

UNIVERSITY OF NORTHERN COLORADO
COLLEGE OF NATURAL AND HEALTH SCIENCES
OFFICE OF EXTENDED STUDIES
SUMMER 2012

SCI 109-941: **The Cosmos**

Prerequisites: None
Credit: 3

Notice

The Office of Extended Studies reserves the right to cancel or reschedule courses based upon enrollment. Enrolled students will be contacted with information of any change.

Instructors

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Info Design Professor: Dr. Anna Ursyn Guggenheim Hall 106 A 351-2476 ursyn@unco.edu

Textbook and Course Website

- Cosmic Perspective with Mastering Astronomy 6/E by Jeffrey O. Bennett
 ISBN-10: 0321620909 ISBN-13: 9780321620903

If you buy a new book, the access code to the course website **www.masteringastronomy.com** will be included; if you buy a used book, you need to purchase an access code separately at this site for \$40.20; if you buy a ebook with 18 month subscription, the cost is \$74.70 which will include the access code.

Either e-text or paper textbook is fine, but the access code for the website is required for the course requirement.

COURSE ID: SCI109SUMMER2012 (needed at www.masteringastronomy.com)

The course website includes bb.unco.edu and masteringastronomy.com

Course Description

SCI109 -- The Cosmos is an introductory cosmology and astronomy course for all science and non-science majors. The course introduces basic principles and laws in physics and astronomy, scientific methods and instrument used in the exploration of the origin and structure of our universe, star formation and evolution, solar system formation and planetary motion, as well as the cosmological principles for predicting the future of our universe. The content materials will be introduced at a conceptual and qualitative level, although some algebraic mathematics will be applied. There is no pre-requisite on the science background. Some multimedia online materials will be incorporated into our study. A non-graded pre-test will be required from each student at the beginning of the course.

Course Objectives

- Describe the scientific methods and instruments used in classical and modern astronomical observations and analysis;
- Describe the Big Bang model and discuss the origin, evolution and structure of our universe;
- Quantitatively describe the dimension of galaxies and stars and planetary motion.
- Explain the basic principles of physics and astronomy, such as universal gravitational law, Kepler's law, nuclear reaction principles, spectroscopy, cosmological principles, gravitational lensing, electromagnetic radiation, mass-energy equivalence, etc.
- Be able to calculate the distance, velocity, wave, force, energy, temperature, etc.

Grades

Final letter grade will be determined based on the following scale:

90%-100%	A
80%-89%	B
70%-79%	C
60%-69%	D
Below 60%	F

- Grade Component 1 (10%) –
- **Assignment 1** (multiple-choice questions at masteringastronomy.com)
- Grade Component 2 (10%) –
- **Assignment 2** (multiple-choice questions at masteringastronomy.com)
- Grade Component 3 (10%) –
- **Assignment 3** (multiple-choice questions at masteringastronomy.com)
- Grade Component 4 (10%) –
- **Assignment 4** (multiple-choice questions at masteringastronomy.com)
- Grade Component 5 (20%) –
- **Eight Activities** (see the Activity Guideline below)
- Grade Component 6 (10%) –
- **Discussion Forum** (see the Discussion Forum Participation Guideline below)
- Grade Component 7 (30%) –
- **Final Exam (accumulative, open book/notes/computer/internet, set-time, date to be announced)**

Students will be divided randomly into three learning groups, i.e. Group A, Group B, Group C for easier discussion within the group and for using different format in the eight activity report.

Activity Guideline

There are eight activities for this course which constitute 10% of your grade.

The references that you need for these activities include the textbook and Self-guided Tutorial at masteringastronomy.com under “Study Area”.

The description of each activity is located at bb.unco.edu under “My Group”. You will be asked to develop projects supporting and demonstrating your understanding of the course materials.

Discussion Forum Participation Guideline

Each group will have assigned topics for discussion. Students are expected to actively participate in-group critiques and take the positive approach to their participation. The guidelines for this part will be posted in the Course materials section at a later date.

Honor Code

All members of the University of Northern Colorado community are entrusted with the responsibility to uphold and promote five fundamental values: *Honesty, Trust, Respect, Fairness, and Responsibility*. These core elements foster an atmosphere, inside and outside of the classroom, which serves as a foundation and guides the UNC community's academic, professional, and personal growth. Endorsement of these core elements by students, faculty, staff, administration, and trustees strengthens the integrity and value of our academic climate.

UNC's policies and recommendations for academic misconduct will be followed.

Disability Access

Students with disabilities who believe they may need accommodations in this class are encouraged to contact the Disability Support Services (970) 351-2289 as soon as possible to better ensure that accommodations are implemented in a timely fashion.

For additional student rights and responsibilities see:
<http://www.unco.edu/dos/handbook/links.htm>

Course Schedule

Learning materials:

- 1) Textbook: Cosmic Perspective by Jeffrey O. Bennett
- 2) Powerpoint at bb.unco.edu under “Course Materials”
- 3) Self-guided Tutorials at masteringastronomy.com under “Study Area”.

Content	Objectives	Readings	Assessment
<p>Unit 1 – Developing Perspective (Chapter 1, 3)</p> <ul style="list-style-type: none"> A brief overview of our modern view of the universe, including the hierarchical structure of the universe (our cosmic address) and the history of the universe (our cosmic origins). Overview of development of astronomy by discussing how ancient observations were made helped lay the groundwork for modern science, how and why the geocentric model of the universe was abandoned, the unfolding of the Copernican revolution and how Kepler’s laws were introduced. 	<ul style="list-style-type: none"> Describe our cosmic address, typical size of stars and galaxies, and distances between earth to the sun and to other stars, galaxies. Calculate light-year, light-hour, etc. and convert LY and AU to metric system. Use examples to discuss how scientific methods are practiced. Describe in details the ancient and modern view of solar system model. Use your words to describe Kepler’s three laws and apply it to the planetary motion. Use Kepler’s third law to calculate the period or distance. 	<ol style="list-style-type: none"> Text book Ch. 1, 3 Powerpoint Ch. 1, 3 Self-guided Tutorials <ul style="list-style-type: none"> Scale of the Universe Orbits and Kepler’s laws 	<p>Assignment 1</p> <p>Activity 1</p> <p>Activity 2</p>
<p>Unit 2 – Key Concepts for Astronomy (Chapter 4, 5, 6)</p> <ul style="list-style-type: none"> Introduce Newton’s three laws of motion and the Universal Gravitational Law to understand how they are applied to the motion of celestial objects. Introduce the concept and forms of energy and Einstein’s mass-energy equivalence. Introduce basic properties of light and matter as well as the interaction between them. Use the fundamental 	<ul style="list-style-type: none"> Describe Newton’s three laws of motion and Universal Gravitational Law (UGL) Explain mass and weight by using UGL, forms of energy and mass-energy formula Describe electromagnetic wave, frequency, wave length, wave speed Explain how to use emission and absorption spectrum to detect chemical components of stars 	<ol style="list-style-type: none"> Textbook Ch. 4, 5, 6 Powerpoint Ch. 4, 5, 6 Self-guided Tutorials <ul style="list-style-type: none"> Motion and Gravity Energy Light and Spectroscopy Doppler Effect 	<p>Assignment 2</p> <p>Activity 3</p> <p>Activity 4</p>

<p>principles and laws to develop methods and instruments for observing celestial objects and detecting their chemical components, surface temperature and motion.</p>	<ul style="list-style-type: none"> • Explain how to use Doppler effect to determine stars and galaxies’ motion • Explain blackbody radiation spectrum and how to use it to determine the temperature of stars 		
Content	Objectives	Readings	Assessment
<p>Unit 3 – Stellar Alchemy (Chapter 14, 15, 16, 17)</p> <ul style="list-style-type: none"> • Describe how the Sun works and explain nuclear fusion. • Introduce luminosity, brightness, and distance. • Introduce H-R diagram. • Introduce star formation and evolution • Analyze low-mass star life cycle • Analyze high-mass star life cycle 	<ul style="list-style-type: none"> • Describe Sun’s size, luminosity and structure • Explain the nuclear reaction inside of the Sun • Describe gravitational and thermal pressure equilibrium process • Locate a star’s position and trace its life cycle in the HR diagram for low-mass star and high-mass star, respectively • Describe the formation and characteristics of white dwarf , neutron star, and black hole • Explain nova and supernova process 	<ol style="list-style-type: none"> 1) Textbook Ch. 14, 15, 16,17 2) Powerpoint Ch. 14,15,16,17 3) Self-guided Tutorials <ul style="list-style-type: none"> – a) The Sun b) Hertzsprung-Russell Diagram c) Stellar Evolution 	<p>Assignment 3</p> <p>Activity 5</p> <p>Activity 6</p>
<p>Unit 4 – Galaxies and Beyond (Chapter 22, 23)</p> <ul style="list-style-type: none"> • Introduce the concepts of dark matter and dark energy • Discuss the evidence and candidates • Discuss the fate of the Universe • Discuss the Big Bang theory and supporting evidence • Introduce cosmic background radiation • Explain how the Hubble’s Law is applied 	<ul style="list-style-type: none"> • Describe dark matter and energy • List the evidence supporting dark matter assumption • Explain the significance of finding the dark matter • Discuss the Big Bang theory and list events after the Big Bang • List the evidence that support the BB theory • Describe the Hubble Law and discuss how to use it to predict the age of the universe • Explain the functions of 	<ol style="list-style-type: none"> 4) Textbook Ch. 22, 23 5) Powerpoint Ch. 22,23 6) Self-guided Tutorials <ul style="list-style-type: none"> – a) Detecting Dark Matter in Spiral Galaxies b) Hubble’s Law 	<p>Assignment 4</p> <p>Activity 7</p> <p>Activity 8</p>

	COBE satellites		
Final Exam Date TBD	accumulative, open book/notes/computer/internet, set-time, date to be announced		

Library Services for Distance Education and Off-Campus Students: Obtaining Materials from UNC Libraries

Off-campus students residing within 50 miles of the UNC campus are required to come to the library and borrow materials in person. Students residing more than 50 miles from campus may request that materials be delivered to them. All requests must include complete citations. We will supply materials from the UNC Libraries, as well as materials from other libraries obtained via Interlibrary Loan. Articles will be delivered via email. Books will be mailed first class. Delivery time by U.S. postal service is approximately 1 week. It is the responsibility of the student to return books by the date due. UNC does not pay return postage on books. For information on document delivery, call (970) 351-1446.

Requests for materials may be made through the following methods:

- Online: <http://www.unco.edu/library/forms/distancerequest.htm>
- By email: library.ocp@unco.edu
- By fax: (970) 351-2540

Student Satisfaction Evaluation

Participants will be asked to evaluate the workshop for instructors' knowledge, interest and enthusiasm as well as providing additional information on classes or topics which you would like to see developed as a future offering from UNC.

Course Withdrawal Information

In accordance with University and Colorado Department of Higher Education policy, if you drop this class after the course starts you will be assessed a drop fee. The drop fee is pro-rated up to the half-way point in the class. You are legally responsible for payment of full tuition once 50% of this course has been concluded. In order to be eligible to receive any refund of tuition, you must contact the Office of Extended Studies (1-800-232-1749) to formally withdraw from your class. Your refund, if applicable, will be based on the date of contact with our office. Withdrawals received via telephone during non-business hours will be processed and dated on the next working day. Failure to notify us will result in UNC tuition being owed even though you do not attend or complete the coursework.