

Physics of the Cosmos: Astronomy B1

Fall semester

Instructor: Nick Strobel

Office: MS 101, 395-4526 (leave a message if I'm not there)

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Department Office: SE 57, 395-4401 (another place to leave messages)

Lectures: MW 11:10 AM & 1:00 PM in the Planetarium (MS 112) for 85 minutes each

Office Hrs: TTh 12:10 – 1:40 pm in MS 101

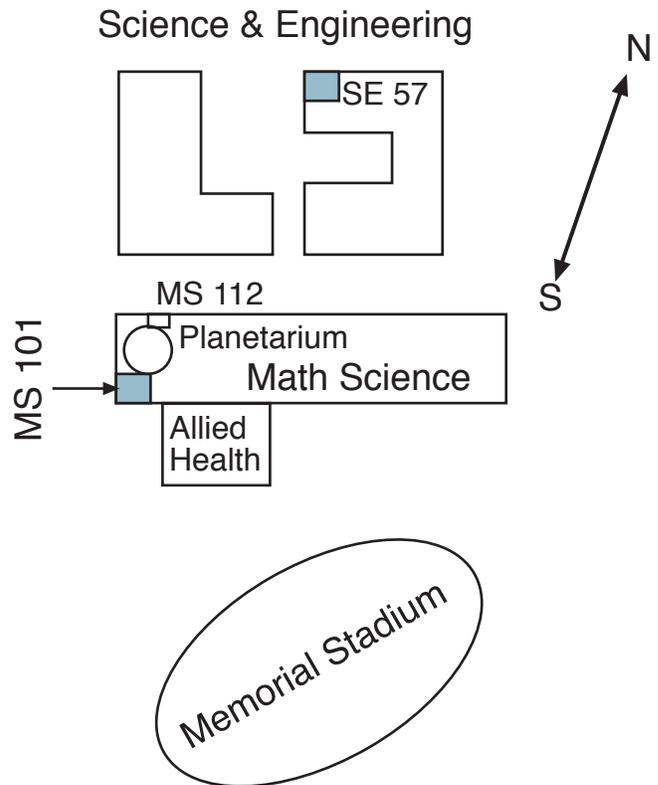
Required Texts: *Astronomy Notes* (2010 edition) at campus bookstore and the *Astronomy B1 Student Guide* at campus bookstore

Prerequisites: Reading Level 5

Recommended: First semester college algebra.

Astronomy class website:

<http://moodle.bakersfieldcollege.edu>



Course Overview:

A college-level survey of the universe, from the everyday observations we make of the sky (and what they mean) to our ideas about the inner workings (**physics**) of the planets, stars, galaxies and overall characteristics of the universe. **Equivalent to a university course** except: a) slower pace; b) instructor wants you to succeed and is much more available for questions; c) cost.

Throughout the course we will examine the process and philosophy of science from the astronomical perspective. We will use several examples from current research problems. Modern astronomy deals with some very mind-expanding stuff requiring sophisticated abstract and logical thinking so you will need to give your brain TIME to mull over and digest the concepts. If you take a look at any college astronomy textbook (not just mine) and any course outline for a college astronomy class, you will see that modern astronomy is mostly a “physics of the cosmos”—**how things work** and **how we know**. Astronomy is a visually beautiful and intellectually stimulating subject. We live in a beautiful universe on a gorgeous planet. Understanding how it became the way it is and how the parts interact with each other enriches and deepens our appreciation for the artistry around us. It is my hope that you will take the time and expend the effort to learn how our universe works.

Learning Outcomes:

At the end of the Physics of the Cosmos (Astr B1) course, the successful student **will be able to:**

1. Apply concepts to new situations using logical, deductive reasoning. The student will recognize the appropriate concept or principle to be applied to a new situation not given in the book or in lecture.
2. Distinguish a scientific explanation from a non-scientific one.
3. Solve word problems using required calculation skills, application of relevant concepts to the problem, and discriminating relevant data from irrelevant data.
4. Determine trends in data and make extrapolations+predictions based on that data.
5. Use a computer to locate information on the internet.

6. Correctly order the relative size and time lengths of things in the universe and to place him/herself in the context of the size and time scale of things. For example, the student will be able to correctly order: atom, galaxy, planet, Sun, Earth, Moon, star, solar system, human, proton, universe. The student will be able to compare the length of a human lifetime to the length of a human lifetime or civilization to the age of the Earth, solar system, and the universe (since the start of the expansion).
7. Describe the “where we come from” topics:
 - (a) Big Bang theory of the beginning of the universe and how we know.
 - (b) Formation of the Earth and the solar system and how we know.
 - (c) What has to take place first and what is needed to create a habitable planet with life on it, i.e., the raw materials around us except hydrogen + helium were created in the cores of stars and the material was dispersed via stellar explosions.
8. Describe the “where we are going” topics:
 - (a) The eventual fate of the universe (continued expansion, recollapse, or ...?) and how we will figure that out.
 - (b) The future of the Earth as the Sun ages and how we can make a sensible prediction of that.
9. Describe the properties and processes of the Earth that make it a habitable planet and contrast our situation with the environments on other planets in our solar system that make life impossible or very unlikely to exist. Closely allied with that is that students will be able to describe how those nice properties of our situation informs us in our search for habitable planets or moons in other solar systems.
10. Explain using the tools of telescopes, spectroscopy and the law of gravity how we measure the physical properties of the planets, moons, stars (including the Sun!), galaxies, and galaxy clusters, e.g., their distances, mass, diameter, volume, density, composition, temperature, and internal structure, while still being bound to the Earth.

Grading for day class: Your grade will be based on your performance on three exams (50 pts each) + final (100 pts), 5 required homework assignments posted on the web, 11 quizzes (8–12 pts each), 1 Skywatch (30 pts), & in-class projects – classroom participation (about 50 pts). All points will be added up and the sum divided by the maximum possible (*about* 470–475 pts total—excluding extra credit). **The course grade will be determined by the following percentage scale:**

90 – 100% = A, 80 – 89.9% = B, 65 – 79.9% = C, 50 – 64.9% = D, below 50% = F.

The *homework* assignments will stress **critical reasoning** (and some computation). Five of them will be required—see the class website for which ones they are. The required and extra credit homework will be turned in at the beginning of a Wednesday’s class. Exam questions are drawn partly from the required homework assignments. Homework assignments are posted exclusively on the class website. **No late (including tardy) homework assignments will be accepted.**

Quizzes & exams are multiple-choice format. The *quizzes* will be every Wednesday except for exam weeks or Wednesday holiday. The exam material will be drawn from homework, quizzes, in-class projects, lectures, and the textbook review questions. The exams are *closed book*—no live or electronic help, except a calculator, is allowed. Dates for exams are given at the end of the syllabus and also on the class website. **There are no make-up quizzes or exams without hardcopy documentation of a medical or legal emergency from an officially-recognized neutral third party.** Any other reason, **including work schedules**, will *not* be accepted. You will need to do the quiz or exam make-up the week of your return. If you have another school/work activity or family event that prevents you from taking the exam or quiz on the given date, *you* will need to arrange with the instructor an alternate quiz/exam time that is **before** the given date.

The Skywatch assignment is due **November 28 (Monday)** and is worth 30 points. **No late Skywatch reports will be accepted—mark your calendar and hand it in early if you will not be able to turn it in on the due date!** Choose *one* of the Skywatch assignments described in chapters 4 and 5 of the Student Guide. The Skywatch requires a *hardcopy report* that will be turned in (or mailed or faxed) to me on campus—no emailed skywatch reports! The *hardcopy* typed, complete data *table*, star chart, and/or photos are due by **November**

9 (Wednesday) at the beginning of the class time (NOT emailed!). No late, untyped, incomplete data records accepted; hand in early if necessary! You must turn in the complete, typed data record by the due date or you will receive *zero* credit for the final report (not just the data record)! Therefore, **November 8** is the last possible date to complete your observations. If you mail me your data record or your final report, allow for at least 3 days mail transit time so that it arrives by the due date!

Your Role + Expectations:

Understanding how the universe around us became the way it is and how the parts interact with each other enriches and deepens our appreciation for the artistry around us. However, it does mean that one has to confront and leave aside misconceptions and grapple with some complex (but manageable!) ideas. This class will be challenging but I hope you will find it rewarding and worth the time it takes to learn the subject so that at the end of the semester you will have that appreciation of our universe I spoke of above.

Your role: I expect you to take responsibility for your own learning. The expectations for a college class are a definite jump up from what you had in high school! The standard for minimum acceptable work, the *quality* and amount of study time, and the pace the material is covered will be a significant jump up from high school. This a voluntary college course that meets just two times a week for 85 minutes a lecture. Because of the limited time spent in class, you will need to spend **at least** 6 hours a week *outside* of class reviewing lecture material, reading the textbook, and doing the homework assignments. You will not pass if you only attend every lecture and do just the in-lecture-period work. Your grade is determined only by *your* performance on the required assignments not on “how well I feel you did”. ***It is possible in a college course to get an “F” if your performance on the required assignments is below the “D” threshold regardless of the effort you put into the course.***

- **Be prepared to learn astronomy when you come to lecture.** Conversing with your neighbor about something unrelated to the topic of the class prevents you and them from learning the concepts and makes it very difficult for other classmates to learn. Although I may not hear you conversing quietly with your neighbor, your other classmates will and they will find it hard to concentrate. Do not violate their right to an education. If you need to spend the time talking, doing assignments for other classes, or reading the newspaper or magazines, then do not waste your or my time by coming to lecture. **Turn OFF your cell phone in class!**
- **Take the initiative to seek clarification of the concepts.** As an adult, one needs to have the self-motivation to learn anything. I can only help you learn. I will present the material in as clear and logical way as I can and give assignments that require you to think critically about the concepts. Then it is up to you. I expect you to ask questions when you do not understand something, either in class or in office hours or via email. If you are doing poorly and you decide not to get help, I will honor your choice. Learning is a choice and requires a voluntary decision to spend extra effort and time.
- **Use the keys at the library reserve counter.** If you answered a question on an assignment incorrectly, you will need to take the initiative to find out why your answer is incorrect. Use the keys at the library reserve counter, ask a question in class or in office hours or via email.
- **Modern astronomy deals with some very mind-expanding stuff** requiring sophisticated abstract and logical thinking so you will need to give your brain **TIME** to mull over and digest the concepts. Finding sufficient **TIME** to study the concepts and think and synthesize the concepts is the greatest stumbling block to students. Students who try to cram their studying in the day before an assignment is due get D’s and F’s. Modern astronomy is mostly a “physics of the cosmos”—**how things work and how we know.**
- If you miss a lecture, I expect you to see me after class or in my office or check the class website (or email me) to find out what you missed. **If you miss four or more classes during the semester or an exam, you MAY be dropped from the course. However,** do not assume that I will automatically do this for you. If you wish to drop, then drop via Luminis/BanWeb (<https://banweb.kccd.edu>).
- **If you are tardy, I expect you to enter quietly and sit in the BACK of the room without disturbing anyone.**
- Use the study tips in the Student Guide. They include how to more efficiently and effectively use your textbook to succeed in the class and tried-and-true techniques for taking multiple-choice exams.
- Students with disabilities who believe they may need accommodations in this class are encouraged to contact Disabled Students Program & Services at Student Services Building, 1st Floor, Counseling Center, 395-4334, as soon as possible to better ensure such accommodations are implemented in a timely fashion.

Late Assignments

Absence for an exam or quiz will result in zero credit. In the event of an unavoidable and *documented* medical or legal emergency that prevents you from taking a quiz or exam, I will consider a make-up quiz or exam on an individual basis. **Work schedules are not valid excuses.** The documentation must be from an officially-recognized neutral third party. You must take the exam or quiz the week of your return. Abuse of this policy will void your privilege of a make-up exam or quiz. It is possible to take the exam or quiz *early* in the case of medical, legal, or job conflicts. Exam and quiz dates are given on the class website. The Final Exam will be comprehensive and will be on the date given in the printed class schedule.

Required homework and skywatch assignments are due at the beginning of class on the given due date. **No late homework (including tardy!) will be accepted. No late skywatch reports or late, incomplete, untyped data records accepted at all.** If you are sick, have a classmate turn it in. **Assignments, including quizzes and exams, can always be turned in EARLY.**

I do not like people distracting their classmates by turning in something tardy after I have started instruction! *If you are tardy when a homework assignment is due, do NOT turn it in at all.* I want you to pay attention in class, not work on assignments that should be completed beforehand. Turn the assignment in the lecture before if you plan to miss class or be unavoidably late! You can also email me the homework and exam make-up assignments **but** only if they are emailed by **the beginning of class time** of the due day (not a minute or more later!!). Emailed assignments sent after the beginning of class time will simply be returned with no credit. **The emailed assignments must be in the BODY or your email message—no file attachments. The Skywatch report & data record canNOT be emailed.**

Absence of an in-class project (not pop quizzes, homework, or Skywatch) will result in half credit provided the work is made up within one week of the day when the project is given. Make-up of an in-class project requiring me to set something up will have to be done at a time that is convenient for *me*, the instructor. I will be lenient in the case of unavoidable and *documented* medical or legal reasons. Other miscellaneous (and missed) in-class activities that may contribute to your participation grade will be dealt with on an individual basis.

Cheating: By cheating, you are being unfair to yourself and your classmates. Cheating is defined as not doing your own work on class assignments or on exams. There is a distinction between being helped by someone and copying someone's work. State your answers to the homework and skywatch in your **own** words. Do NOT show your written (or electronic) copy of your assignment to other classmates. If you help someone out, be sure that they can articulate their response in their own words. **NO group solutions!** If copying is noticed by me, each person will get a fraction of the total group's solutions grade. Cheating on an exam will result in zero credit with no make-up possible. **Permitting someone to copy from you is just as bad.** It takes less effort to play fair than to devise clever ways of deceiving your instructor and classmates.

Exam Dates:

Exam 1: Wednesday, September 21. Exam 2: Wednesday, October 19.

Exam 3: Wednesday, November 17.

Final: 11:10 class = Wednesday, December 7 at 10 AM for 1 hr 50 min;

..... 1:00 class = Wednesday, December 7 at 12 noon for 1 hr 50 min. The final is “cumulative”, “comprehensive” = over the entire semester’s material. Note that final exam times are one hour earlier than regular class time!