

CTY Astronomy

Text Book: *Astronomy Today* (5th Edition) by Chaisson and McMillan

Class Objectives

Students will:

- understand the history of cosmological science;
 - work with the metric system and scientific notation;
 - examine the properties of spectroscopy;
 - on their own, observe the universe using a telescope or binoculars;
 - test the basic components of rockets and rocket design;
 - identify and put into context all the major astronomical parts of the universe;
 - debate whether humans should colonize other planets;
 - understand the anatomy of a star and its evolution;
 - predict the patterns of universal evolution;
 - identify, compare and contrast all the planets and dwarf planets in the solar system;
 - pick out the unique features of our Sun;
 - predict the lunar cycles;
 - pick out the major constellations;
 - understand the relationship between Earth and the Moon;
 - examine sun spots;
 - understand the Big Bang and Hubble's law;
 - know how to identify and interpret H-R graphs and raw data to determine the age of star clusters;
 - understand the role and current theories of Dark Matter;
 - identify the components of the interstellar medium;
 - examine the exotic properties of active galaxies;
 - have a basic understanding of Special and General Relativity; and
 - examine the size and scope of the universe.
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Field Trips

There will be two off-campus field trips to:

- the Smithsonian Air and Space Museum and IMAX; and
- the Maryland Science Center and Davis Planetarium.

On-campus trips include:

- the Space Telescope Science Institute lecture
- the Maryland Space Grant Consortium presentation
- Sloan Digital Sky Survey Presentation

The Maryland Space Grant Consortium telescope is open every **Friday** night for public observation.

Astronomy

Course Outline

Session	Topics Activities & Demonstrations	Materials & Equipment
Monday		
Morning	<ul style="list-style-type: none"> ❖ General welcome and introduction to astronomy ❖ Pre-test ❖ Overview of syllabus and rules ❖ Fill out forms ❖ Ice-breaker activity/ classmate introductions ❖ PowerPoint presentation from chapter 1 of text: Astronomy and the Universe ❖ Assign presentation topics and dates 	Class forms Laptop and overhead projector Text: <i>Astronomy Today</i> with software Pre-test
Afternoon	<ul style="list-style-type: none"> ❖ Overview of text ❖ Handout and review constellation guides and binoculars ❖ Lecture: Review atoms, molecules, elements, mass, weight, density, volume, subatomic particles, chemical properties, thermodynamics, basic structure of the universe, Newton's Laws of Motion ❖ Brainstorm activity with bubble outline 	<i>Astronomy Today</i> Constellation guides Binoculars Bubble outline Newton's Cradle
Evening	<ul style="list-style-type: none"> ❖ Naked-eye night observations of Ursa Major and Minor, Venus, Saturn, and Jupiter ❖ Activity: In their journal notebooks, students sketch the phase of the Moon and the planets as they see them ❖ Students read <i>Astronomy Today</i> 1.1, 1.2, 1.3, 1.4 	<i>Astronomy Today</i> Constellation Sky Wheel Constellation Guide
Tuesday		
Morning	<ul style="list-style-type: none"> ❖ Lecture: Computer constellation guide, constellations, elliptical plane, celestial sphere, the Zodiac, metric system, scientific method, light year (chapter 1 of text) ❖ Project the constellation program from the text using the LCD ❖ PowerPoint presentation on chapter 2: Our Planetary System ❖ Handouts on metric system, scientific method, calculating a light year, night sky wheel, presentation rubric ❖ Students work on presentation posters 	Handouts: metric system, scientific method, calculating a light year, night sky wheel, presentation rubric Poster board (25 sheets) Laptop and overhead projector Text: <i>Astronomy Today</i> with software Celestial Sphere Model
Afternoon	<ul style="list-style-type: none"> ❖ Library talk on presentation topic research with Robin Sinn at the Eisenhower Library ❖ Students begin research 	

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Evening	<ul style="list-style-type: none"> ❖ Students work on presentation posters ❖ Activity: Students observe the phase of the Moon, find Hercules and Draco, and the planets Venus, Jupiter and Saturn and afterwards, sketch them in their journal notebooks ❖ Students read <i>Astronomy Today</i> 1.5, 1.6. 1.7; chapter 3 	<i>Astronomy Today</i> Constellation Sky Wheel Constellation Guide
Wednesday		
Morning	<ul style="list-style-type: none"> ❖ Lecture: Using the right measurements ❖ Review: Scientific notation, scaling out the universe, scaling down the solar system ❖ Handouts: worksheets 1, 2, and 3 ❖ Students complete worksheets in class 	<i>Astronomy Today</i> Handouts on scientific notation, scaling out the universe, and scaling down the solar system
Afternoon	<ul style="list-style-type: none"> ❖ Lecture: Concretely understanding the scaled-down version of the solar system ❖ Cooperative Learning Activity: Students walk out the scaled-down solar system (see more detailed lesson plan) ❖ Trip to the Computer Lab for research ❖ Students visit website: http://spaceflight1.nasa.gov/realdata/sightings/ ❖ Students work on their final projects 	<i>Astronomy Today</i> Meter measuring sticks
Evening	<ul style="list-style-type: none"> ❖ Activity: Students observe the phase of the Moon and sketch in their journal notebooks ❖ Students read <i>Astronomy Today</i>, chapter 6 	<i>Astronomy Today</i> Constellation Sky Wheel Constellation Guide
Thursday		
Morning	<ul style="list-style-type: none"> ❖ Lecture: Kepler's Laws, Planetary Motion, Newton's Three Laws, the Sun, red giants and white dwarfs (chapter 2 of text) ❖ Activity: Students make their own ellipse (see lesson plan) ❖ PowerPoint presentation: Low-mass stars (chapter 17 of text) 	Ellipse materials: Cardboard, string, thumbtacks, pencil and scissors Laptop and overhead projector <i>Astronomy Today</i> with software
Afternoon	<ul style="list-style-type: none"> ❖ Lecture: Star Formation (chapter 19 of text) ❖ Trip to the Computer Lab for research ❖ Students research topic for their final projects 	Laptop and overhead projector <i>Astronomy Today</i> with software

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Evening	<ul style="list-style-type: none"> ❖ Introduction to the telescope (chapter 5 of text) <ul style="list-style-type: none"> -naming the parts of the telescope -identifying the type of telescope ❖ Set up telescopes ❖ Students observe the Moon with both refracting and reflecting telescopes ❖ Activity: Students draw the Moon, as seen through the telescopes ❖ Students read <i>Astronomy Today</i> 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7; chapter 16.1, 16.2, 16.3, 16.4, 16.5 	Refracting and reflecting telescopes <i>Astronomy Today</i> Constellation Sky Wheel Constellation Guide
Friday		
Morning	<ul style="list-style-type: none"> ❖ Lecture: Stellar evolution (chapter 20 of text) ❖ Review of week's material ❖ Quiz #1 ❖ Trip to the Computer Lab for research ❖ Students work on their final projects and posters 	Quiz #1 Laptop and overhead projector <i>Astronomy Today</i> with software
Afternoon	<ul style="list-style-type: none"> ❖ Lecture: Death of high-mass stars (chapter 21 of text) ❖ PowerPoint presentation on stellar explosions 	Laptop and overhead projector <i>Astronomy Today</i> with software
Sunday		
Evening	<ul style="list-style-type: none"> ❖ Students observe the phase of the Moon with the telescope and draw in their journal notebooks ❖ Students read <i>Astronomy Today</i>, chapter 20 	Telescopes <i>Astronomy Today</i> Constellation Sky Wheel Constellation Guide
Monday		
Morning	<ul style="list-style-type: none"> ❖ Trip to the Computer Lab ❖ Cooperative learning presentation of first project: The Inner Planets (chapters 8, 9, and 10 of text) ❖ Compare and contrast inner planets Mercury, Venus, and Mars ❖ Mars Rover VHS ❖ Solar System Demonstration (see more detailed lesson plan) ❖ Students recreate figure 17 and 9.19 from page 245 	Mars Rover VHS Model of the solar system Laptop and overhead projector <i>Astronomy Today</i> with software Solar system model

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Afternoon	<ul style="list-style-type: none"> ❖ Finish Mars Rover DVD ❖ Cooperative learning presentation of second project: The Moon (chapter 8 of text) ❖ Research colonization questions ❖ Class debate: Should humans begin to colonize other planets? (see more detailed lesson plan) ❖ Students draw figure 8.26 ❖ Students do colonization activity worksheet 	Colonization activity worksheet Mars Rover DVD Laptop and overhead projector <i>Astronomy Today</i> with software
Evening	<ul style="list-style-type: none"> ❖ Night observations ❖ Students find the International Space Station in the night sky ❖ Students find Jupiter in the night sky ❖ Students observe the phase of the Moon, Hercules and Leo and sketch in their journal notebooks ❖ Students read <i>Astronomy Today</i> 8.2, 8.3, 8.6, 8.8, 9.2, 9.4, 9.5, 10.2, 10.3, 10.4, 10.5, 10.6 	Telescopes <i>Astronomy Today</i> Constellation Sky Wheel Constellation Guide Moon Poster
Tuesday		
Morning	<ul style="list-style-type: none"> ❖ Cooperative learning presentation of third project: Jupiter, Saturn, Neptune, and Uranus (chapters 11, 12, and 13 of text) ❖ Planets video ❖ Students draw figure 11.4, 11.5, 12.6, 12.11 ❖ Research colonization questions ❖ Class debate: Should humans begin to colonize the other planets? 	Laptop and overhead projector <i>Astronomy Today</i> with software Planets VHS
Afternoon	<ul style="list-style-type: none"> ❖ PowerPoint presentation on stellar explosions continued (chapter 21 of text) ❖ Trip to the Computer Lab ❖ Final work on presentation and posters 	Laptop and overhead projector <i>Astronomy Today</i> with software
Evening	<ul style="list-style-type: none"> ❖ Students read <i>Astronomy Today</i> 11.2, 11.4, 11.6, 12.2, 12.3, 12.42, 12.3, 12.4, 12.5 	<i>Astronomy Today</i> Constellation Sky Wheel Constellation Guide
Wednesday		
Morning	<ul style="list-style-type: none"> ❖ Cooperative learning presentation of fourth project: Solar Debris (chapter 14 of text) ❖ Cooperative learning presentation of fifth project: Formation of Planetary Systems (chapter 15 of text) ❖ Cooperative learning presentation of sixth project: the Interstellar Medium (chapter 18 of text) ❖ Cooperative learning groups read <i>Astronomy Today</i> 16.4, 16.5 	Laptop and overhead projector <i>Astronomy Today</i> with software

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Afternoon	❖ Trip to Space Telescope Science Institute for lecture and question/answer time with astrophysicist Dr. Frank Summers on the topic of Cosmic Extremes	Contact: Dr. Frank Summers
Evening	❖ Students observe the Andromeda galaxy through telescopes and sketch in their journal notebooks ❖ Students read <i>Astronomy Today</i> 13.1, 13.2, 13.3, 13.4, 13.8, 14.1, 14.2, 14.3, 15.1, 15.2, 15.3, 15.5, 15.6	Telescopes <i>Astronomy Today</i> Constellation Sky Wheel Constellation Guide
Thursday		
Morning	❖ Discuss sunspots (<i>Astronomy Today</i> 16.4, 16.5) ❖ Trip to the Maryland Space Consortium to observe sun spots ❖ Cooperative learning presentation of seventh project: Spectroscopy (chapter 4 of text) ❖ Students draw figures 16.20 and 16.21	Laptop and overhead projector <i>Astronomy Today</i> with software Contact: Ivelisse Cabrera
Afternoon	❖ Cooperative learning presentation of eighth project: Neutron Stars and Black Holes (chapter 22 of text) ❖ Cooperative learning presentation of ninth project: Special Relativity (chapter 22 of text)	Laptop and overhead projector <i>Astronomy Today</i> with software
Evening	❖ Students observe Jupiter, Venus and Saturn ❖ Students find where the asteroid 4 Vesta should be (may be faint) ❖ Students write and sketch in journal notebooks ❖ Students read <i>Astronomy Today</i> 4.1, 4.2, 22.1, 22.2, 22.3, 22.4, 22.5, 22.6, 22.7, 22.8	Telescopes Constellation Sky Wheel Constellation Guide
Friday		
Morning	❖ Cooperative learning presentation of tenth project: the Milky Way (chapter 23 of text) ❖ Cooperative learning presentation of eleventh project: Normal and Active Galaxies (chapter 24 of text) ❖ Review for Quiz #2 ❖ Quiz #2 ❖ Review and correct quiz	Laptop and overhead projector <i>Astronomy Today</i> with software Quiz #2 Milky Way Galaxy poster
Afternoon	❖ Cooperative learning presentation of twelfth project: Galaxies and Dark Matter (chapter 25 of text) ❖ Students begin reading chapter 23 of text	Laptop and overhead projector <i>Astronomy Today</i> with software
Sunday		
Evening	❖ Students read <i>Astronomy Today</i> chapter 24	<i>Astronomy Today</i> Constellation Sky Wheel Constellation Guide

Session	Topics Activities & Demonstrations	Materials & Equipment
Monday		
Morning	<ul style="list-style-type: none"> ❖ Trip to Maryland Science Center ❖ Students see exhibits, including Newton's Alley (hands-on applications of Newton's Laws), Our Place in Space, SpaceLink Gallery, the Demo Stage, Science on a Sphere, and the Davis Planetarium shows "The Sky Live" and "Beyond the 9." 	
Afternoon	<ul style="list-style-type: none"> ❖ Trip to Maryland Science Center continued 	
Evening	<ul style="list-style-type: none"> ❖ Students observe the night sky with telescopes and sketch in their journal notebooks ❖ Students read <i>Astronomy Today</i> chapter 25 and 26 ❖ Telescopes will be set up by AMR 1 for all students 	Telescopes <i>Astronomy Today</i> Constellation Sky Wheel Constellation Guide
Tuesday		
Morning	<ul style="list-style-type: none"> ❖ Trip to Computer Lab for presentation from Jordan Raddick from the Sloan Digital Sky Survey ❖ Cooperative learning presentation of thirteenth project: The Big Bang and the Fate of the Universe (chapter 26 of text) ❖ Cooperative learning presentation of fourteenth project: The Early Universe (chapter 27 of text) 	Laptop and overhead projector <i>Astronomy Today</i> with software Contact: Jordan Raddick
Afternoon	<ul style="list-style-type: none"> ❖ Cooperative learning presentation of fifteenth project: Life in the Universe (chapter 28 of text) ❖ Activity: Students begin building rockets 	Laptop and overhead projector <i>Astronomy Today</i> with software Rockets Glue Exacto knives Solid rocket fuel engines Paint and brushes (optional)
Evening	<ul style="list-style-type: none"> ❖ Students observe the night sky with telescope and sketch in their journal notebooks ❖ Students read <i>Astronomy Today</i>, chapter 27 ❖ Possibly work on rockets (depends on progress) ❖ Telescopes will be set up by AMR 1 for all students 	Telescopes <i>Astronomy Today</i> Rockets Glue Exacto knives Solid rocket fuel engines Paint and brushes (optional) Constellation Sky Wheel Constellation Guide

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Wednesday		
Morning	❖ Rocket Launch: Students finish rockets and launch them at 11:45 (See more detailed lesson plan)	Laptop and overhead projector <i>Astronomy Today</i> with software Rockets Glue Exacto knives Solid rocket fuel engines Paint and brushes (optional) Rocket stands Rocket launcher
Afternoon	❖ Final Exam ❖ Notebook check	Final exam
Evening	❖ Philosophical open conversation on the fate of the universe ❖ Review/ realize what was learned	
Thursday		
Morning	❖ Trip to Smithsonian Air and Space Museum ❖ Students see exhibits: Looking at Earth, Explore the Universe, Lunar Exploration Vehicles, Rocketry and Space Flight, Apollo to the Moon, Exploring the Planets, GPS: A New Constellation, as well as watch Lockheed Martin IMAX: Space Station 3D ❖ Student worksheets to be completed during tour	Student worksheets
Afternoon	❖ Return from Smithsonian at 5:30	
Evening	No evening session	
Friday		
Morning	❖ Return final exams and review ❖ Remind students to use CD of night sky from their books	Corrected final exams