ASTRONOMY 25 **STARS AND GALAXIES** ***SPRING 2020***

***or**, Big Bang to Black Holes*

COURSE INFORMATION SHEET/SYLLABUS
Tuesday/Thursday sections

Instructor: S. Vincent Lloyd ***email***: svlloyd@elcamino.edu
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Office hours: see instructor website. ***twitter:*** @eccobservatory
Office location: Physics 117F, next to the Warrior Pantry.

Dates: Tuesdays & Thursdays, February 18 — June 11
Holidays: April 13–18 (Spring Break)

Course Description

Greetings, Earthlings! You are about to embark on a journey into the depths of space and towards the beginning of time! Astronomy 25 is an introductory-level course which tells the story of the Universe from the Big Bang to the rise of life on Earth.

The course has no astronomy, physics, or math prerequisites. There is only a little math in the course, buy you will be expected to know concepts like squares and exponents. There are many physics ideas in the course, since we need to understand the laws of physics in order to interpret what we see in the sky. If you are not interested in learning some basic physics concepts, you should consider taking another course.

Credit for Astronomy 25 is fully transferable to the California State University system. Credit is fully transferable to the U.C. system (however, U.C. won't give you full credit for both Astro 20 and Astro 25 — see a counselor).

This is a 3 unit course. Each unit represents three hours of work. One of those hours is spent in class; the other two hours are study outside the classroom. We meet for 3 hours every week, so you are expected to study 6 hours a week at home.

Course Objectives

The objective of Astronomy 25 is to give you an insight into the Earth's place in the cosmos. At the end of the course, you will be expected to be able to:

1. Explain the difference between science and"pseudo-science."
2. Explain the causes of seasonal variations in the daily path of the Sun.
3. Explain how astronomers use the properties of light to learn about stars and galaxies.
4. Discuss the effect of the solar cycle on the Earth.
5. Compare different ways astronomers use to measure the distances to the stars.
6. Contrast the life history of a low-mass star with the life history of a high-mass star.
7. Describe the properties of space and time around a black hole.
8. Describe the structure and contents of the Milky Way Galaxy.
9. Compare and contrast the different kinds of galaxies.
10. Show how galaxies are arranged in clusters, walls, and voids.
11. Discuss the process of nuclear fusion, the energy source of stars.
12. Discuss the evidence for Dark Matter and Dark Energy.
13. Evaluate the significance of the major evidence in favor of the Big Bang theory.
14. Discuss the factors affecting the possibility of intelligent life around another star.
15. Explain the evidence for the expansion of the Universe

Student Learning Objectives

1. Students will be able to recognize the elements of the Scientific Method in the discussion of a scientific problem.
2. Students will be able to explain how the study of electromagnetic radiation and astronomical instruments are used to reveal the properties of stars and planets.
3. Students will be able to explain the modern theory of the origin of the Universe (the Big Bang Theory) and discuss the evidence that supports the theory.

Required textbooks

Lecture Tutorials for Introductory Astronomy by Prather. BUY THIS BOOK — DON'T RENT IT! You will be writing in this booklet.

Lloyd's Astronomy Reader by Lloyd (available in the El Camino Bookstore).

On-line textbook: *www.teachastronomy.com* (free).

Additional materials: 8 Scantron No. **883** forms , a pack of 100 3x5-inch index cards, pencils, and a ruler.

Attendance and Withdrawal

The College expects students to attend every class (except in case of illness or emergency). Keep in mind that while coming to class by itself will not earn you a passing grade, not coming to class makes it difficult to pass the course. If you can't make it to class, check the instructor's website to see what you have missed. Contact the instructor if you miss two or more classes in a row.

The instructor may drop you from the course if you miss more than 3 classes before the last day to drop. However, he might not drop you if he doesn't notice that you're not in class. If you decide not to complete the course, it is your responsibility to drop the course on-line (if it is before the last day to drop). Otherwise, you may end up with an "F" for this course on your transcript.

Important dates

Last day to drop without a "W"	**Sunday, March 1**
Last day to drop with a "W"	**Friday, May 15**

A "W" (withdrawal) means that you attempted the course but did not complete it; it doesn't affect your Grade Point Average (GPA), but a large number of Ws will cause you to be put on academic probation. If you stop attending after the "W" date you will probably receive an "F" for the course. If an emergency comes up at that time, ask the instructor for an I (incomplete) (see page 6).

Assignments, Exams, and Grades

Speech.

With a partner, you will make a 2-minute speech about a famous celestial object, a star, star cluster, nebula, or galaxy. This is a 2-person speech; you **must** have a partner. First you will prepare an outline and bring it to the instructor during office hour. After your outline is approved, you will be ready for your speech. A form for the outline is attached. The speech is worth **20** points (about 5% of your course grade).

If you or your partner are absent on the day your talk is scheduled, you will be rescheduled for the next available day, if one is open. If you give your talk on the scheduled day, you will be awarded bonus points. The number of bonus points equals the number of whole weeks left in the semester.

Note: The use of notes is **not** allowed during the talk.

Projects

You will do two homework projects involving observation of the Sun and the stars. Details can be found on the website. You can do the project by yourself or with one partner, but no more than two people can work together. If you choose to work with a partner, be aware that both partners are responsible for turning the project in on time. Do not copy from a third person or let someone else copy your results.

If because of special circumstances you can't do one of the projects, talk to the instructor about doing a substitute project.

Each project is worth **30** points. Penalty for late projects: 3 points per school day. The project should be stamped every week. Late projects will be accepted only if they have at least one stamp.

Note: Each project is worth 7% of your grade.

NOT DOING THE PROJECTS WILL LOWER YOUR COURSE GRADE AT LEAST ONE FULL GRADE.

Homework

There will be 4 Problem Sets (worth **10** points each).

Two students can do the **Problem Sets** together, but no more than two. Do not copy from a third person or let someone else copy your results.

Late homework will not be accepted after the graded homework has been returned.

Note: The homework is 10% of your grade.

NOT DOING THE HOMEWORK WILL LIKELY LOWER YOUR COURSE GRADE ONE FULL GRADE.

Quizzes and exams

There will be a quiz or exam **every other Thursday**. See the schedule (page 7) for the quiz and exam dates. Bring a **Scantron 883** for each quiz and exam.

The quiz is practice for the exam. It is not graded.

There will be 4 exams worth **100** points each (together making up 60% of your course grade). See the schedule (page 7) for the exam dates. Bring a Scantron No. **883** for each exam.

During the exam, you are allowed to use notes written on **one** standard 3x5-inch index card, written **in your own hand.** It has to be a **pre-cut** file card or index card; pieces of paper you cut out yourself are not allowed.

The lowest exam score will be dropped, so there is no penalty for missing one exam. (Exception: any exam in which cheating occurs will automatically get a 0 which will not be dropped.)

If an emergency causes you to miss a second exam, you may, at the instructor's discretion, be allowed to take an **oral** make-up exam. No notes are allowed during the oral exam. The oral exam must be taken before the next regular exam date.

Study guides: You will be given study guides that will detail what material you are responsible for on the exams. If you can thoroughly explain all the concepts on the study guide, you should do well on the exam.

If you have a disability that affects your ability to take exams, contact the Special Resource Center well ahead of the exam date to discuss special test-taking arrangements.

Extra credit

You may go to **one** of the following two science museums for up to 30 points extra credit.

1) Griffith Observatory

Location: Griffith Park; go up Vermont Ave. to the end. Parking is $6–8 an hour. Parking is limited on weekends — get there at 10am on Saturday or Sunday.

Public transportation: DASH Observatory bus (50¢) leaves from Vermont/Sunset station on the Metro Red Line. You can get to the Red Line by taking the Silver Line bus and get off at 7th St.

Website: **griffithobservatory.org**.

Hours: Tuesday–Friday:12 to 10 pm. Saturday & Sunday: 10am to 10 pm.

Closed Mondays. Closed Thanksgiving Day and Christmas.

You will need to get a proof of attendance with a **date** on it: Options:

(1) Get a proof of attendance from one of the friendly staff.
(2) Buy a planetarium show ticket ($5 for students).
(3) Buy something at the store or the cafe and get a printed receipt.

A BROCHURE IS NOT ENOUGH. A PHOTO IS NOT ENOUGH.

2) **California ScienCenter**

Location: Exposition Park near the Coliseum. Open daily 10–5.

The museum is free but parking is $12 (cash only). Be aware of heavy traffic on football days.

Public transportation: the museum is a short walk from the 37th St/USC stop on the Metro Silver Line.

Website: **www.californiasciencecenter.org**.

Be sure to get a proof of attendance with a **date** on it. Options:

(1) Buy a ticket for the Space Shuttle and get a printed receipt.
(2) Make a small donation and get a printed receipt.
(3) Buy something at the store and get a printed receipt.
(4) Buy a ticket for the IMAX theater or a special exhibit.

A "SCIENCE PASSPORT" IS NOT ENOUGH. A BROCHURE IS NOT ENOUGH.
A PHOTO IS NOT ENOUGH. A PARKING PERMIT ISN'T ENOUGH, EITHER.

Rules for all extra credit

1)You can make **one** visit for extra credit. You may go to either Griffith Observatory or the California Science Center, but not both.

2) Write a **1-page report** and explain 15 things you learned about **science or spaceflight**. This is an individual report; everyone must write their own report in their own words.
Be specific: tell what you learned, not what you learned about.

Acceptable:*I learned that the Apollo command module carried three men to the Moon.*
Not acceptable: *I learned about the Apollo program*.

You get 2 points for every specific fact that you describe in your report, up to a maximum of 30 points.

3) Attach proof of attendance with a date on it.
A BROCHURE, PARKING PERMIT, OR PHOTO IS NOT SUFFICIENT.

4) Turn in your report no later than the end of week 15.
"Turning it in" means printing it out and handing it to the instructor (or leaving it on his door); email is NOT enough.

NO EXCEPTIONS—not for illness, computer malfunction, natural disaster, or alien abduction!

Grading Scale

Grade points	
4 Problem sets	40
2 Projects	60
Speech	20
3 of 4 exams	300
Total	420

Tentative grading scale		
>92%	A	≥386 pts
88 — 92%	B or A	370 — 385 pts
77 — 88%	B	323 — 369 pts
73 —77%	C or B	307 — 322 pts
62 — 73%	C	260 — 306 pts
58% — 62%	D or C	244 — 259 pts
50% — 58%	D	210 — 243 pts
<50%	F	<210 pts

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The precise grade breakpoints will be determined at the end of the semester on the basis of the points distribution, but will be within the ranges shown above. This means that in order to guarantee an "A," for example, you need to get at least 92% or 386 points.

GRADE RECORD	Points	Cumulative Points	Possible Points	Cumulative Possible Pts
Problem set 1	_____	_____	10	10
Exam 1	_____	_____	100	110
Problem set 2	_____	_____	10	120
Exam 2	_____	_____	100	220
Project 1	_____	_____	30	250
Problem set 3	_____	_____	10	260
Exam 3	_____	_____	100	360
Project 2	_____	_____	30	390
Problem set 4	_____	_____	10	400
Exam 4	_____	_____	100	500
Less lowest exam	_____	_____	—100	400
Speech	_____	_____	20	420
Extra credit	_____	_____	30	420

Grading Policies.

The college's standard grading policies can be found at:

www.elcamino.edu/admissions/grading.aspx

This page contains information on units, grade points, withdrawal, incompletes, and grade change procedures.

Class Policies

Manners. Treat other students and the instructor with respect and courtesy. Do not talk while another student or the instructor is speaking.

Food and drink. Please do not bring drinks other than water into the Planetarium; coffee and soda spills will stain the carpet. Do not eat during class.

Time deadlines. Assignments are considered late if they are given to the instructor **after the end of his last office hour** on the week that they are due. An assignment has to be handed to the instructor during class or office hour or clipped to his office door. Do not drop off assignments in the division office. emailed assignments are not accepted. Late homework is not accepted after the graded homework has been returned. Observing projects turned in late are subject to a 10% per day penalty (not counting weekends or holidays).

Incompletes in the course. An "incomplete" grade will be given only when the student is prevented from finishing the course on time because of an extraordinary, unexpected circumstance. Students receiving an incomplete must be doing passing work up to that point. If such an occurrence happens, it is the student's responsibility to contact the instructor immediately to explain the situation and make arrangements to complete the course.

Academic integrity. The following acts are considered dishonest and are not allowed:

1. On homework assignments and projects: copying someone else's work, making up data, or reporting that you saw something that you didn't see. Copying someone else's homework is against the rules in the United States. So is letting someone else copy your work.
2. On exams or quizzes: copying from another student's answer sheet or using notes other than those allowed by the instructor. Letting someone else copy your answers is also unethical.
3. Taking an exam or quiz copy home.

Any quiz or exam during which cheating occurs will automatically get a 0 which will not be dropped.

Students who do any of these actions are subject to disciplinary action.

For a complete list refer to the El Camino College Catalog:

Students' Rights and Responsibilities: Policies and Procedures: Definitions

Recording devices in the classroom

The use of any recording device during class without the prior consent of the instructor is prohibited, except as necessary to provide reasonable auxiliary aids and academic adjustments to disabled students who present official documentation from the Special Resource Center to the instructor prior to recording. This is to protect privacy and to create a safe classroom environment where all participants can discuss potentially controversial or sensitive subjects freely. If you want to take a photograph or make an audio or video recording, you must get the prior written permission of the instructor. The instructor also may require the verbal and/or written permission of everyone present. Even if a student gets permission to record, the recordings are only for personal use and may not be distributed, posted, published, or shared in any manner. A student who records without instructor permission or distributes any recordings is subject to disciplinary action in accordance with El Camino College District Administrative Procedure 5500 Standards of Student Conduct.

Students with disabilities

El Camino College is dedicated to providing access to education for students with disabilities. For further information, see the El Camino Catalog, Special Resource Center. Students with disabilities should inform the instructor especially if there are medical problems or learning disabilities. Accommodations may be provided as recommended by the Special Resource Center. See http://www.elcamino.edu/student/studentservices/src/

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ASTRONOMY 25 TOPIC SCHEDULE

Wk	Date	Topic	
1	2/18	Introduction	
	2/20	Bad Astronomy	
2	2/25	The Universe in Space & Time	
	2/27	Powers of 10	**Quiz 1**
3	3/3	Starrise & starset / Star paths	
	3/5	Sky Gems / L.T. “Solar vs Sidereal Day”	
4	3/10	Great Discovery #1: The Sun is in the Center	
	3/12		**Exam 1**
5	3/17	Great Discovery #2: The Stars are Suns	
	3/19	Great Discovery #3: the Galaxy	
6	3/24	Great Discovery #4: the Galaxies	
	3/26	Great Discovery #5: the Expanding Universe	**Quiz 2**
7	3/31	The Big Bang vs the Steady State Theory	
	4/2	The First Million Years	
8	4/7	Annual motion of the Sun / Zodiac/ Star Seasons	
	4/9		**Exam 2**
9	4/21	The Galaxies	
	4/23	Dark Matter	
10	4/28	The Milky Way	
	4/30	Stars: Distance	**Quiz 3**
11	5/5	Stars: Brightness	
	5/7	How stars shine	
12	5/12	The Zoo of Stars	
	5/14	Precession of the Equinoxes	
13	5/19		**Exam 3**
	5/21	Life Histories of Stars	
14	5/26	The Sun	
	5/28	Stars that Go Boom!	**Quiz 4**
15	6/2	The Theory of Relativity / Interstellar Travel	
	6/4	Black Holes	**E/C due**
16	6/9	The Search for Life in the Universe	
	6/11		**Exam 4**

TIPS FOR SUCCESS IN YOUR ASTRONOMY COURSE

While you are away from campus

1. Get a student calendar and write in your exam dates and assignment due dates.

2. Set aside a regular time and place to study your astronomy every week. You are expected to spend six hours every week on study and homework.

3. Make college a priority in your life. For example, don't make appointments during class time.

4. Do your homework.

5. Make flash cards to prepare for exams.

While you are on campus

1. Buy all your Scantron forms the first week so you will have one on test day. Also get a stack of 3x5-inch index cards.

2. Find out where the instructor's office is and when his office hours are.

3. Get to know the tutor. She or he is in the library on the 2nd floor, west end.

4. Form a study group with others in the class.

5. Take an Academic Strategies class, such as Test-Taking Strategies (English 61), Listening and Note-taking Strategies (English 65), or EDEV 33 -(Specific Learning Strategies).

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While you are in class

1. Get to class five minutes early and review your notes from last time.

2. Turn off your cellphone. Do student 100%.

3. Take enough notes during class so that at the end of the week you will be able to tell what the lecture was about.

4. Raise your hand when something is not clear. The thing will no doubt be unclear to many others in class. They will be grateful to you.

5. Do the lecture-tutorials completely and conscientiously. See the tutor or visit the instructor during his office hour if you don't understand something.

Thanks to Dave Pierce for suggestions.

"We are not here to worship what is known, but to question it."—J. Bronowski

EXAMPLE: SPEECH OUTLINE

Topic ___ *M81* __ Outline due_____ Speech Date _____

Make an outline organized by topic and subtopics. Don't write out complete sentences. Be neat.

I. Introduction: *M81* _ is interesting because...

A. *It's easy to see.*
B. *It's my favorite galaxy.*

II. Middle. Give the basics about your subject: what, where, how big. etc.

A. Classification
1. *a spiral galaxy*
2. *spiral arms — star formation*

B. Location
1. *constellation — Ursa Major*
2. *12 million LY away*
3. *Ursa Major family — neighboring galaxy cluster*

C. Size
1. *about 100,000 LY across*
2. *size of Milky Way*

D. Supernova
1.*SN 1993J*
2. *unusual kind of exploding star*
3. *led to re-classification of supernovas*

III. Conclusion:*M81* is important because...

A. *shows how galaxies affect their neighbors*

IV. References
List at least two references with complete URLs.

1. *en.wikipedia.org/wiki/Messier_81*
2. *coolcosmos.ipac.caltech.edu/cosmic_classroom/multiwavelength_astronomy/multiwavelength_museum/m81.html*

NAME _____
Home town _____
High school _____
Major _____
Other info _____

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SPEECH OUTLINE

Topic _____ Outline due_____ Speech Date _____

Make an outline organized by topic and subtopics. Don't write out complete sentences. Be neat.

I. Introduction:_____ is interesting because...

II. Middle. Give the basics about your subject: what, where, how big. etc.

III. Conclusion: _____ is important because...

IV. References
List at least two references, with complete URLs.