

## College Prep Physics Full Year Course

**Instructor:** Jacki Omland

**Ementor:** Christina Strid

**Class session:** 50 minutes: Monday – Friday

**Grade Level:** 11 or 12

Delivery Method: DDN & Internet

**Course Prerequisites:** Algebra 1 & 2 and Junior or Senior standing

**Course Textbook:**

Recommended: Serway & Faughn, **College Physics, 5th Edition** (Thomson\*Brooks/Cole Publishing, ISBN 0-03-023798-X) or Serway & Faughn, **College Physics, 6th Edition** (Thomson\*Brooks/Cole Publishing, ISBN 0-03-035114-6)

**There is no required textbook, as I will be using information from several sources. I would however recommend that each classroom have at least 1 copy of the above physics text. Contact me and I can let you know where you might be able to get some used texts.**

**Project/Papers:** VTEL, over the internet through WebCT course site, e-mail, FAX, or Snail Mail

**Equipment Needed:** DDN classroom with at least 1 Microsoft Windows compatible computer with internet access for every 3-4 students. Students will also need access to string, masking tape, scissors, rulers, protractors, graphing paper, and white paper. NSU will assemble loan physics equipment kits to each school for every 3 – 4 students. A list of equipment and replacement costs will be included in each kit. These kits must be returned to the NSU E- Learning Center. A charge will be assessed for any missing or damaged items.

**Course Description:** This is a general physics course with a problem-solving component requiring an Algebra 2 level of mathematics preparation and will include basic trigonometry (taught in the course). The topics to be covered in the first semester are Measurements, Mechanics, and Circular and Rotational Motion. The topics to be covered in the second semester are Electricity and Magnetism, Wave Motion, Thermodynamics and Modern Physics.

**Course Objectives:** The intent of this course is to introduce students to the principles and methods of physics and to show them how these principles are applied in order to explain the phenomena of the physical world. The laboratory experiences and demonstrations will give the students insight into how experimentation leads to the discovery of new scientific principles. Cooperative attitudes will be nurtured through the use of group activities. In addition to the knowledge base developed in physics, use of computer technologies are integrated throughout the entire course. The use of these technologies are intended to impart the following specific skills: ability to use a Web browser to access online information; ability to use bulletin boards; ability to download files; ability to use software packages for data acquisition and analysis.

Syllabus:

<sup>st</sup>  
1 Semester

Exam	Topics
1	Standard measurements, significant figures, scientific notation, basic trigonometry, motion in one dimension, and free fall
2	Vectors, projectile motion and Newton's Laws of Motion
3	Work, energy, power, and momentum
4	Circular motion, gravity, torque, and rotation

<sup>nd</sup>  
2 Semester

Exam	Topics
1	Thermal physics, heat transfer, and thermodynamics
2	Vibrations and waves, sound, light, and mirrors and lenses
3	Electrostatics, capacitance, current, resistance, and magnetism
4	Relativity, quantum physics, nuclear physics, and elementary particles

South Dakota Science Standards

Grades 9-12 South Dakota Science Standards can be found at the following website:  
<http://www.state.sd.us/deca/TA/contentstandards/science> . This course addresses the following state standards:

**GRADES 9-12 NATURE OF SCIENCE STANDARDS**

**STUDENTS WILL:**

1. analyze how societal, cultural, and personal beliefs influence scientists' investigations and interpretations.
2. analyze evidence that supports or refutes past or current scientific theories, hypotheses, and/or explanations about a specific topic.
3. analyze how new discoveries may either modify existing theories or result in establishing a new paradigm.
4. compare different scientific explanations for the same observations about natural phenomena.
5. explain how observation and evidence are essential for reaching a conclusion.
6. analyze how new knowledge and methods emerge from investigations and from public communication among scientists.
7. differentiate among facts, predictions, theory, and law/principles in scientific investigations.
8. apply basic science process skills. (example: observing, classifying, measuring, communicating, predicting, inferring)
9. identify questions and concepts to guide the development of hypotheses and of scientific investigations including the analysis of primary sources of information.
10. select and use appropriate instruments to extend observations and measurements.

11. manipulate multiple variables with repeated trials.
12. apply appropriate mathematical techniques in evaluating experimental data.
13. formulate and revise scientific explanations and models.
14. use written, oral, and technological communication skills to explain scientific phenomena and concepts.
15. use safe and effective laboratory techniques.

## GRADES 9-12 PHYSICAL SCIENCE STANDARDS

### STUDENTS WILL:

1. explain characteristics of atoms and of relationships that exist among them.
2. compare characteristics of isotopes of the same element.
3. compare the roles of electrons in covalent, ionic, and metallic bonding.
4. apply calorimetry to investigate heat of reaction.
5. analyze the properties and interactions of acids, bases, and salts.
6. analyze energy transfer as matter changes from one form to another.
7. analyze how phases of matter are explained by kinetic theory and by forces of attraction between particles.
  
8. apply the kinetic molecular theory to solve quantitative problems involving pressure, volume, and temperature in ideal gases.
9. demonstrate the relationships between force and motion in Newton's laws.
10. solve graphically and analytically vector problems related to force.
11. relate gravitational or centripetal force to projectile or uniform circular motion.
12. apply quantitative relationships among mass, velocity, force, and momentum.
13. apply the quantitative relationships among force, distance, work, time, and power to solve problems or to describe situations.
14. explain how extremely large and extremely small quantities and very rapidly moving objects are not necessarily described by the same laws that Newtonian physics describe.
15. explain the sources of intramolecular and intermolecular forces in matter.
16. calculate the force on a charged particle at rest and/or in motion.
17. determine if an object is in equilibrium and distinguish among stable, neutral and unstable equilibria.
18. describe mathematically the relationships among potential energy, kinetic energy, and work.
19. describe how energy can be transferred and transformed to produce useful work and to calculate the efficiency of selected systems.
20. explain methods of heat transfer. (example: conduction, radiation, convection)
21. relate conservation of matter and energy to the flow of energy through food webs.
22. describe the use of isotopic dating in determining the age of fossils.
23. interpret wave phenomena using models of transverse and longitudinal waves.
24. analyze the different frequencies and wavelengths in the electromagnetic spectrum.
25. investigate how light behaves in the fundamental processes of reflection, refraction, and image formation. (example: manipulate prisms, mirrors, lenses)
26. use single and multiple slits and diffraction gratings to demonstrate the wave properties of light.

GRADES 9-12 SCIENCE, TECHNOLOGY, ENVIRONMENT, AND SOCIETY  
STANDARDS

STUDENTS WILL:

1. analyze the impact of scientific investigations and findings on human society.  
(example: issues surrounding genetic engineering)
2. explain how progress in science and technology can be affected by social issues and by challenges.
3. explain the relationships between the maintenance and progress of society and of scientific advancement.
4. describe and explain scientific factors that affect population size and growth. (example: birth and death rates, medical services, social services, quality of environment, disease, education)
5. evaluate the scientific accuracy of information relevant to a specific issue regarding local, national, and/or global agricultural practices that affect the environment.
6. evaluate the impact of products made of natural materials or synthetic materials, or of a combination of the two.
  
7. describe immediate and long-term consequences of potential solutions for technological-related issues. (example: natural catastrophes, interactions of populations, resources and environment, health, disease)
8. evaluate factors that serve as potential constraints on technological design and use.  
(example: ethics, ecology, manufacturing processes, operation, maintenance, replacement, disposal, liability)
9. understand technological design. (example: identify appropriate problems for technological design, design a solution or product, implement a proposed design, evaluate technological designs or products, communicate the process of technological design)
10. predict and evaluate how the characteristics of materials influence product design.
11. Analyze the benefits, limitations, cost, and consequences involved in using, conserving, or recycling resources.
12. explain how people control the outputs and impacts of our expanding technological activities in the areas of communication, construction, manufacturing, power and transportation, energy sources, health technology, and biotechnology.
13. compare and contrast the positive and negative consequences of technology.  
(example: nuclear power for generating electricity)
14. describe possible consequences of reducing or of eliminating some of Earth's natural resources.

Class format:

The class is scheduled to meet for 50 minutes per day M-F excluding holidays listed on the e-learning course schedule. These 50 minutes will be integrated with lecture, laboratory work, problem solving, question and answer, and demonstrations. Lab activities will be done in groups both at your home site and pairing up with members from other sites. You will also be expected do assigned problems and/or worksheets.

Exams (four per semester) will be 50 minutes long. Special projects may be assigned to be done outside of class in groups or individually, depending upon the project.

Evaluation and grading:

The following grading scale will be used:

Percentage	Grade
90.0% - 100.0%	A
80.0% - 89.9%	B
70.0% - 79.9%	C
60.0% - 69.9%	D
Below 60.0%	F

Exams: There will be four 50-minute exams each semester (see syllabus above for contents.) Each exam will have a short-answer essay section and a problem section. The short-answer essay questions will be taken from notes and/or worksheet questions.

The problems will be taken from the assigned problems and un-graded suggested problems, worksheets, and practice test problems. After some exams, I will allow you to correct mistakes and obtain up to one-half of the points missed. Each test will be worth 100 – 150 points.

Laboratory activities: Various types of labs will be conducted. They will involve computer-acquired data, digital video analysis, computer simulations and hands-on measurements. Each lab will require a written report. There will be approximately one lab per week and range between 10 – 30 points each.

Problems: Before exams there may be a set of graded problems assigned. Each problem will be worth 5 points. I will also be suggesting other problems, questions, worksheets and practice test problems for some tests. These will not be graded but will be important to try, as some of these may be on the exam.

Special projects: Each semester there may be special projects assigned to be done outside of class. Some projects will be done as groups, some will be individual. These will involve creativity and application of learned concepts but should be fun. Each project will be worth up to 100 points and you will be expected to present them to the class upon completion.

All assignments are expected to be done completely and on time. If work is not turned in by the due date, a 10% reduction will be made for each day late up to a maximum of 50%. Exceptions to this may be granted on an individual basis due to unforeseen, unusual circumstances.

Plagiarism of any kind is totally unacceptable!! Any assignment deemed to be plagiarized will receive a grade of 0% and your parents and school officials will be notified immediately!!