

# ASTRONOMY 4

## De Anza College

Section 1

M - F, 8:30 - 9:20 am

De Anza Planetarium (PLT)

Marek Cichanski

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Office hours: M thru F 9:30-10:20am; other times by appt.

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## TEXTBOOK

***The Solar System, 9th edition*** by Seeds & Backman

(You can use the 8th edition if you want - the reading assignments and 'What2Know' list have both the 8th and 9th edition pages listed.)

## STUDENT LEARNING OUTCOMES

You'll be learning a lot about our solar system - and others - this quarter. You'll also learn a lot about how a large college course like this works. Here are some specific things your instructor wants to help you do; I hope that doing these things enables you to become a more scientifically aware citizen, and gets you excited about science no matter what your eventual path in life!

SLO #1: "Evaluate claims about the nature of the physical universe using the scientific method of hypothesis testing."

*In other words:* We observe the universe around us and we wonder how it works; why is it the way it is?

A proposed explanation for how the universe (or some part of it) works is called a *hypothesis*.

When someone proposes a hypothesis, other scientists try to *evaluate* that hypothesis, by checking to see if its predictions fit all of the other relevant observations. This process, of making and testing hypotheses, is called the *scientific method*. It is a way of thinking about the world that minimizes our chances of fooling ourselves, and maximizes our chances of figuring out how things really work. Part of what you'll do in this class is to put yourself in a scientist's shoes, by using this method.

SLO #2: "Compare and contrast the histories of solar-system bodies (e.g. moons, planets, asteroids, comets, meteorites) by integrating data from spacecraft and Earth-based observatories."

*In other words:* Many scientists - with job descriptions like *astronomers* and *planetary scientists* - study solar systems and the things they're made of (stars, planets, asteroids, etc). Their observations have shown a tremendous diversity among the things that make up our solar system, and among the solar systems that we know about in our galaxy. There are many differences from object to object, and from system to system, but there are some similarities, too. What are the reasons for these similarities and differences? Why, for example, did the Earth and Venus wind up so similar in some ways (size, mass), but so different in other ways (such as their surface temperatures)? These scientists use all of the information they can, both from Earth-based telescopes, and from spacecraft - to try and puzzle out these histories, and to try and understand the reasons for the diversity they see. In this class, I'll try to give you the opportunity to think like a scientist, and go through some of this reasoning yourself.

# Astronomy 4 lecture schedule, Spring 2016 Morning Class

**Important:** Dates of TESTS are fixed, but the *lecture topics* (shown in *italics*) are tentative. For example, we may or may not cover "Observatories..." on April 29th, depending on how quickly we cover the preceding material.

*Each test covers the material since the last test. See the What2Know list for details.*

*Final Exam is comprehensive - it covers the whole quarter.*

		MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Wk. 1	Apr	4 <i>Class Enrollment</i>	5 <i>How the class works, Looking at the Sky</i>	6 <i>Diurnal apparent motions in the sky</i>	7 <i>Annual apparent motions in the sky</i>	8 <i>Apparent Magnitudes, The Ancient Two-Sphere Univ.</i>	9
Wk. 2	Apr	11 <i>Moon Phases: What we see in the sky</i>	12 <i>Moon Phases: What's really going on?</i>	13 <i>Eclipses</i>	14 <i>Seasons</i>	15 <i>Pre-Copernican models of the universe</i>	16 Last day to add
Wk. 3	Apr	18 <i>The Copernican model</i>	19 <i>"Galileo's Battle for the Heavens"</i>	20 <i>Galileo: Jupiter's moons and seeing a gibbous Venus</i>	21 <i>Tycho's data and Kepler's laws</i>	22 <i>Newton's Laws: What causes a change of motion?</i>	23
Wk. 4	Apr	25 <b>TEST 1</b>	26 <i>Tides, How orbits work</i>	27 <i>Review Test 1</i>	28 <i>How telescopes work</i>	29 <i>Observatories on Earth and in space</i>	30
Wk. 5	May	2 <i>Light and spectra</i>	3 <i>"Birth of the Earth"</i>	4 <i>Origin of the Solar System</i>	5 <i>The Sun: Structure, Fusion, Magnetic field</i>	6 <i>The Earth: A quick course in geology and geophysics</i>	7
Wk. 6	May	9 <i>Earth's Moon: What formed all those craters?</i>	10 <i>Earth's Moon: Its origin, geology, and exploration</i>	11 <i>Mercury: The (slightly) shrinking planet</i>	12 <i>Twin sibling... or not? Venus and the greenhouse effect</i>	13 <i>Comparative planetology: Tectonics of Venus and Earth</i>	14
Wk. 7	May	16 <b>TEST 2</b>	17 <i>Mars: Early observations and discoveries</i>	18 <i>Review Test 2</i>	19 <i>Mars: Evidence for water and the search for life</i>	20 <i>"Five Years on Mars"</i>	21
Wk. 8	May	23 <i>Jupiter: The giant planet</i>	24 <i>Jupiter's Moons: Ice, volcanoes, and the search for life</i>	25 <i>Saturn and its rings</i>	26 <i>Saturn's Moons: Ice, geysers, a giant "walnut", and lakes</i>	27 <i>Uranus</i> Last day to drop with "W" grade	28
Wk. 9	May/ Jun	30 <b>HOLIDAY</b>	31 <i>Neptune</i>	1 <i>Asteroids: A failed planet</i>	2 <i>The Dawn mission: Asteroids Ceres and Vesta</i>	3 <i>Meteors and meteorites</i>	4
Wk. 10	Jun	6 <b>TEST 3</b>	7 <i>Comets</i>	8 <i>Review Test 3</i>	9 <i>Rosetta: Mission to A Comet</i>	10 <i>Impact hazards and planetary defense</i>	11
Wk. 11	Jun	13 <i>Discovery of Pluto</i>	14 <i>New Horizons: Pluto revealed at last</i>	15 <i>What is a planet? and the search for Planet Nine</i>	16 <i>How to find planets around other stars</i>	17 <i>Extrasolar Planets: What we know so far</i>	18
Wk. 12	Jun	20	21	22 <b>FINAL EXAM</b> 7:00 - 9:00 am	23	24	25

# Astronomy 4 reading assignments, Spring 2016 Morning Class

The reading assignments shown below should be done BEFORE each class.

Some assignments apply to both the 8th and 9th editions of "The Solar System" by Seeds and Backman.

Where the pages are different between the two editions, the 8th and 9th edition pages are listed separately.

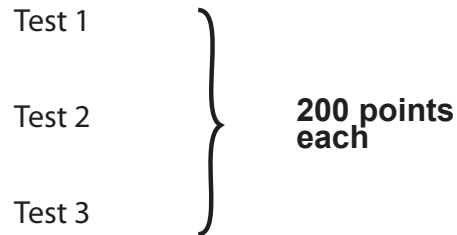
	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Wk. 1	Apr 4 <i>Class Enrollment</i>	5 <i>How the class works, Looking at the Sky</i> Chap. 1	6 <i>Diurnal apparent motions in the sky</i> p. 18-19	7 <i>Annual apparent motions in the sky</i> Sec. 2-2, 2-3	8 <i>Apparent Magnitudes, The Ancient Two-Sphere Univ.</i> Section 2-1	9
Wk. 2	Apr 11 <i>Moon Phases: Drawings 2a, 2b in "The Phases of the Moon"</i>	12 <i>Moon Phases: What's really going on?</i> Section 3-1	13 <i>Eclipses</i> Sec. 2-2, 2-3	14 <i>Seasons</i> 8th: p. 22, 24-25 9th: p. 22-25	15 <i>Pre-Copernican models of the universe</i> 8th: p. 55-59 9th: p. 56-61	16 Last day to add
Wk. 3	Apr 18 <i>The Copernican model</i> 8th: p. 60-63 9th: p. 59, 62-64	19 <i>"Galileo's Battle for the Heavens"</i> 8th: p. 70-73 9th: p. 71-74	20 <i>Galileo: Jupiter's moons and seeing</i> 8th: carefully review Figs. 4-17 and 4-18 9th: Fig. 4-18	21 <i>Tycho's data and Kepler's laws</i> 8th: p. 64-69 9th: p. 65-70	22 <i>Newton's Laws of Motion</i> 8th: p. 78-84 (up to Sec. 5-2) 9th: p. 80-86 (up to Sec. 5-2)	23
Wk. 4	Apr 25 <b>TEST 1</b>	26 <i>Tides, How orbits work</i> Section 5-2	27 Review Test 1	28 <i>How telescopes work</i> Sec. 6-1, 6-2	29 <i>Observatories on Earth and in space</i> Sec. 6-3 thru 6-5	30
Wk. 5	May 2 <i>Light and spectra</i> Chap. 7	3 <i>"Birth of the Earth"</i> 8th: Sec. 19-1, 20-1, 20-2 9th: Sec. 10-2, 11-1, 11-2	4 <i>Origin of the Solar System</i> 8th: Sec. 19-2, 19-3 9th: Sec. 10-1, 10-3	5 <i>The Sun: Structure, Fusion, Magnetic Fields</i> Chap. 8	6 <i>The Earth: A quick course</i> 8th: Sec. 20-3, 20-4 9th: Sec. 11-3, 11-4	7
Wk. 6	May 9 <i>Earth's Moon: What formed it?</i> 8th: p. 450-456 9th: p. 244-250	10 <i>Earth's Moon: Its origin, geology, and atmosphere</i> 8th: p. 457-461 9th: p. 251-255	11 <i>Mercury: The (slightly) shrinking planet</i> 8th: Sec. 21-2 9th: Sec. 12-2	12 <i>Twin sibling... or not? Venus and Earth</i> 8th: Sec. 22-1 9th: Sec. 13-1	13 <i>Comparative planetology</i> 8th: Review 474-483 9th: Review 269-276	14
Wk. 7	May 16 <b>TEST 2</b>	17 <i>Mars: Early observations</i> 8th: p. 483-490 9th: p. 278-284	18 Review Test 2	19 <i>Mars: Evidence for water</i> 8th: p. 490-498 9th: p. 284-292	20 <i>"Five Years on Mars"</i>	21
Wk. 8	May 23 <i>Jupiter: The giant planet</i> 8th: Sec. 23-1, 23-2 9th: Sec. 14-1, 14-2	24 <i>Jupiter's Moons: Ice volcanoes, auroras, and more</i> 8th: Sec. 23-3 9th: Sec. 14-3	25 8th: p. 519-521 and 527-531 9th: p. 312-314 and 319-323	26 <i>Saturn's Moons: "Titan" through "The Origin of Saturn's Moons"</i>	27 <i>Uranus</i> 8th: Sec. 24-1 9th: Sec. 15-1	28
Wk. 9	May/ Jun 30 <b>HOLIDAY</b>	31 <i>Neptune</i> 8th: Sec. 24-2 9th: Sec. 15-2	1 <i>Asteroids: A failed planet</i> 8th: Sec. 25-2 9th: Sec. 16-2	2 <i>The Dawn mission: Asteroids Ceres and Vesta</i>	3 <i>Meteors and meteorites</i> 8th: Sec. 25-1 9th: Sec. 16-1	4
Wk. 10	Jun 6 <b>TEST 3</b>	7 <i>Comets</i> 8th: Sec. 25-3 9th: Sec. 16-3	8 Review Test 3	9 <i>Rosetta: Mission to A Comet</i>	10 <i>Impact hazards and planetary evolution</i> 8th: Sec. 25-4 9th: Sec. 16-4	11
Wk. 11	Jun 13 <i>Discovery of Pluto "The Discovery of Pluto"</i> 8th: p. 553 9th: p. 346-347	14 <i>New Horizons: Pluto revealed</i> 8th: p. 553-556 9th: p. 347-350	15 <i>What is a planet? and the search for Planet Nine</i>	16 <i>How to find planets around other stars</i> 8th: p. 422-426 9th: p. 213-218	17 <i>Extrasolar Planets: What are they?</i> 8th: p. 426-428 9th: p. 218-220	18
Wk. 12	Jun 20	21	22 <b>FINAL EXAM</b> 7:00 - 9:00 am	23	24	25

# Astronomy 4

## GRADES

### step 1:

You take various tests and the final



FINAL EXAM 300 points

### step 2:

I drop the lowest midterm score

-200pts = 400 points of midterms

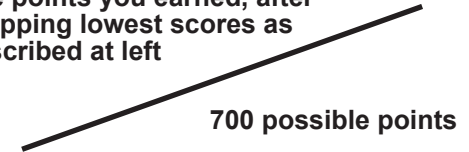
*There's no way I'm gonna drop **this** one...*

### step 3:

I calculate the final grade.

Your final percentage =

The points you earned, after dropping lowest scores as described at left



I then round your final percentage to the nearest whole percent, and use the following grading scale:

Notes:

1) A %-age like 88.7 rounds to an 89, so it's an A.

89-100	A
79-88	B
68-78	C
57-67	D
<57	F

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If something causes you to miss a test, that will be the one that you drop. This means that there are **NO MAKEUPS**.

You have to take all of your midterms and your final exam with **YOUR SECTION** of the class.

I'm afraid that my schedule won't allow me to give you a final at a different time in order to fit your vacation.

You'll need to plan around the final.

# Astronomy 4 Rules and Procedures

During the first few weeks of class, I will collect state-mandated attendance data using a sign-in sheet and/or seating chart.

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## ADDING THE CLASS:

If you add the class, *make sure that your add code has worked, and that you have been properly added to the class.* If not, it is your responsibility to check with the Admissions/Records office to find out how this can be corrected. After the end of Week 2, the College cannot process a late add, and you could find yourself not enrolled and not receiving a grade for the course, if you're not registered!

## DROPPING THE CLASS:

I would like to see everyone complete the course, earn a good grade, and become excited about science. However, the realities of life sometimes get in the way. You should assess your situation realistically throughout the quarter.

If you decide to drop the class, you must do so by the final date to drop with a "w", or you risk receiving an "F" if you haven't earned enough points to pass the class.

Let me re-emphasize that: If you decide to drop the course, it is *your* responsibility to go to the registrar and drop yourself. The deadline is the end of the eighth week.

## VERY IMPORTANT INFORMATION ABOUT DROPPING AND THE END OF THE QUARTER:

For many years, De Anza students have been given the impression that "your instructor can drop you" after the end of the 8th week. **THIS IS CHANGING!** We are no longer allowed to give a "W" on the final grade form. Additionally, I will NOT be able to drop you using a blue 'Addendum to Class List' form after the end of the 8th week. If you have a personal hardship after the end of the 8th week, you will have to request a "Late Drop" using a white form called "Petition for Exception to Registration Policies", which will be evaluated by the Registrar and/or the Academic Council.

## CLASS ENVIRONMENT:

Remember that we have all chosen to be in this class. We should thus have an environment that fits this choice.

Talking to your neighbor(s) while I'm lecturing, reading non-course material in class, doing outside homework, and using wireless devices of any kind are not allowed in class, and may result in dismissal for the remainder of the class period.

Such dismissal will count as an absence.

## TESTS:

After you start working on a test or quiz, you must hand it in before leaving the room.

If you arrive late for a test or quiz, you won't be given extra time to finish it.

On tests and quizzes, once the first person has turned it in and left the room, no further latecomers will be given tests.

If you find yourself wanting to use a calculator on a test (such as to solve an extra-credit question that involves a numerical calculation), you'll need to use a regular calculator; you can't use a cell-phone calculator.

## NOTICE:

Cheating on any exam or project is grounds for a failing grade in the class and a permanent note in a student's file. "Cheating" is defined (in this course) to be an effort by a student to obtain a grade by any means other than demonstration of that student's individual achievement in mastering the class material and/or fulfilling terms of a project.

Further grounds for expulsion from the class include any activity which interferes with others' ability to benefit from the class (such as chronic distracting behavior) or which degrades the Planetarium's function or environment.