSAY), NASA PAST MISSIONS <a href="http://www.nasa.gov/missions/past/">http://www.nasa.gov/missions/past/</a></li> <li><input type="checkbox"/> Textbook reading: Chapter 9</li> <li><input type="checkbox"/> Problem Set</li> <li><input type="checkbox"/> Post on Discussion Board</li> <li><input type="checkbox"/> Stellarium Lab #3 The Mars Challenge (Due end of week 8)</li> </ul>	C1, C2, C3, C4

Week	Unit Topic	Assignments	Required Core Learning Outcomes
8	Venus	<ul style="list-style-type: none"> <li><input type="checkbox"/> Objective: To assess knowledge of Venusian geology and gross properties.</li> <li><input type="checkbox"/> Read/View Week 8 Lecture Materials: How Do Atmospheres Shape and Define Planets? (AMNH Essay)</li> <li><input type="checkbox"/> Textbook reading: Chapter 10 - sections 10.1, 10.2 and 10.3 (pages 335-349)</li> <li><input type="checkbox"/> Quiz #3</li> <li><input type="checkbox"/> Stellarium Lab #3 The Mars Challenge (Due this Week)</li> </ul>	C1, C2, C3, C4
9	Mars	<ul style="list-style-type: none"> <li><input type="checkbox"/> Objective: To assess knowledge of Venusian geology and gross properties.</li> <li><input type="checkbox"/> Read/View Week 8 Lecture Materials: How Do Atmospheres Shape and Define Planets? (AMNH Essay)</li> <li><input type="checkbox"/> Textbook reading: Chapter 10 - sections 10.1, 10.2 and 10.3 (pages 335-349)</li> <li><input type="checkbox"/> Quiz #3</li> <li><input type="checkbox"/> Stellarium Lab #3 The Mars Challenge (Due this Week)</li> </ul>	C1, C2, C3, C4
10	Gas Giants	<ul style="list-style-type: none"> <li><input type="checkbox"/> Objective: To assess knowledge of Venusian geology and gross properties.</li> <li><input type="checkbox"/> Read/View Week 8 Lecture Materials: How Do Atmospheres Shape and Define Planets? (AMNH Essay)</li> <li><input type="checkbox"/> Textbook reading: Chapter 10 - sections 10.1, 10.2 and 10.3 (pages 335-349)</li> <li><input type="checkbox"/> Quiz #3</li> <li><input type="checkbox"/> Stellarium Lab #3 The Mars Challenge (Due this Week)</li> </ul>	



Week	Unit Topic	Assignments	Required Core Learning Outcomes
11	Rings, Moons, and Pluto	<ul style="list-style-type: none"> <li><input type="checkbox"/> Objective: To assess knowledge of Venusian geology and gross properties.</li> <li><input type="checkbox"/> Read/View Week 8 Lecture Materials: How Do Atmospheres Shape and Define Planets? (AMNH Essay)</li> <li><input type="checkbox"/> Textbook reading: Chapter 10 - sections 10.1, 10.2 and 10.3 (pages 335-349)</li> <li><input type="checkbox"/> Quiz #3</li> <li><input type="checkbox"/> Stellarium Lab #3 The Mars Challenge (Due this Week)</li> </ul>	C1, C2, C3, C4
12	Comets and Asteroids: Debris of the Solar System	<ul style="list-style-type: none"> <li><input type="checkbox"/> Objective: To assess knowledge of Uranus and Neptune’s gross properties and composition.</li> <li><input type="checkbox"/> Read/View Week 12 Lecture Materials: “The Pluto Controversy: What's a Planet, Anyway?” (AMNH Essay)</li> <li><input type="checkbox"/> Textbook reading: Chapter 13</li> <li><input type="checkbox"/> Problem Set</li> <li><input type="checkbox"/> Lab Report Project</li> <li><input type="checkbox"/> Stellarium Lab #4 Density in the Moons of Saturn and Jupiter</li> <li><input type="checkbox"/> Stellarium Lab #5 Drake Equation and Extrasolar Planets</li> <li><input type="checkbox"/> Both lab reports are due by the end of week 15 (3 weeks/Lab as an average work time)</li> </ul>	

Week	Unit Topic	Assignments	Required Core Learning Outcomes
13	Cosmic Samples and the Origin of the Solar System	<ul style="list-style-type: none"> <li><input type="checkbox"/> Objective: To assess knowledge of Uranus and Neptune’s gross properties and composition.</li> <li><input type="checkbox"/> Read/View Week 12 Lecture Materials: “The Pluto Controversy: What's a Planet, Anyway?” (AMNH Essay)</li> <li><input type="checkbox"/> Textbook reading: Chapter 13</li> <li><input type="checkbox"/> Problem Set</li> <li><input type="checkbox"/> Lab Report Project</li> <li><input type="checkbox"/> Stellarium Lab #4 Density in the Moons of Saturn and Jupiter</li> <li><input type="checkbox"/> Stellarium Lab #5 Drake Equation and Extrasolar Planets</li> <li><input type="checkbox"/> Both lab reports are due by the end of week 15 (3 weeks/Lab as an average work time)</li> </ul>	C1,C2, C3,C5
14	The Sun	<ul style="list-style-type: none"> <li><input type="checkbox"/> Objective: To assess knowledge of Uranus and Neptune’s gross properties and composition.</li> <li><input type="checkbox"/> Read/View Week 12 Lecture Materials: “The Pluto Controversy: What's a Planet, Anyway?” (AMNH Essay)</li> <li><input type="checkbox"/> Textbook reading: Chapter 13</li> <li><input type="checkbox"/> Problem Set</li> <li><input type="checkbox"/> Lab Report Project</li> <li><input type="checkbox"/> Stellarium Lab #4 Density in the Moons of Saturn and Jupiter</li> <li><input type="checkbox"/> Stellarium Lab #5 Drake Equation and Extrasolar Planets</li> <li><input type="checkbox"/> Both lab reports are due by the end of week 15 (3 weeks/Lab as an average work time)</li> </ul>	C1,C2,C3,C5

Week	Unit Topic	Assignments	Required Core Learning Outcomes
15	Life in the Universe	<input type="checkbox"/> Objective: To assess knowledge of Uranus and Neptune's gross properties and composition. <input type="checkbox"/> Read/View Week 12 Lecture Materials: "The Pluto Controversy: What's a Planet, Anyway?" (AMNH Essay) <input type="checkbox"/> Textbook reading: Chapter 13 <input type="checkbox"/> Problem Set <input type="checkbox"/> Lab Report Project <input type="checkbox"/> Stellarium Lab #4 Density in the Moons of Saturn and Jupiter <input type="checkbox"/> Stellarium Lab #5 Drake Equation and Extrasolar Planets <input type="checkbox"/> Both lab reports are this week	C1,C2,C3,C4, C5
16	Final Project Due (finals Week)	<input type="checkbox"/> Presentation of Lab Reports and Discussion (2 Topics) <input type="checkbox"/> Wrap-Up	C1,C2,C3,C4, C5