

**SCI 265, Physical Science for Elementary Teachers**  
**Fall 2015**  
**MWF 11:15-12:05 PM**

**Instructors:** Wendy Adams and Courtney Willis  
**Office:** Office 2279 Ross Hall / 0232C Ross Hall  
**Hours:** Adams: MWF 12:15 – 1:00 p.m. Willis: Typically in from 8-10:00 MWF and by appointment  
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**Course Website:** <http://www.unco.edu/nhs/physics/faculty/adams/Sci265home.html> Check it often!!

**Course Description:** Investigation of physical science concepts (physics and chemistry), emphasizing their application to everyday life. Designed for elementary majors to build a strong conceptual foundation of the physical sciences.

**Course Objectives:**

To learn content necessary to teach elementary school physical science. It will be a fun challenge! Rather than just memorizing facts in this class we will be thinking, creating and synthesizing. You will be asking questions, defining problems, developing and using models, planning and carrying out investigations, analyzing and interpreting data, using elementary level mathematics and computational skills, constructing explanations and designing solutions, engaging in argument from evidence, obtaining, evaluating and communicating information. Specifically the objectives are:

- To provide content necessary to enable teacher licensure students to address the [Colorado Academic Standards](#).
- This course specifically focuses on the elements of K-8 Physical Science Standards both from the Colorado Academic Standards and the Next Generation Science Standards <http://www.nextgenscience.org/next-generation-science-standards>
- This course is a UNC Liberal Arts Core Area 6 *Lecture Class with lab*.

**Learning Outcomes:**

At the end of this course students will be able to:

- Compare and contrast different types of waves
- Describe for various waves the amplitude, frequency, wavelength, and speed
- Describe the relationship between pitch and frequency in sound
- Classify solids and liquids based on their properties, and justify your choice based on evidence
- Use the particle model of matter to illustrate characteristics of different substances
- Identify and describe a variety of energy sources
- Show that electricity in circuits requires a complete loop through which current can pass
- Describe the energy transformation that takes place in electrical circuits where light, heat, sound, and magnetic effects are produced
- Measure mass and volume, and use these quantities to calculate density
- Predict how changes in acceleration due to gravity will affect the mass and weight of an object
- Explain that the mass of an object does not change, but its weight changes based on the gravitational forces acting upon it
- Observe, investigate, and describe how different objects move
- Analyze and interpret observable data about the impact of forces on the motion of objects
- Identify and predict how the direction or speed of an object may change due to an outside force
- Predict and evaluate the movement of an object by examining the forces applied to it

- Use mathematical expressions to describe the movement of an object
- Explain the similarities and differences between elements and compounds
- Identify evidence suggesting that atoms form into molecules with different properties than their components
- Develop, communicate, and justify a procedure to separate simple mixtures based on physical properties
- Share evidence-based conclusions and an understanding of the impact on the weight/mass of a liquid or gas mixture before and after it is separated into parts
- Identify properties of substances in a mixture that could be used to separate those substances from each other
- Develop and design a scientific investigation to separate the components of a mixture
- Identify the distinguishing characteristics between a chemical and a physical change
- Gather, analyze, and interpret data on physical and chemical changes
- Gather, analyze, and interpret data that show mass is conserved in a given chemical or physical change
- Identify evidence that suggests that matter is always conserved in physical and chemical changes

**Topics:**

You will learn about the following topics (not necessarily in this order):

Waves – Sound, Electromagnetic, Seismic and Water  
 Energy – Forms, Flow and Conservation  
 Force and Motion  
 Mass, Weight, Volume and Density  
 Phases of Matter  
 Atomic structure of matter  
 Physical and Chemical Changes  
 Properties of mixtures – solubility, boiling points, magnetic properties and densities

Your goal is to approach each topic as an inquiry challenge – as a scientist would. You will be provided with ample opportunities to collaborate with your colleagues, achieve new levels of frustration (a good thing!), and accomplish much with your intellect. In the end, you will become a better scientist in order to better teach others to become scientists.

**Method of Evaluation:**

Grades will be assigned according to the following scale:

100 – 90%	A
89 – 80%	B
79 – 70%	C
69 – 60%	D
less than 60%	F

“A” quality work will require deep thinking, creativity and synthesis of ideas. Effort beyond “knowing the material”. A grading rubric will be provided and sample “A” quality work demonstrated.

**Course Requirements:**

A sample distribution of course assessments follows:

Method of Assessment	Approximate weight
In-Class discussion/activities	10%
Home work	15%
Quizzes	25%
Exams	30%
Lab	20%

### Quizzes:

Some quizzes will be given in class and others online. These quizzes will be used as both pre-reading quizzes and weekly quizzes. One of each type of quiz will be dropped – no exceptions.

### Class time:

#### *Pre-Reading*

You are expected to read the assigned material *before* the class that it is assigned. Class time will be used to answer students' questions, practice difficult concepts and problems and investigate phenomena through hands on activities. It will not but used to "cover the material." All class notes/worksheets/examples/clicker questions will be posted on the course calendar so you don't have to focus your attention on playing the role of a scribe. During class you'll be working with other students to make sense out of and practice physical science.

#### *Clickers*

2.5% of your in class grade will be earned through answering clicker questions. Most will simply be for participation but a few times during the semester the clicker questions will be graded for correctness. When the questions are graded, it will be announced in advance. The points you've earned from clicker questions will not be applied towards your grade until you return an i>clicker (if you lose the one given out in class, buy another one). Register your i>clicker at iclicker.com.

### *In-class Activities and Homework:*

If you miss class on the day an assignment is given or an activity is done you will probably NOT be able to make it up. Homework assignments will not be accepted late.

Assignments that are not collected the day they are done in class should be typed. Please use standard fonts such as 10-12 point Times Roman or Calibri. Creativity should go into the content rather than the way it looks. Depending on the assignment daily work can be single spaced.

Assignments that are not collected the day they are done in class are expected to be written clearly and at the level a professional teacher would write. Grading will be based on the content as well as grammar and spelling. Please proof read all work before submitting. If you need help with your writing, the Writing Center, Ross Hall 1230, is an excellent resource.

Discussions with your peers are an important learning tool. The best way to learn something is to teach it. Also scientists rarely work alone, despite society's stigma that scientists are unsocial intellects working in some smelly lab. You are strongly encouraged to form friendships and exchange emails and phone numbers that will enable you to work on assignments outside of class especially with your assigned group.

### *Exams:*

There will be three exams evenly spaced over the semester plus a comprehensive final exam. Students will be expected to take all exams when scheduled and should **NOT** make plans that conflict.

### *Laboratory:*

Laboratory each week will involve hands-on activities appropriate for the elementary classroom. You will investigate phenomena related to that week's class material.

You must pass the lab to pass the course. Attendance at all labs is required.

### **Student Expectations:**

- Students are expected to work an average of 2 hours outside of class for each hour spent in class.
- Students are expected to regularly attend class. Absences greater than professional teaching responsibilities will probably have a detrimental effect on you final grade.
- Students are expected to read all assignments.
- Students are expected to participate in classroom discussions and activities.
- Students are expected to turn in assignments on announced due dates.
- Students are expected to actively participate in group functions and fulfill other group responsibilities.
- Students are expected to take tests and quizzes on the days they are given
- Students are expected to be responsible for their own work and be thoughtful of others.

- Students are expected to follow UNC's Honor Code and Student Code of Conduct  
<http://www.unco.edu/dos/communityStandards/index.html>

**Resources:**

Students with disabilities who believe they may need accommodations in this class are encouraged to contact Disability Support Services (970) 351-2289 as soon as possible to better ensure that accommodations are implemented in a timely fashion. Students with accommodations must provide the disability access form at least 3 days before accommodations are needed.

Writing Center in Ross Hall 1230

**Sexual Misconduct/Title IX Statement**

The University of Northern Colorado prohibits and will not tolerate sexual misconduct or gender-based discrimination of any kind. UNC is legally obligated to investigate sexual misconduct (including, but not limited to sexual assault, sexual harassment, stalking, and intimate partner violence). If you disclose an incident of sexual misconduct to a faculty member, they have an obligation to report it to UNC's Title IX Coordinator. "Disclosure" may include communication in-person, via email/phone/text message, or through in/out of class assignments.

If you wish to speak confidentially about an incident of sexual misconduct, please contact the UNC Counseling Center (970-351-2496) or the Assault Survivors Advocacy Program (970-351-4040).

If you would like to learn more about sexual misconduct or report an incident, please visit [www.unco.edu/sexualmisconduct](http://www.unco.edu/sexualmisconduct).

**Equity and Inclusion Statement**

The University of Northern Colorado embraces the diversity of students, faculty, and staff, honors the inherent dignity of each individual, and welcomes their unique perspectives, behaviors, and worldviews. In this course, people of all races, religions, national origins, sexual orientations, ethnicities, genders and gender identities, cognitive, physical, and behavioral abilities, socioeconomic backgrounds, regions, immigrant statuses, military or veteran statuses, size and/or shapes are strongly encouraged to share their rich array of perspectives and experiences. Course content and campus discussions will heighten your awareness to each other's individual and intersecting identities.

The Office of Student Rights & Responsibilities (located in Decker Hall) serves as resource to anyone seeking support or with questions about equity and inclusion at the University of Northern Colorado (UNC). If you are a witness to or experience acts of bias at UNC and would like to learn more about bias response or report a bias incident, please visit Bias Response at <http://www.unco.edu/biasresponse/>.

**Academic Integrity Statement**

You are expected to practice academic honesty in every aspect of this course. Make sure you know and understand the pillars of the UNC Honor Code: Honesty, Trust, Responsibility, Respect, and Fairness. Become familiar the Student Code of Conduct, especially the section on acts of dishonesty. Students who engage in academic misconduct are subject to grading consequences with regard to this course and/or university disciplinary procedures through the office of Student Rights and Responsibilities.

Everything on this syllabus is subject to revision throughout the semester; however, adequate notice will be given.

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CONSENT FORM FOR HUMAN PARTICIPANTS IN RESEARCH  
UNIVERSITY OF NORTHERN COLORADO

Project Title: Adams' Course Data

Researcher: Wendy Adams, Ph.D., School of Earth Sciences and Physics.

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The purpose of the proposed project is to better understand effective teaching methods for promoting student understanding of the content, student perceptions of the discipline and student understanding of the nature of science. Specifically I am using teaching methods that are considered best practices learned from education research. As part of my own evaluation of these teaching methods, I will be asking you about your views of science, physics and the nature of science. In addition I will ask you to complete a survey at the end of the semester about your opinion as to the value of various aspects of the course for learning.

To evaluate the effectiveness of the course, I will look at all the data from the course in aggregate, without students' names or other individual identifiers. The course data includes in class questions, quizzes, exam results and student responses to the surveys that are offered at the beginning and the end of the semester.

The risks, discomforts and benefits are the same as those encountered by students taking a typical college level physics course.

Participation is voluntary. You may decide not to participate in this study and if you begin participation you may still decide to stop and withdraw at any time. Your decision will be respected and will not result in loss of benefits to which you are otherwise entitled. Having read the above and having had an opportunity to ask any questions, please complete the survey. By completing the survey, you will give permission for your participation. You may keep this form for future reference. If you have any concerns about your treatment as a research participant, please contact the Office of Sponsored Programs, Kepner Hall, University of Northern Colorado Greeley, CO 80639; 970-351-2161.