

COLLEGE OF DUPAGE

Astronomy: Stars & Galaxies (Earth Science 1124-001)

Spring 2024

Instructor: Dr. David R. Fazzini

Office: BIC-3E04B

Office Hours: Mon.: 10:20 AM – 11:50 AM & 4:00 PM – 4:30 PM

Tues.: 1:00 PM – 2:00 PM

Wed.: 10:20 AM – 11:50 AM & 1:00 PM – 2:00 PM

Thur.: 1:00 PM – 2:00 PM

Fri: 9:00 AM – 9:50 AM & 10:00 AM – 10:50 AM

(Additional times available by appointment.)

NOTE: During some of my office hours, I will be found in the Physics Lab Prep area (BIC-3E06) or one of the adjoining labs (BIC-3F03, -3F05, or -3F07).

Phone: 630-942-3349

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Course Description:

A study of stars, galaxies, deep space objects, and cosmology utilizing the latest astronomical discoveries. Major topics include constellations, the Sun, stellar types, motions, parallax, magnitudes, luminosity, spectra, classifications, clusters, evolution, quasars, nebula, galaxy classification and composition, the Big Bang, inflation, and cosmology.

Semester Credit Hours: 4

(Weekly: 3 lecture hours + 3 lab hours)

IAI Course Code: P1-900L (for general education)

Prerequisite: MATH 0465 or MATH 04841 (or college equivalent) with a grade of “C” or better or qualifying score on the mathematics placement test or a qualifying A.C.T. math score. Course requires Reading Placement Score-Category One

Text: The Cosmic Perspective: Stars, Galaxies and Cosmology 9th ed. by Bennett, Donahue, Schneider and Voit (required)

Material: Chapters 1-6, S1-S3, 14-24

Lab Manual: Earth 1124 Lab Manual by J. DalSanto, Kendall Hunt Publishing (required)

Lecture & Lab Location: BIC-3533

Time: TR: 9:00-11:50 AM

Course Objectives:

Upon successful completion of this course you should be able to do the following:

1. Identify common seasonal and circumpolar constellations, asterisms, and major bright stars
 2. Solve problems related to synodic and sidereal time as well as stellar locations, using both the horizon and equatorial systems
 3. Describe the composition, structure, features, and processes of the Sun
 4. Demonstrate how to use stellar spectra to determine spectral class, temperature, amount of Doppler shift, and composition of the star(s) in question
 5. Justify parallax to determine the distances to nearby stars
 6. Recognize stellar motions, magnitudes, luminosity, and classifications
 7. Explain the various stages in the life cycle of a star using the positions on Hertzsprung-Russell (H-R) diagram
 8. Compare and contrast binary stars, variable stars, red giants, white dwarfs, neutron stars, pulsars, black holes, and normal stars
 9. Categorize galaxies on the basis of their characteristics using the Hubble/DeVaucouleurs system
 10. Differentiate among peculiar galaxies: quasars, Seyfert galaxies, and radio galaxies
 11. Appraise the relationship of energy and matter formation in the Big Bang using string theory
 12. Assess the accepted theories of cosmology and their relationship to open, closed, and flat models of the universe and their relation to the fate of the universe
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Course Logistics:

GENERAL COURSE INFORMATION can be found through the class webpage:

<https://www.cod.edu/faculty/websites/fazzinid/astronomy-1124.aspx>

and the **Blackboard** website:

<https://bb.cod.edu/webapps/login/>

Check the class webpage regularly for general announcements and updates. Login to **Blackboard** homework access assignment updates. These sites will provide important announcements and course updates such as reading/online homework assignments and laboratory information. The class webpage will be updated on a regular basis and **Blackboard** will be used for homework access, blanket emails and grade dissemination.

READING assignments will be announced in class and posted on the class webpage. It is assumed that you have read the assigned material by the due date (see QUIZZES). Check the class webpage regularly for assignment updates.

HOMEWORK assignments will be provided online using the *MasteringAstronomy* homework platform which **must be accessed within your EARTH 1124 shell of Blackboard**. (See the **Blackboard** URL above.) You will need to create an account:

Once in your EARTH 1124 Shell of Blackboard, click on “Mastering Astronomy” content area in the navigation column to the left. Then click on “MyLab and Mastering Course Home.” If you purchased the textbook new, it will have come with a student access code. If not, you will need to purchase an access code to subscribe to **MasteringAstronomy** at a nominal cost. Alternatively, you can pay for access when you register. (You can also choose to buy just the e-book version if you wish when registering).

Plan to do this *early* to be ready to begin promptly. Check the *MasteringAstronomy* calendar and/or class webpage regularly for assignment updates. **Again, it is important that you always enter the Mastering Astronomy platform through Blackboard.**

As the homework is a required part of the course, you must complete at least 50% of all the homework in order to receive a passing grade regardless of exam, lab, and quiz scores. As there are no “make-ups,” you are strongly advised not to miss any homework assignments.

Be aware that it is very important that you make an honest attempt to work through the questions, exercises, calculations and problems since doing the homework is a primary technique for learning the material. It is also very important that you be able to understand the solutions conceptually rather than just memorizing formulas since the exam questions and problems generally require you to demonstrate application of the concepts being assessed. Be sure that you can answer any assigned question or solve any assigned problem since they may appear on an exam. It is your responsibility to seek assistance from your instructor and/or other resources if you are having difficulties.

QUIZZES consisting a few multiple-choice, matching, or short response questions based upon the reading assignment due that day are administered with warning or without warning prior to the start of each class. (You must be in class for the quizzes at the time they are administered. There are no “make-ups.” However, there will be a few extra quizzes that can replace a missed quiz.) The quizzes are primarily designed to make sure that you keep up with the assigned reading and thus have some familiarity with the topics that are about to be discussed.

EXAMS will consist of four exams during the semester. The exams typically consist of 30 multiple choice questions following by matching, true/false, and short response questions. The questions are derived from homework sets, the textbook, and examples worked in class or the laboratory. All exams are closed book and closed note. All four exams must be taken in order to receive a passing grade. Any missing exam score will result in an automatic grade of “F” for the course regardless of other exam, lab, quiz, and homework, lab, and quiz scores.

Tentative Exam schedule:

Exam 1: 10:00 AM-11:50 AM, Tuesday, Feb. 13 th	Chapters 1-3, S1
Exam 2: 10:00 AM-11:50 AM, Tuesday, Mar. 12 th	Chapters 4-6, S2, S3
Exam 3: 10:00 AM-11:50 AM, Tuesday, Apr. 16 th	Chapters 14-18
Exam 4: 9:00 AM-10:50 AM, Thursday, May 16 th	Chapters 19-24

LABORATORY sessions are embedded in every class meeting. The laboratory section is designed to provide you with interactive experiences related to the topics that are discussed during the lecture. The labs are designed to enable you to discover for oneself how astronomers have learned what we know about the cosmos. While greatly simplified, the laboratory activities provide good examples as to how astronomy is done. You will use simulation software, videos, make predictions, answer questions, and record observations and findings in the required manual. The lab activity packet is to be completed and submitted by the end of the class period (11:50AM) unless otherwise stated.

As the laboratory is a required part of the course, your final grade will drop one full letter for every three lab assignments that are missed regardless of exam, homework, and quiz scores. As there are no “make-ups,” you are strongly advised not to submit all lab assignments.

iCLICKERS will be provided to each student by the instructor. The system will allow you to further interact with the instructor during the lecture. You will be able to respond to questions and give feedback as the course progresses. The questions typically consist of surveys, conceptual questions or short calculations and are designed to uncover some of the common pitfalls and surface possible misconceptions and that confuse many students. Students are encouraged to participate in small group discussions with classmates while answering these questions. Responses are recorded and scored. The scoring is used as a measure of class attendance and participation and may be used for as part of the final grade determination particularly in borderline situations.

PARTICIPATION in the course can have a reflection in the overall final grade. Items such as attendance, attitude, sincerity, changes in performance, etc. will be considered in borderline situations.

GRADING is tentatively based on the following breakdown:

Homework:	200 points	A: > 900 points
Quizzes:	100 points	B: > 800 points
Laboratory:	200 points	C: > 700 points
4 Exams:	500 points (125 pts. each)	D: > 600 points
		F: < 600 points

Depending on other factors involved with the course, it is possible for the grade cut-offs to be lowered by up to 50 pts., but do not count on it.

LATE MATERIAL & MAKE-UPS:

All quizzes must be completed on the date at the time they are scheduled. There are no make-ups for any reason. All online homework must be submitted by the cut-off time (11:00 PM) in *MasteringAstronomy* and all laboratory packets must be submitted by the end (11:50 AM) of that session unless otherwise stated by the instructor. Any laboratory assignment submitted after 11:50 AM of the lab will receive a 20% penalty. After that,

the penalty is an additional 20% for every 24 hours past the original due date and time up to one week. After that, the lab will no longer be accepted for credit.

A make-up for only one exam will be granted. The make-up will be granted ONLY if you give prior notice of the extenuating circumstance and ONLY for reasons deemed acceptable to the instructor. Examples include medical emergency, jury duty, active call to military service. If notified after the exam, there is a 10-point penalty on the make-up. Missing more than one exam will result an automatic grade of “F” for the course regardless of other exam, homework, lab, and quiz scores.

RETURN POLICY:

In general, every effort will be made to return work/provide feedback in a timely fashion usually within one week after submission.

ATTENDANCE/TARDINESS:

In general, formal attendance is recorded by means of “iClickers,” submitted quizzes, and officially stamped laboratory work. Students who have missed 5 or more classes or labs AND are not passing with a grade of “C” or better by Friday, March 15th, 2024 will be considered in “non- pursuit” and may be dropped from the course by the instructor. Students who do not “click in” during the class due to tardiness or any other reason will not necessarily have their attendance recorded.

ACCOMMODATIONS: The College of DuPage is committed to the equitable access of educational opportunities for students with disabilities in accordance with The Americans with Disabilities Act, As Amended and Section 504 of the Rehabilitation Act of 1973. Any student who feels they may need an accommodation on the basis of an illness, injury, medical condition, or disability should contact the Center for Access and Accommodations to determine eligibility for accommodations and to obtain an official Letter of Accommodation. The Center for Access and Accommodations can be reached via email at

access@cod.edu.

Students may also initiate a request for services by going to www.cod.edu/access and clicking on the green box labeled “complete form to request accommodations.” If you are already registered with the Center for Access and Accommodations, please email me your Letter of Accommodation as soon as possible. Please DO NOT send any private health documentation or doctor’s notes to me.

WITHDRAWAL POLICY:

The last day to withdraw from this course without appeal is Sunday, April 14th, 2024. After that date, students may file a *Petition for Late Withdrawal* through the Registration Office. A *Petition for Late Withdrawal* will be granted for extenuating circumstances only, including student illness, death in the immediate family, family emergencies, call to active duty, or other appropriate extenuating circumstances. The student will be required to provide appropriate documentation for all requests for late withdrawal. Students are strongly encouraged to speak to their instructor prior to withdrawing from this class.

As stated earlier, students who have missed 3 or more classes or labs AND are not passing with a grade of “C” or better by Friday, March 15th, 2024 will be considered in “non-pursuit” and risk being administratively dropped from the course. (No refunds!)

INCOMPLETE POLICY:

Under extraordinary circumstances (such as an extended medical emergency or family tragedy) a student currently earning “C” or better may not be able to complete all of the course requirements. In such instances, the student may petition the instructor for an “incomplete” grade. Only if the instructor deems the request as warranted will a contract agreement be made between the student and instructor as to how the course will be completed. After both the student and the instructor sign the contract, the student will receive a grade of “I”. Note: The course must be completed with the same instructor and within one calendar year of the end of the term for which the student was enrolled. If the student does not complete the requirements for the course as prescribed in the agreement, the “I” grade will automatically revert to a grade of “F.” It is advised that the students be fully aware of the consequences of receiving an incomplete grade and understand the terms described in the COD Catalog and can be accessed at

<https://catalog.cod.edu/academic-policies-procedures/>

CONDUCT & DISRUPTIONS:

The proprietor of any cellular device that is heard to go off in class or the laboratory ensures him/herself a "0" on the next quiz. Disruption during an exam will result in a 5-point deduction off that exam score (10 points during the final exam).

It is expected that you are aware of and follow the guidelines for conduct as described in the COD Catalog: *Student Rights and Responsibilities*. In particular, *Student Code of Conduct (Board Policy 20-35)*. Individuals that exhibit disruptive behaviors that interfere with the lectures and/or laboratory sessions will be removed from the class so that those individuals who wish to learn physics can do so. Those individuals removed must then conference with either the Dean or an Associate Dean in Natural & Applied Sciences Division. Those individuals may then rejoin the class pending the outcome of the conference.

Anyone caught cheating or plagiarizing will receive an automatic failure for the course. You will not be allowed to drop the class if you are found in violation of this section. It is expected that you are aware of and follow the guidelines for conduct as described in the COD Catalog, pp. 163-164: *Students Code of Academic Conduct (Board Policy 20-41)* and that you are aware of the definitions of the terms described therein. Also, the college will not tolerate discrimination or harassment. It is also expected that you are aware of and follow the guidelines for conduct as described in the COD Catalog, page 167: *Prohibition of Discrimination, Harassment and Sexual Harassment (Board Policies 15-10 and 15-11)*. The policies described in this section can be accessed at

<https://catalog.cod.edu/student-services-general-student-information/>

CALCULATORS, LAPTOP & CELL PHONES:

Students may use their own calculator for all activities. During exams, there is no sharing of calculators and the cover must be removed. No CELL PHONE CALCULATORS may be used during exams. Students may use laptops or tablets to take notes during lecture only under the following conditions: 1) the screen must be displayed upon request and 2) you show me that day's notes at the conclusion of the class. If these conditions cannot be met, then you may not use the device in class.

The proprietor of any cellular device that is heard to go off in class or the laboratory ensures themselves a "0" on the next quiz. Disruption during an exam will result in a 5-point deduction of that exam.

COMMUNICATION:

You should use email or phone as a method to communication with me if my office hours conflict with your schedule. You are strongly encouraged to ask questions about the syllabus during class time and office hours. For more in-depth discussions (such as guidance on assignments) it is possible to set up a one-on-one zoom meeting if a face-to-face meeting is not possible. Such conversations should take place in person or over the phone rather than through email. This allows us to communicate more effectively and fosters a more collegial learning atmosphere.

RELIGIOUS OBSERVANCE:

The College will reasonably accommodate the religious observances of individual students with respect to class attendance, and the scheduling of examinations and class requirements. The student should notify the instructor well in advance of any anticipated absence or a pending conflict between a scheduled class and the religious observance.

COURSE EXPECTATIONS
Earth Science 1124
Astronomy: Stars and Galaxies

What Dr. Fazzini Expects from You:

- You will have read the syllabus.
- You will be punctual to class.
- You do not make or receive telephone calls or text messages during class or lab sessions.
- You demonstrate respect for what I and your fellow students have to say.
- You will come to class prepared (pencils, calculator, lab manual, etc.)
- You will come to class ready to ask and answer questions of substance on the day's topic(s).
- You will concentrate exclusively on this course during the class hours of this course.
- You will notify me prior to class if you have to leave early.
- You will “check your entitlement at the door” and take responsibility for your own learning.

What You Can Expect from Dr. Fazzini:

- I will be punctual to class.
 - I will give each of you a fair share of my attention.
 - I will work to make the class interesting and relevant.
 - I will make myself available as a helpful resource outside of class.
 - I will work to help you learn the material and perform at your best.
 - I will be the sole arbiter of partial credit.
 - I will grade the QUALITY of your work rather than the amount of time and effort you spent on it. (In other words, you will be assessed on your demonstrated performance rather than on anecdotal testimony.)
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Astronomy 1124 TENTATIVE LECTURE SCHEDULE for Spring 2024

Week	Dates	Chapter(s)	Topic(s)
1	Jan. 23 rd	1.1-1.4	Overview; Scale of the Cosmos
	Jan. 25 th	2.1, 2.2; S1.2	Celestial Sphere; Night Sky
2	Jan. 30 th	2.3-2.4; S1.1	Lunar Phases; Eclipses
	Feb. 1 st	3.1-3.2	Ancient & Greek Astronomy
3	Feb. 6 th	3.3-3.4	Copernicus, Brahe, Kepler, Galileo
	Feb. 8 th	4.1-4.2	Describing Motion; Newton's Laws
4	Feb. 13 th	Exam 1	Chapters 1-3, S1
	Feb. 15 th	4.3-4.4	Conservation Laws; Universal Gravitation
5	Feb. 20 th	5.1-5.3	Properties of Light
	Feb. 23 rd	5.4	Light Spectra and Matter
6	Feb. 27 th	6.1-6.4	Telescope Types & Uses
	Feb. 29 th	S2	Special Relativity
7	Mar. 5 th	S3	General Relativity
	Mar. 7 th	14.1-14.3	Our Sun
8	Mar. 12 th	Exam 2	Chapters 4-6, S2, S3
	Mar. 14 th	15.1	Stellar Properties
9	Mar. 19 th	15.2-15.3	Star Types; Hertzsprung-Russell Diagrams
	Mar. 21 st	16.1-16.3	Star Formation
10	Mar. 26 th	NO CLASSES	SPRING BREAK
	Mar. 28 th		
11	Apr. 2 nd	17.1-17.2	Low Mass Stellar Evolution
	Apr. 4 th	17.3-17.4	High Mass Stellar Evolution
12	Apr. 9 th	18.1-18.2	White Dwarfs; Neutron Stars
	Apr. 11 th	18.3	Black Holes
13	Apr. 16 th	Exam 3	Chapters 14-18
	Apr. 18 th	19.1-19.4	Our Galaxy
14	Apr. 23 rd	20.1-20.2	Galaxy Types; The Hubble Law
	Apr. 25 th	20.3	Age of the Universe
15	Apr. 30 th	21.1-21.3	Galactic Evolution
	May 2 nd	23.1-23.3	Dark Matter
16	May 7 th	23.4	Dark Energy; Fate of the Universe
	May 9 th	24.2-24.3	Extraterrestrial Life
17*	May 16 th	Exam 4	Chapters 19-24

* Denotes shortened week due to final exams.

There are NO CLASSES during Week 10 due to Spring Break.

NOTE: Not every topic in the each assigned chapter may be discussed in class. However, you are responsible for every topic in each assigned chapter unless otherwise stated. If you are having trouble with a topic that is not discussed in class, it is your responsibility to seek out the instructor and/or other resources to ensure understanding of that topic.

Astronomy 1124 LABORATORY SCHEDULE for Spring 2024

Week	Dates	Lab	Topic(s)
1	Jan. 23 rd	Handout	Overview
	Jan. 25 th	1	Starry Night: Earth, Moon, and Sun (Part 1)
2	Jan. 30 th	2	Starry Night: Earth, Moon, and Sun (Part 2)
	Feb. 1 st	3	Starry Night: The Night Sky
3	Feb. 6 th	4	Starry Night: The Solar System
	Feb. 8 th	5	Motion & Orbits
4	Feb. 13 th	Exam 1	Chapters 1-4, S1
	Feb. 15 th	6	Energy & Gravity
5	Feb. 20 th	7	Properties of Light
	Feb. 23 rd	8	Understanding Spectra
6	Feb. 27 th	9	Telescopes
	Feb. 29 th	10	Special Relativity
7	Mar. 5 th	10 (Cont'd)	General Relativity
	Mar. 7 th	11	The Sun
8	Mar. 12 th	Exam 1	Chapters 4-6, S2, S3
	Mar. 14 th	12	Stellar Properties
9	Mar. 19 th	13	The HR Diagram
	Mar. 21 st	14	Stellar Formation
10	Mar. 26 th	NO CLASSES	SPRING BREAK
	Mar. 28 th		
11	Apr. 2 nd	15	Low Mass Stellar Evolution
	Apr. 4 th	16	High Mass Stellar Evolution
12	Apr. 9 th	17	Cosmos Video
	Apr. 11 th	18	Black Holes
13	Apr. 16 th	Exam 3	Chapters 14-18
	Apr. 18 th	19	Monster of the Milky Way
14	Apr. 23 rd	20	Exploring Galaxies
	Apr. 25 th	21	Distances & Hubble's Law
15	Apr. 30 th	22	Distribution of Mass in a Galaxy
	May 2 nd	23	Dark Matter
16	May 7 th	24	Runaway Universe
	May 9 th	25	Cosmology
17*	May 16 th	Exam 4	Chapters 19-24

Disclaimer:

To the best of the instructor's knowledge, the information in this syllabus was correct and complete at the start of the semester. However, the instructor reserves the right, acting within the policies and procedures of the College of DuPage, to make changes in course content, instructional techniques or grading policy during the term. (Any changes would always be in favor of the student body as a whole.) It is assumed that you have read this

course syllabus. Your continued enrollment in this course means that you accept the terms and conditions outlined in this syllabus.

Topical Outline:

1. Constellations
2. History and mythology
3. Asterisms
4. Major bright stars
5. Sidereal time
6. Our star-the sun
7. Composition
8. Structure
9. Features
10. Thermonuclear reactions
11. Electromagnetic radiations
12. Stellar spectra
13. Composition
14. Spectral classes
15. Doppler shifts
16. Stellar
17. Parallax
18. Distance to stars
19. Apparent and absolute magnitudes
20. Proper and radial motions
21. Stellar properties
22. Luminosity
23. Mass
24. Temperature
25. Stellar life cycles in the H-R diagram
26. Protostars
27. Main sequence stars
28. Red giants and supergiants
29. Dying stars
30. White dwarfs
31. Neutron stars
32. Pulsars
33. Black holes
34. Nova and supernova types
35. Unique stellar objects
36. Binary stars
37. Variable stars
38. Star clusters
39. Open
40. Globular
41. Interstellar medium and nebula
42. Galaxies

43. Milky way
 44. Composition and structure
 45. HI and H II Regions
 46. Population I and II
 47. Stars
 48. Black hole
 49. Other
 50. Galaxies
 51. Spirals
 52. Barred spirals
 53. Elliptical
 54. Irregulars
 55. Peculiar galaxies
 56. Quasars
 57. Seyfert galaxies
 58. Radio galaxies
 59. Cosmology
 60. Evidence for the Big Bang
 61. Hubble law and red shifts
 62. Cosmic background radiation
 63. String theory
 64. Energy and matter
 65. Quarks, leptons, and bosons
 66. Fate of the universe
 67. Open, closed, flat
 68. Big crunch vs. continued expansion
 69. Anti-gravity inflated expansion
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