

STARS AND GALAXIES ASTRONOMY SYLLABUS

Contents

Stars and galaxies Astronomy Syllabus	1
Contact Info.....	2
Videos.....	2
Tutoring.....	2
Books and Supplies	2
Disabilities.....	3
Safety notice.....	3
Course Description.....	3
Course goals	4
Primary goals.....	4
Student Learning Outcomes	4
Philosophical statement.....	5
Learning planets, stars, and constellations	5
Credit for the Course, Transferability to a University	5
Grades, Homework, Late Policy	6
Grades.....	6
Homework.....	6
<i>Submitting homework over email</i>	6
Late Policy.....	6
<i>NQA coupons</i>	7
Clicker questions/participation.....	7
Tests	7
Note cards.....	7
Scantron.....	7
Test dates.....	7
Test Rewrites.....	7
Missing an exam.....	7
Student Expectations	8
Keep all handed-back assignments	8
Attendance.....	8
Dropping students for non-attendance	8
Study sufficiently	8
Ask Questions	8
Cell Phones and Pagers – please turn them off.....	8
Good luck and learn lots of astronomy!	8
Clicker Usage	9
My Clicker Number is _____.....	9
Voting.....	9
Changing your vote	9
Troubleshooting:	9
ECC Campus Map.....	10

Contact Info

Instructor: David Vakil (pronounced Vuh-keel)

Course: Astronomy 25, Spring 2009

Class time: Daytime section: Section 1073: MW 2:45pm-4:10pm (If you miss your class, you may be able to attend

Evening section: Section 1075: T 6-9:10 pm the other section.)

Office: Physics 117F (see map at end)

Phone: (310) 660-3593 x3134.

Email: dvakil@elcamino.edu

Office Hours: MW 4:15pm-5:15pm, TTh 2:45-3:45pm, W 10am-11am OR by appointment, OR **just stop by!** I'm around.

Web Page: www.elcamino.edu/faculty/dvakil/astronomy_25.html

All materials except exams will be posted on the web page. If something is missing, please inform me.

Videos

During class, I may wear a microphone and have my computer create a movie from what's on the computer screen and what the microphone records. These videos will be posted on the videos website and a link will be available on the course web page. Please note: things you say may be recorded on the video. If you are reading this sentence, you have now discovered there is an extra credit assignment hidden in this syllabus in sentences like this one; keep reading. These videos are provided solely to help you succeed. They should help students who need to see/hear things again or at a different pace, as well as to help students who miss class. However, daily attendance is still mandatory, as described below. Do not rely on the video instead of coming to class!

Tutoring

There is a FREE tutor, Jessica Asbell, available in the Learning Center of the library. *Her hours are Tuesdays & Thursdays from 4:30pm until 6pm.* She has taken all of the astronomy courses, some with me, so she is a good resource for you. She can also be reached at jlasbell@yahoo.com. She is very knowledgeable and friendly. Put that to good use. For students in Astronomy lab courses, Jeff may be available one night per week on the math roof for tutoring (emphasis on telescope usage). This evening tutoring availability is subject to change; contact me for the latest information about the nighttime tutoring. Here are your directions for receiving the syllabus extra credit, worth two points. Find the six code words in this syllabus and write them down on a piece of paper and which syllabus page you found the clue. Yes, there really are six. Turn that paper in by the second class if your class meets only once per week, or by the third class if we meet twice per week.

Books and Supplies

SCANTRON FORM 882-E IS REQUIRED FOR ALL EXAMS! The bookstore sells a 6-pack which I suggest you purchase. (Form 882-N-E is ok also, but has numbers instead of letters. My tests have lettered answers instead of numbered answers.) Total estimated scantron form cost: \$1-2.

Texts. There are two texts and both are required.

<p><u>Text #1</u>, required (or use the library's reserved copy) and may be purchased bundled new with required text #2. Bring this book to class every day, or sit next to someone who does.</p>

You must have regular access to one of the following texts:

The Cosmic Perspective: Stars, Galaxies, & Cosmology, 5th edition by Bennett, Donahue, Schneider, and Voit. The ISBN for this textbook when ordered bundled with text #2 below is either 9780321503190 or 9780321618870. There are two possible ISBN numbers because the second

ISBN is the “media update” version of the textbook. Both the regular and the media update versions are acceptable. If ordered on its own, without text #2, its ISBN is 9780321503206 or 9780321565037 (“media update”).

OR

The Cosmic Perspective, 5th edition by Bennett, same authors. This version is called “combined version”. If ordered bundled with text #2, the ISBN is 9780321554499 or 9780321609779 (“media update”). If ordered on its own its ISBN is 9780321505675 or 9780321551382 (“media update”).

Deciding on text #1 Textbook costs are: approximately \$80 for the Stars, Galaxies & Cosmology version bundled with text #2 or \$132 for the “combined version” bundled with text #2. Adding text #2 to the bundle adds little cost to the price. I recommend the “combined version” to students who are taking (or who plan to take) Astro 20 (Solar System) with me or Astro 12 (the lab class) with any teacher. The “combined version” is the text for both Astro 20 and 25 for my classes only. (Other teachers use other books, so be careful.) The lab class covers material from both classes. Students who think they may develop a recreational interest in astronomy are also encouraged to buy the combined version. However, if you know you will not use your book after the end of the semester, get the single-volume version specifically titled "Stars, Galaxies & Cosmology" to save money.

Note: the “combined version” will be on reserve in the library, for use only inside the library. Both the 4th edition (which I used a year ago) and two copies of the 5th edition are on reserve. (One of the two copies is the “media update” version.) The 4th edition is similar to the 5th, so feel free to use it, too.

Text #2 is a workbook and is also required. It is available at a BIG discount when purchased new in a bundle with Text #1. Bring this book to class every day.

The workbook is titled *Lecture Tutorials for Introductory Astronomy*, 2nd edition (black cover) by Prather, Slater, Adams, and Brissenden. This book will come bundled with text #1 if purchased new from ECC’s bookstore or using one of the appropriate ISBN numbers above. It costs approximately \$30 if purchased separately and its ISBN on its own is 9780132392266.

Disabilities

If you have a disability (learning, physical, seeing, hearing, or otherwise), let me know so I can work with you. The note card that I ask you to fill out (see homework handout) is a good place to do this. You should also considering visiting the Special Resource Center, located in the Student Services Building. The first code is my (i.e. your astronomy professor’s) last name and my office location.

Safety notice

Campus police and cadet escorts are available to take you to and from your car before, during, and after class. You can contact them with a campus “blue light” phone, located in various areas on campus. Or ask your instructor to call them for you. I am certainly happy to place this call. If you prefer, you can call them from any phone: 310-660-3100, or dial 3100 from any campus phone.

Course Description

Astronomy 25 is an introductory-level course which concentrates on the foundation of modern astronomy and the study of the nature and structure of stars, light, galaxies, cosmology, and the

possible existence of extra-terrestrial life. The course has no astronomy, physics, or math prerequisites. Math will be used rarely.

Course goals

Primary goals

Written by Professor Vakil. All concern the nature of scientific thinking.

1. **Appreciating** science in general, and astronomy in specific.
2. **Understanding** how knowledge is gained and be critical of what you see and hear. You will begin to ask “How can we test that?” when forming hypotheses or “How do we know that?” when reading new information.
3. **Distinguishing** scientific from non-scientific work, and therefore understanding what science is.
4. **Developing** a working knowledge of the scientific method and how to apply it to real world situations.
5. **Critically analyzing and evaluating** information, scientific or otherwise

Student Learning Outcomes

The following outcomes were developed either by the astronomy department when denoted with an (A) or Professor Vakil when denoted with a (V).

6. (V) Learn some simple astronomical nomenclature/terminology. However, note that memorization of most vocabulary is not emphasized in this class.
7. (V) Learn about some problems astronomers and astrophysicists are trying to solve, and understand the methods scientists are using to try to solve these problems.
8. (V) Develop a sense of what scientists know about the overall universe, its constituents, and our location
9. (V) Understand the data that led to the development of modern cosmology and the Big Bang theory
10. (A) Evaluate the significance of the major evidence in favor of the Big Bang theory.
11. (A) Illustrate how galaxies are distributed through space.
12. (A) Discuss the evidence for Dark Matter and Dark Energy.
13. (V) Understand the following ideas related to gravity:
 - a. Falling in a gravitational field
 - b. Newton’s 3rd law relating action forces and reaction forces
 - c. Three components that determine the strength of the gravitational force
 - d. Orbits
14. (V) Understand and be able to make predictions about orbital motions, as explained by Kepler’s laws as revised later by Isaac Newton.
15. (V) Understand the simpler concepts about light and the different processes that cause light to be emitted or absorbed
16. (A) Explain how electromagnetic radiation and astronomical instruments are used to reveal the properties of stars and galaxies.
17. (A) Diagram the process of nuclear fusion.
18. (V) Describe major star characteristics, stellar structure and stellar evolution
19. (A) Calculate the distance to a star.
20. (V) Describe galaxy structure and a little about evolution in clusters
21. (A) Diagram and explain radiative transport in the Sun. Explain the causes of surface features

on the Sun.

22. (A) Contrast the life history of a low-mass star with the life history of a high-mass star.
23. (A) Explain how black holes are formed and their effect on their surrounding environment.
24. (A) Describe the structure and contents of the Milky Way Galaxy.
25. (A) Compare and contrast elliptical, spiral, peculiar, dwarf, and irregular galaxies.
26. (A) Evaluate the possibility of intelligent life around a particular star.

The following student learning outcomes may not be covered in this course.

27. (A) Judge whether a particular study is a science or a “pseudo-science” using the scientific method.
28. (A) Predict the phase of the Moon seen in the sky, given the positions of the Earth, the Sun, the Moon, and the observer.
29. (A) Explain the causes of seasonal variations in the length of the day, the direction of sunrise and sunset, and the amount of solar heating.
30. (A) Diagram the positions of the Sun, the Earth, and the Moon during solar and lunar eclipses.
31. (V) Newton’s laws of inertia (i.e. Newton’s 1st law) and acceleration (i.e. Newton’s 2nd law).

Philosophical statement

A sense of curiosity regarding the universe in which we live is an essential asset in any science course. Develop the habit of questioning, critiquing, and wondering about the things you observe around you; the quality and enjoyment of your life will be immensely enriched. Hopefully this class will help you ask and answer questions.

Learning planets, stars, and constellations

If you are looking for a class that will teach you about specific stars and constellations, you should enroll in Astronomy 12, which is a nighttime astronomy lab class that may use the planetarium more than we will. You will receive credit for both Astronomy 25 and 12. If you are interested in learning about planets, moons, asteroids, comets, or similar objects, you should enroll in Astronomy 20. These topics will be covered very minimally in astronomy 25 (if at all). The second code word is quasar.

Credit for the Course, Transferability to a University

Credit for 3 units of Astronomy 25 is fully transferable to the California State University system. Credit is fully transferable to the U.C. system unless you also take Astronomy 20. See a counselor if you have taken or will take Astro 25 and are planning to transfer to a U.C.

Grades, Homework, Late Policy

Grades

Your overall course grade will be determined as follows:

Clicker questions/participation....	20 pts total*	No penalty for wrong answers
6 Tests.....	100 pts each**	Multiple choice types of questions
Homework.....	approx 40 pts total.....		Assignment type varies.
Extra credit.....	Up to 30 pts max.....		See elsewhere for more information.

* There is a correlation between participation and final course grade. The more often you come to class and participate, the more likely you are to receive a better grade. While participation usually helps, it does not guarantee any specific grade.

**Every test will be graded out of a different number of questions. Your score will be converted into a percent, which I called "points" in the table above. The third code word is brown dwarf. For example, test 1 may be graded out of 75 questions. If you got 68 correct, you'd have $68/75 = 90.7\% = 90.7$ points. What matters is your percent on each test.

A grade of "A" will be earned for a 90% average, "B" for 80%, "C" for 65%, "D" for 50%, and "F" for below 50%. This scale will not be revised during the semester.

Homework

Homework will be collected almost every day in class, except on days when we have tests. For classes that meet only once per week, two separate homework assignments may be collected in a single class session. Each homework assignment will be graded out of 2 points.

Unless you request otherwise, it is likely you will only receive a score on your homework paper when you get it back. However, if you wish for more detailed comments from me, write your request clearly in large and/or colorful letters at the top (so I notice your request) and I will do my best to honor your request. I do tend to write more comments on homework submitted via email. (See below for instructions on how to submit homework via email.)

Homework will be accepted during the first 15 minutes of class. It need not be typed, but it must be easy for me to read in order to receive credit.

Submitting homework over email

You are also **welcome, but not required, to submit homework via email *before class begins*, as long as you send the email from your El Camino email account and indicate which day(s) your class meets in the subject line of your email.** I will reply with an email or two acknowledging I received your email and informing you of your grade on the assignment. These two emails may come separately or may be combined into one.

Late Policy

If you do not submit your homework by the first 15 minutes of class, you will receive no credit for the work. There are only two exceptions.

Exception #1: you are given two NQA (No Questions Asked) coupons with the homework packet. You may submit an NQA coupon instead of a homework assignment.

Exception #2: circumstances arranged in consultation with the instructor. Leaving me a message notifying me that you'll be late does NOT count as prior arrangement. The fourth code word is your last name.

NQA coupons

I will keep track of coupon usage on my computer, so you do not need to cut the coupons out of your syllabus.

For homework, the NQA coupon may be submitted up to one class after the homework was due. Submitting a coupon will give you 2 points on the assignment.

You also may use your coupon(s) to postpone the due date for test rewrites, which tend to earn you MUCH more credit than a homework assignment. For test rewrites, the NQA coupon should be submitted with the test rewrite.

Clicker questions/participation

A radio-frequency personal response system (a.k.a. “clickers” which function like “Ask the audience” on TV’s *Who Wants to Be a Millionaire* and *I vs. 100*) will be used frequently during the class. Clickers will be used to take attendance daily and to ask questions during class. Answering these questions will give you full participation points. There is no penalty for answering incorrectly.

Tests

Note cards

You are permitted and encouraged to use one handwritten 3-inch by 5-inch double-sided index card for each test.

Scantron

SCANTRON FORM 882-E IS REQUIRED FOR ALL EXAMS!

Test dates

Test dates and more information will be handed out on a separate form. For classes that meet twice per week, tests will take place on the second day of the week unless announced otherwise one week in advance.

Test Rewrites

Test re-writes are available for all but the last test. These rewrites are an educational way to increase the scores you earned for the tests and help you learn from your mistakes. See elsewhere in this syllabus for test rewrite directions and for more information. The fifth code word is your first name.

Missing an exam

If you miss an exam... All students will have their lowest test grade dropped. Therefore there are no make-up tests. If you know you will be absent on one of the dates above, **contact the instructor at least two calendar days prior** to the test to see if there is a way to accommodate you at another time (e.g. another section). **There are no exceptions to this rule**: if you do not contact the instructor two calendar days prior to the test and you miss the exam, **you will receive a zero on the test**. But it’s not so terrible because your lowest score gets dropped.

Student Expectations

Keep all handed-back assignments

My computer frequently deletes and changes scores. If my computer has a mistake, this will allow you to make sure you receive the grade you have earned.

Attendance

Please be prompt and do not leave class early without a good reason. **Attendance in this class is mandatory, will be taken daily, and will form part of your grade** through the clicker points. The reason attendance is mandatory is because material will be covered in class in more detail than in the text and this extra material will appear on tests. We will also be doing several activities that require your participation and discussion. For this reason, watching the videos at home instead of coming to class is insufficient.

Dropping students for non-attendance

If you've missed more than **six** hours of class without justification, you **may** be dropped. However, if you wish to be dropped from the class, it is your responsibility to withdraw. Do not count on me to drop you just because you do not show up for class. Students who withdraw from the course after **May 8** will receive a letter grade based on the entire semester's requirements. If you wish to receive a refund for this class, you must drop by **February 27**. If you wish to drop and receive no mark on your record, do so by **March 6**.

Study sufficiently

You should plan to work outside of class for at least 1.5 hours (and more likely 2-3 hours) for every hour of class time (which amounts to 4.5-9 hours per week). It should take you at least 30 minutes alone to do the required reading and homework each night. While this may sound like a lot, probably more than your work in high school, it is no more an impingement on your time than most college classes at four-year schools (e.g. USC, UC, CSU). You are expected to work at (or above) the college level and most of you will find that this requires a lot of preparation outside of class.

Ask Questions

The most important expectation I have of you is to **ask questions** (either in class or in office hours) especially if you do not understand something covered in class (or in the readings). **Don't be shy**, since **others likely share your concerns**. Chances are that if you are having trouble with something in class, **you are not alone** and I need to address it.

Cell Phones and Pagers – please turn them off

Ringing phones and pagers are distracting to the teacher and other students. Please be considerate and turn off such devices.

And most importantly:

Good luck and learn lots of astronomy!

CLICKER USAGE

Please read this entire sheet! Keep this for your records.

Each clicker has a label on the back with a number on it. From now on, you should use the same clicker for every class.

My Clicker Number is _____

Voting

To vote, press and release the number of your choice. The **light** above the “1” should blink amber (orange) until the signal is received by the teacher’s computer. When the signal is received, the light should turn green and then go off. If your response was a valid choice (i.e. 1 or 2 for a True/False question – 3 through 9 are not valid choices for T/F questions), the response box (projected on the same display as the question) corresponding to your clicker number should change from the background color to a different color.

Changing your vote

Except for questions that allow more than one choice, you may change your vote as many times as you like until polling closes. Only your final vote will be recorded by the computer unless told otherwise. Each time you change your vote, the response box corresponding to your clicker number will alternate between two colors. Polling opens when the PowerPoint presentation shows a green box in the upper right corner. When that box turns red, polling closed.

Troubleshooting:

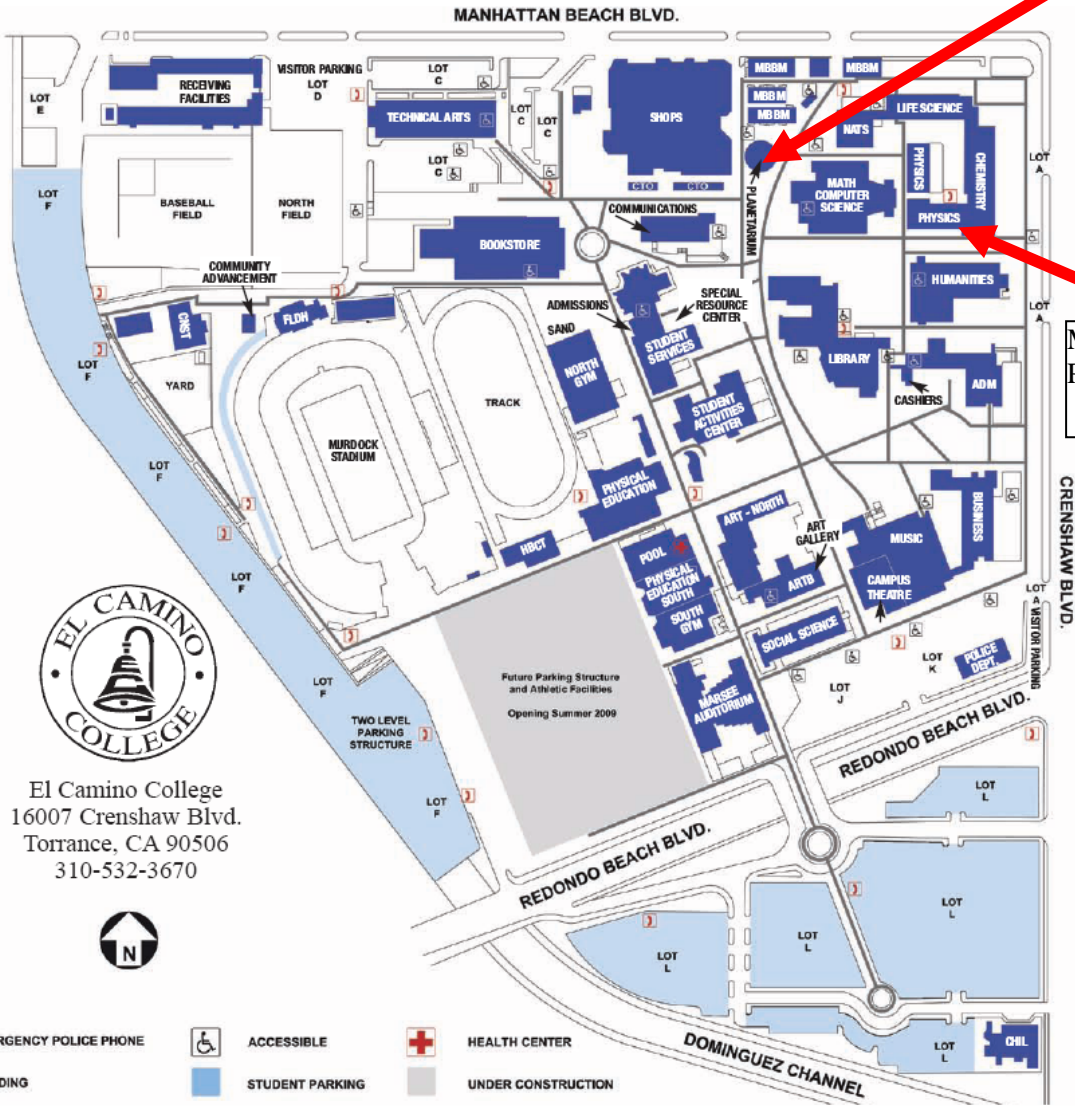
- 1) If your signal was not received by the teacher’s computer, your light will flash amber (orange) up to 10 times and then turn red. Try resubmitting your vote. If it doesn’t work the second time, try again and if it still fails, ask your teacher for a temporary replacement clicker to be used for the rest of class.
- 2) **Don’t press the “Go” button** below the “7”. This will change the “channel” of your clicker, and your teacher’s computer only reads channel 41 right now. All clickers are currently set to channel 41. If you do accidentally press “Go”, the colors on your clicker light should alternately flash red-orange-green. When this happens, press “4” and “1” and press “Go” again. This should turn the light green, indicating you successfully changed back to channel 41. If not, try “Go” “4” “1” “Go” again. If that doesn’t work, ask your teacher for a temporary replacement clicker to be used for the rest of class. The last syllabus extra credit word is astronomy.

On your homework sheet, there is a clicker contract you MUST sign and submit to the instructor.



ECC CAMPUS MAP

Planetarium is here



Mr. Vakil's office =
Physics 117F is here



El Camino College
16007 Crenshaw Blvd.
Torrance, CA 90506
310-532-3670



- KEY:**
- EMERGENCY POLICE PHONE
 - ACCESSIBLE
 - HEALTH CENTER
 - BUILDING
 - STUDENT PARKING
 - UNDER CONSTRUCTION

EL CAMINO COLLEGE

BUILDING / LOCATION	ABBREVIATION	BUILDING / LOCATION	ABBREVIATION
ADMINISTRATION	ADM	MATH / COMPUTER SCIENCE	MCS
ART AND BEHAVIORAL SCIENCE	ARTB	MURDOCK STADIUM	STAD
ART BUILDING - NORTH	ARTN	MUSIC	MUSI
BASEBALL FIELD	BBFL	NATURAL SCIENCE	NATS
BOOKSTORE	BKST	NORTH FIELD	NFLD
BUSINESS	BUSI	NORTH GYM	NGYM
POLICE DEPARTMENT	ECPD	PHYSICAL EDUCATION	PE
CAMPUS THEATRE	TH	PHYSICAL EDUCATION SOUTH	PE-S
CHEMISTRY	CHEM	PHYSICS	PHYS
CHERRY TREE OFFICES	CTO	PLANETARIUM	PLAN
CHILD DEVELOPMENT CENTER	CHIL	POOL	POOL
COMMUNICATIONS	COMM	SAND COURTS	SAND
COMMUNITY ADVANCEMENT OFFICE	CADV	SHOPS	SHOP
CONSTRUCTION TECHNOLOGY	CNST	SOCIAL SCIENCE	SOCS
FIELDHOUSE	FLDH	SOUTH GYM	SGYM
HANDBALL COURTS	HBCT	SPECIAL RESOURCE CENTER	SRC
HUMANITIES	H	STUDENT ACTIVITIES CENTER	ACTC
SCHAURMAN LIBRARY	LIB	STUDENT SERVICES CENTER	SSVC
LIFE SCIENCE	LS	TECHNICAL ARTS	TECH
MANHATTAN BEACH BLVD. MODULES	MBBM	TRACK	TRAK
MARSEE AUDITORIUM	AUD	YARD	YARD