NEW JERSEY CENTER
FOR TEACHING & LEARNING

PHYS 6601C: Learning and Teaching Algebra-Based Physics:
Waves, Quantum & Nuclear Physics

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Course Credit: 2.0 NJCTL credits

Dates & Times:

This is a 2-credit, self-paced course, covering 6 modules of content. The exact number of hours that you can expect to spend on each module will vary based upon the module coursework, as well as your study style and preferences. You should plan to spend 6-12 hours per module, completing the module slides, readings, short answer assignments, labs, mastery exercises, practice problems, and module exams.

COURSE DESCRIPTION:

This is the last of three mini-courses which, together, are designed for those who are learning to teach Algebra-Based physics for middle school or high school students, focusing on conveying physics and mathematical concepts and understandings. Underlying themes are physics connections to everyday life, applications of mathematics in physics, problem solving, and hands on laboratory experience. The course presents physics as the foundation for studying chemistry, biology and advanced mathematics. Technology serves as a tool to establish these connections through exploration, problem solving, formative assessment, presentation, and communication.
New Points:

This final course is comprised of modern physics, including Simple Harmonic Motion, Waves, Light and the Bohr model of the Hydrogen atom for the last 20%.

The order of the topics has been geared towards reinforcing skills in algebra and requires no trigonometry. This is accomplished by only including problems that can be simplified to one-dimensional form. While vectors are introduced, they are only added and subtracted in one dimension at a time. Connections are also developed between the analysis of motion and graphical analysis, collision problems and the solving of systems of equations.

Teachers will learn core foundational concepts in modern physics topics as well as the pedagogical content knowledge needed to successfully teach introductory physics to students.

STUDENT LEARNING OUTCOMES:

Upon completion of the course, the student will be able to:

1. Demonstrate mastery of Algebra-Based Physics on a comprehensive exam.
2. Demonstrate mastery of pedagogical content knowledge for teaching Algebra-Based Physics.
3. Identify, understand, and communicate the elements, representations, and models of scientific phenomena to solve scientific problems.
4. Apply basic mathematical tools such as linear algebra and graphical analysis to solve physics problems.
5. Apply the laws of physics in the areas of kinematics, dynamics, uniform circular motion, Newtonian gravitation, conservation of energy and momentum, electromagnetism and modern physics.
6. Examine, investigate, and assess the relationships between various physics models and their variables.

TEXTS, READINGS, INSTRUCTIONAL RESOURCES:

Required Texts:

- PSI Algebra-Based Physics uses a free digital text book accessible at: https://njctl.org/courses/science/algebra-based-physics/
- Participants will download SMART Notebook presentations, homework files, labs, and teacher resources from the PSI Algebra-Based Physics Course
- Holton, G. J., Brush, S. G., & Holton, G. J. (2001). *Physics, the Human Adventure: From Copernicus to Einstein and Beyond*. New Brunswick, N.J: Rutgers University Press. ISBN-13: 9780813529080

Recommended Texts:

The Physics Classroom - http://www.physicsclassroom.com/

HyperPhysics - http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html

PhET (simulations) - http://phet.colorado.edu/en/simulations/category/physics

COURSE REQUIREMENTS:

Consistent attendance in your online courses is essential for your success. Failure to verify your attendance within the first 7 days of this course may result in your withdrawal. If for some reason you would like to drop a course, please contact the Dean of Students.

Online classes have assignments and participation requirements just like on-campus classes. Budget your time carefully. If you are having technical problems, problems with your assignments, or other problems that are impeding your progress, let your instructor know as soon as possible.

GRADE DISTRIBUTION AND SCALE:

In order to receive a Passing grade, the participant must complete the following course requirements: all short answer assignments, mastery exercises, labs, exams, and the reflection paper outlined in the *Assignments* section of the Class Schedule (below).

GRADE DISTRIBUTION AND SCALE:

Grade Distribution:

Module Exams	70%
Final Exam	10%
Short Answer Assignments	6%
Labs	6%
Mastery Exercises	6%
Reflection Paper	2%

Grade Scale:

A	93 – 100
A-	90 – 92
B+	86 – 89
B	83 – 86
B-	80 – 82
C+	77 – 79
C	73 – 76
C-	70 – 72
D	60.0 – 69.9
F	59.9 or below

ACADEMIC STANDING:
NJCTL has established standards for academic good standing within a student's academic program. Students enrolled in any NJCTL online course must receive an 80 or higher to successfully complete a course and receive credit for that course. An 80 is equivalent to a GPA of 2.7 or B-. Additionally, students in an endorsement program must receive a cumulative GPA of 3.0 for all courses combined in order to successfully complete the program.

ACADEMIC INTEGRITY:
Students must assume responsibility for maintaining honesty in all work submitted for credit and in any other work designated by the instructor of the course. Academic dishonesty includes cheating, fabrication, facilitating academic dishonesty, plagiarism, reusing /re-purposing your own work, unauthorized possession of academic materials, and unauthorized collaboration.

CITING SOURCES WITH APA STYLE:
All students are expected to follow proper writing and APA requirements when citing in APA (based on the APA Style Manual, 6th edition) for all assignments.

DISABILITY SERVICES STATEMENT:
We are committed to providing reasonable accommodations for all persons with disabilities. Any student with a documented disability requesting academic accommodations should contact the Dean of Students, Dr. Jamie Korns, additional information to coordinate reasonable accommodations for students with documented disabilities (Jamie@njctl.org).

NETIQUETTE:
Respect the diversity of opinions among the instructor and classmates and engage with them in a courteous, respectful, and professional manner. All posts and classroom communication must be conducted in accordance with the student code of conduct. Think before you push the Send button. Did you say just what you meant? How will the person on the other end read the words?

Maintain an environment free of harassment, stalking, threats, abuse, insults or humiliation toward the instructor and classmates. This includes, but is not limited to, demeaning written or oral comments of an ethnic, religious, age, disability, sexist (or sexual orientation), or racist nature; and the unwanted sexual advances or intimidations by email, or on discussion boards and other postings within or connected to the online classroom.

If you have concerns about something that has been said, please let your instructor know.

CLASS SCHEDULE:

Module	Required Readings	Assignments
1 – Simple Harmonic Motion	• Pages 80-83 in *Physics, the Human* Adventure	• Short Answer • Lab • Mastery Exercises • Module Exam
2 – Waves & Sound	• Pages 341-344 in *Physics, the Human* Adventure	• Short Answer • Lab • Mastery Exercises • Module Exam
3 – Electromagnetic Waves	• Pages 345-351 in *Physics, the Human* Adventure	• Short Answer • Lab • Mastery Exercises • Module Exam
4 – Quantum Physics & Atomic Models	Pages 388-408 and 427-445 in *Physics, the* Human • *Adventure*	• Short Answer • Lab • Mastery Exercises • Module Exam
5 – Nuclear Physics	• Pages 409-426 in *Physics, the Human* Adventure	• Short Answer • Lab • Mastery Exercises • Module Exam

6 - Reflection	• Review topics as desired in *Physics, the Human Adventure* (recommended)	• Reflection Paper • Final Exam