



EDUC 505 Teaching Physical World Course Syllabus

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Format: Online, 7 weeks

Dates: 3/7 - 4/30/2021

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Text: *An Introduction to Physical Science*, 15th ed. + Enhanced WebAssign By Shipman, Wilson, Higgins, and Lou. Cengage Publishing.

Calculator: You also need a simple calculator with trigonometry and exponent capability. (The computer has one, but a separate one is more convenient.)

Course Objectives: This course serves to inspire 4th – 12th grade teachers in the area of Physical Science, particularly Physics. It will acquaint primarily nonscientists with basic scientific principles governing our world in the areas of motion, heat, sound, electricity, and light not to become experts in physical science, but to gain a modest understanding of how physical science is developed and operates. We will explore ways to communicate and inspire students to hunger for knowledge of science. At the end of the course, students are expected to have developed:

- An awareness of the basic assumptions and scopes of physical science
- An awareness that the nature of physical science is based on empirical evidence as opposed to intuition, opinion, or consensus
- An understanding of the basic physical laws in some areas of physical science
- The skills to do simple quantitative measurements, analysis, and deduction
- Learn inexpensive and exciting experiments that will encourage and inspire your students to pursue science
- The ability and confidence to teach and demonstrate a scientific experiment

Content Overview: Welcome to EDUC505 – Teaching Physical World!

When we look up to the sky, or down to the earth, or deep into the heart of atoms, we can only awe at the power, the intricacy, and the beauty of the vision. It is hard to believe that the structure exists by chance, without design or order. We wonder if there is any universal law governing this vast expanse. Physics is a branch of science that deals with this issue. Through observations, experimentations, and intellectual induction, physicists have deduced a few laws that can explain a vast amount of phenomena that we see in the world around us. Through this course, we will see a glimpse of some of these laws and how they can explain the world around us. We will also explore other aspects of physical science.

First, we will see how scientific thinking was developed, and how the knowledge was accumulated through observations and systematic deductions and inductions, known as scientific method. Contributions of some outstanding scientists will be noted as the relevant topics arise. The course will cover basic concepts and terminologies that are necessary to understand the dynamics of the physical world, such as motion, gravity, heat, waves, electricity, and light, and some applications will be scattered throughout the lectures. Laboratory work will accompany the lectures, partly to illuminate the concepts explained in class, and also to learn how to deduce valid conclusions from observational data and other known facts. Additionally you will learn how to teach these experiments to your students.

This course is designed for non-science majors; quantitative problem solving will be limited to using simple algebra. The emphasis will be on familiarizing the students with scientific method and basic principles governing our world, and on our responsible use of physical resources.

Course Grade: Your course grade will be computed as follows, using the scale at the right to determine letter grades.

Task	% of Grade	A: 90-100	C: 70-73.99
Laboratory	20%	A-: 87-89.99	C-: 67-69.99
Homework	10%	B+: 84-86.99	D+: 64-66.99
Discussion	5%	B: 80-83.99	D: 60-63.99
Papers	5%	B-: 77-79.99	D-: 50-59.99
Exam 1	15%	C+: 74-76.99	F: 0-49.99
Exam 2	15%		
Exam 3	15%		
Final Presentation	15%		
Total	100%		

Laboratory: Laboratory work will be woven together with the lecture. It is an integral part of the course; if you fail one portion, you also fail the other. There is no separate letter grade for the lab. The score from the lab work will constitute part of the total score for the course. Passing Laboratory work is a necessary condition for passing the course. Detailed policy for laboratory work will be given during laboratory session. All lab reports are due one week from the laboratory experiment. We will do two laboratory experiments each week.

Homework: Homework will be due per the schedule in WebAssign and will not be accepted late unless there are extenuating circumstances. All homework assignments are given through WebAssign unless otherwise noted in the Course Schedule. WebAssign will allow you instant feedback on homework, as well as tutorials, additional practice problems, and videos that help explain the problems further. I will give an introduction to this program in a YouTube video. Doing homework is essential to learning the material; you will only understand and retain these concepts by practice. I strongly encourage you to find several others in the class to study with and do homework together. However, your work on your homework should be your own.

Discussion: After each lab, there will be a discussion on Canvas that will be initiated and you will be expected to comment and then respond to at least two classmates.

Papers: All due dates and details are on Canvas and will be submitted on Canvas.

#1 – Write a paper between 4 - 5 pages long about your perception of science prior to taking this class. More specifically, I am interested in your elaborate answers on these questions:

1. What experiences have you had with science class(es)? What encouraged you to take this class? Please elaborate!
2. Have you ever taught a science class? If yes, what kind of successes or struggles did you experience?
3. How do think you can weave science into all aspects of your classroom and even time with young people in your life outside of the classroom.
4. What are some of the controversies in science that you are aware of? Are there topics that that you would like to learn more about?
5. What do you expect to learn from this class that will be useful for you?

#2 – Write a paper between 4 - 5 pages long about one of the Noble Prize winners in physics, chemistry, or medicine in the last 15 years whose contribution to science might interest you. Please describe:

1. His/her contribution that lead to winning the prize.
2. A short biography of this person, include their spiritual/religious life.
3. What can you learn from their life or passion in science?
4. How could you inspire your students with what you have learned from this person?

#3 – Develop your own experiment! This is your opportunity to do some research and come up with your own idea that you could implement in your classroom. Write a 10+ page paper that explores the following:

1. The concept you will be exploring and the solid scientific background and explanation. Include equations if needed.
2. What supplies are needed and where could one procure them?
3. Step-by-step instructions including any special notes or warnings.
4. At least a one page handout for students to record their findings.
5. Bonus points if you try this in your own classroom and have pictures and results.
6. Has there been any change in your perception about the inter-relation between science and daily life? How can you weave science into other assignments?
7. You have the option of doing this experiment as your final presentation instead of one of the ones we did in the laboratory experiments.

Exams: All exams will be Canvas based. The dates will be posted on Canvas and each exam will be open from 8 AM – 10 PM so you can complete them asynchronously. Once you begin an exam you will have 60 minutes to complete it. The exams will cover the indicated chapters as posted in Canvas. Please note: You will want to have a

scientific calculator of some sort; the calculator on the computer can be cumbersome. The TI-30 series calculators are sufficient and inexpensive.

Final Presentation: You will teach one of the laboratory experiments that we have learned. You do have the option of working with a partner to:

- Gather the appropriate materials
- Find any videos or develop a presentation to assist the audience in understanding the topic (make sure it is grade appropriate)
- Set-up and run through a portion of the experiment
- Prepare a report to submit via Canvas. (More detail info will be communicated later in the semester.)
- You do have the option of coming up with a different experiment.

Special Assistance: In accordance with the provision of the ADA, please contact the professor immediately.

This syllabus is not a contract, but serves as a general outline for the semester. Various items may be added or subtracted at the discretion of the professor.

DIVERSITY AND INCLUSION STATEMENT: During this particularly difficult time, this statement momentarily underscores and deepens what is expressed in the Lifestyle Covenant regarding the dignity of all humans. The statement will remain in all Bethel Faculty syllabi until spring 2023 and then be remanded back to the Faculty. *Bethel University respects the dignity of all God's image-bearers, and stands against racism, prejudice, and discrimination. Because Christ calls us to love our neighbor as ourselves, Christian discipleship includes pursuing the good of those who suffer injustice due to their color, race, or ethnicity. Therefore, we aim to continually transform our classrooms into safe and hospitable spaces where we listen to one another with mercy, learn from and value each other with tenacity, and commit to pursuing justice for the most vulnerable in our community.*