

Cascadia Community College

Astronomy 115 The Cosmos Syllabus

Course Description:

This course is intended for non-science majors as an introduction to the foundations and current theories of the science of the universe.

Black holes, time travel, the Big Bang, dark matter, and teleportation will be among the subjects studied. Through various methods students will assess the human understanding of our Universe and analyze the many models created to explain the creation, existence, and end of our Universe. Emphasis will be placed on contemporary scientific theories to include the theory of relativity, quantum theory, and current observations. This class will cover the material without the use of intensive mathematics.

5 credit

Room: CC1-087, 1:15pm-3:20pm T Th, Spring 2009

Instructor: Matt
DePies

Office: UW1-151

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Webpage: <http://faculty.washington.edu/mrdepies>

Office hours: T Th 12-1pm

General Comments:

I hope after taking this course you will have learned a great deal about physics, astronomy, and cosmology and, in many cases, how it applies to you. I will try my best to make the course interesting and understandable. To that end, if you are confused please ask me to clarify. Often a slightly different explanation is all that is needed to make the subject clear.

Please note that memorization of material is not very helpful in learning the subject. The particular facts surrounding cosmological observations have changed over the years but the main physical concepts have remained. Please keep an open mind as some of the more modern theories are abstract and are not readily observable to the day to day human senses.

****If you feel you need any assistance, please contact me or come to office hours**** It is up to you to come to your instructor's office hours, you will find it helpful throughout your education to do so. Please do not wait until the end of the quarter if you are having trouble be pro-active. It may be too late by the end of the quarter.

Text: *Foundations of Modern Cosmology*, 2nd Ed., Hawley and Holcomb, Oxford University Press (2005).

Course Topics: A list will be posted and updated with readings and assignments. We will do our best to follow this, and you should come prepared each class having done the reading for that day and completed the homework.

Course Content, Topics and Themes:

- Modern scientific thought
- Historical cosmologies
- The laws, theories, and principles of classical physics

- The special and general theories of relativity: space, time, and spacetime
- Quantum mechanics, quantum fields, and strings
- The Big Bang, Baryogenesis, Dark Matter, Dark Energy, and modern observational astronomy
- Stellar Evolution: Nucleosynthesis, White Dwarfs, Neutron Stars, and Black Holes
- Modern theories about the future of our Universe

Course Outcomes:

I. Learn Actively -

Learning is a personal, interactive process that results in greater expertise and a more comprehensive understanding of the world.

- Investigate the history of the human endeavor to understand our Universe.
- Describe the nature of modern scientific thought.
- Apply the classical laws of physics to one's day to day life.
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Correlate the observed universe to the strange and counterintuitive modern theories of physics including Relativity and Quantum Mechanics.

- Interpret data and graphs.
- Know the significance of the theories on our modern society.

II. Think Critically, Creatively and Reflectively - Reason and imagination are fundamental to problem solving and critical examination of ideas.

- Critically analyze ideas about the origins and fate of the Universe.
- Use in class work to deepen knowledge of physical concepts.
- Develop understanding of the modern (and bizarre!) theories of space and time.
- Analyze "quantum uncertainty" and its effect on scientific thought.
- Evaluate the deeply empirical basis of modern theories and their application to cosmology.

III. Communicate with Clarity and Originality -

The ability to exchange ideas and information is essential to personal growth, productive work, and societal vitality.

- Communicate ideas about the nature of the Universe during class, in peer groups, and in assigned class work.
- Discuss the evidence for the existence of black holes, dark matter, the Big Bang, and dark energy.
- Communicate sound scientific theories and subjects.
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When doing assigned work and discussing the subject, analyze the empirical and theoretical basis of the arguments being made.

IV. Interact in Diverse and Complex Environments - Successful negotiation through our increasingly complex, interdependent and global society requires knowledge and awareness of self and others, as well as enhanced interaction skills.

- Work with peers and learn the benefit of others views.
- Show respect for others with alternate viewpoints.
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Know the great variety of cultures and belief systems that have worked to understand the Universe and respect these ideas.

- Be honest and forthright while working with others and during class discussions.

Assignments:

- **Homework:** From time to time homework will be assigned and due. Late homework is not accepted except in special circumstances.
- **Final Paper:** A semi-formal paper on a topic in cosmology will be turned in by the end of the quarter. 3-5 pages in length, no less than three, no greater than five. A minimum of three references, at least 2 must be either science journals or science texts.
- **Midterm:**
The midterm will either be a short paper or an in class exam. You must give at least 24 hours notice in order to make alternate test arrangements. No more than one test per quarter will be taken at a different time than the normal time. In general the drop will make up for any other missed exams. **Regrades:** if you feel there was an error grading your test, you have two class days from its return to bring it to the instructor. Do not put ANY marks on an exam that needs to be regraded.
- **In-class Work and Tutorials:** During class problems will be assigned to be worked out in small student groups. Everyone must do the work: if you don't and put your name on the assignment, that is "cheating." These may be collected and graded. Also, students may be asked to give presentations of their group work. Since this work is meant to supplement lectures, it cannot be made up.

Grading: The course grade will depend upon your work as below:

- Tests: 20%
- Final Paper: 30%
- In-class Work and Tutorials: 25%
- Homework 25%

The grade scale is as follows:

| <u>%</u> | <u>GPA</u> | <u>%</u> | <u>GPA</u> | <u>%</u> | <u>GPA</u> | <u>%</u> | <u>GPA</u> |
|----------|------------|----------|------------|----------|------------|----------|------------|
| 96-100 | 4.0/ A | 89 | 3.4/ B+ | 79 | 2.4/ C+ | 68-69 | 1.4/ D+ |
| 95 | 3.9/ A | 88 | 3.3/ B+ | 78 | 2.3/ C+ | 67 | 1.3/ D+ |
| 94 | 3.8/ A- | 87 | 3.2/ B+ | 77 | 2.2/ C+ | 66 | 1.2/ D+ |
| 93 | 3.7/ A- | 86 | 3.1/ B | 76 | 2.1/ C | 64-65 | 1.1/ D |
| 92 | 3.6/ A- | 85 | 3.0/ B | 75 | 2.0/ C | 63 | 1.0/ D |
| 90-91 | 3.5/ A- | 84 | 2.9/ B | 74 | 1.9/ C | 62 | 0.9/ D |
| | | 83 | 2.8/ B- | 73 | 1.8/ C- | 61 | 0.8/ D- |
| | | 82 | 2.7/ B- | 72 | 1.7/ C- | 60 | 0.7/ D- |
| | | 81 | 2.6/ B- | 71 | 1.6/ C- | 0-59 | 0.0/ F |
| | | 80 | 2.5/ B- | 70 | 1.5/ C- | | |

Technology: A calculator is useful for simple calculations. Internet access is needed for updated homework assignments and test dates.

Attendance: Students are expected to attend each class session. If you have difficulty making it to class on time, please talk to me. Tutorials or in-class work will be given most classes, these cannot be made up.

Accommodation: If you have or suspect you have a disability and need an accommodation please contact Disability Support Services at 352-8383, or at rlotis@cascadia.ctc.edu, to schedule an appointment." Services and accommodations through DSS are not retroactive.

Academic Integrity: Instances of academic dishonesty will be dealt with harshly. Putting your name on a group project when you did not participate is as unethical as copying someone else's assignment. The first instance of academic dishonesty will result in a zero on that assignment, referral to the Dean for Student Learning, and a record of the instance in your school records. The second instance will result in a 0.0 in the course and possible expulsion.