Course Syllabus

Physics 2013-2014

**Course Description**:

This advanced course is designed to continue student investigations of the physical sciences. Physics is the study of matter and its motion in the physical world. Emphasis is largely placed on applying laboratory techniques, critical-thinking skills and problem solving skills in Physics. Topics include, but are not limited to Motion Mechanics, Newton’s Laws of Motion, vector notation, projectile motion, gravitation, work and energy; thermodynamics; Electricity; Magnetism; Wave and Energy transfer; Sound and Light; Quantum Theory.

**Competencies/ Major Learning Targets**:

Students should be able to:

Use the Scientific Process

Develop and Use Models

Use Mathematics and Computational Thinking

Construct Explanations and Design Solutions

And Engage in Argument from Evidence

To complete tasks including:

1. Students will describe the motion of an object using displacement, velocity, acceleration, and momentum.
2. Students will describe that when an unbalanced force acts on an object, the motion of the object changes.
3. Students will describe that all energy can be considered to be kinetic energy, potential energy, or energy contained by a field.
4. Students will determine that energy can neither be created nor destroyed but can be stored, transferred, or transformed.
5. Students will describe that studying atomic structure is an ongoing process that builds upon the work of many scientists, while continuing to provide insights into the nature of matter.
6. Students will describe the current thinking regarding the fundamental building blocks of matter in particle physics.
7. Students will describe that electricity and magnetism are two aspects of a single electromagnetic force.
8. Students will safely conduct laboratory investigations to apply to conceptual and learning objectives*.*

Note: These are the major learning targets. Daily learning targets will be posted on the board.

**Grading Practices**:

***What is formative?*** Formative is what you do while you are learning. Formative assignments will be practice, lab work, worksheets, quizzes ,to assess progress toward a competency. Some homework assignments will be formative.

***What is summative?*** Summative assignments assess what you have learned. Summative assignments will be a project, lab report or unit test to assess competency in a topic. For a project r lab report a rubric will be given.

***What is responsible learner?*** When you are prepared for class, completed classwork and homework this will be tracked. Even though it is not calculated as part of your grade it will be tracked in Web2school.

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| **UNIT** | **NH State Science Standard** |
| Kinematics (motion) | (S:PS3:11:1.8) Given information (e.g., graphs, data, diagrams), students will use the relationships between or among force, mass, velocity, momentum, and acceleration to predict and explain the motion of objects**.** |
| Dynamics (motion and forces) | (S:PS3:11:2.3) Students will apply the concepts of inertia, motion, and momentum to predict and explain situations involving forces and motion, including stationary objects and collisions. |
| Energy and its conservation | (S:PS2:11:3.1) (S:PS2:11:3.2) Explain that all energy can be considered to be kinetic energy, potential energy, or energy contained by a field and provide examples of how kinetic and potential energy can be transformed from one to the other. |
| Composition and Properties of Matter | (S:PS1:11:1:5) Scientific thought about atoms has changed over time. Using information (narratives or models of atoms) provided , students will cite evidence that changed our understanding of the atom and the development of the atomic theory |
| Electricity and Magnetism | (S:PS2:11:1.5) Students will explain relationships between and among electric charges, magnetic fields, electromagnetic forces, and atomic particles. |
| Waves: Electromagnetic and Sound | (S:PS3:11.2.4) Students will explain the effects on wavelength and frequency as electromagnetic waves interact with matter |
| Science Process Skills  (All year) | Students will safely use laboratory equipment and apply the scientific method to accurately and precisely investigate questions.  Science Process Skills 1: Scientific Inquiry and Critical Thinking,  SPS 2: Unifying Concepts of Science,  SPS 3: Personal, Social, and Technological Perspectives,  SPS 4: Science Skills for Information, Communication, and Media Literacy |

**Timeline/Scope and Sequence**:

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|  | **UNIT** | **TOPICS** | **SUMMATIVE ASSESSMENTS** |
| **Quarter 1** | Physics Introduction  Reference Text Chapter 1  Target #1 and 8 | Safety  Introduction to physics  Units of Measurement  Metric System  Dimensional Analysis  Uncertainty in Measurement: Significant Figures, Precision, Accuracy, and Percent Error  Equations | Safety Quiz  Unit Test |
| **Quarter 1** | Kinematics  Motion (1-Dimensional motion), Introduction to Vectors, Motion in Two Dimensions  Reference Text Chapter 2, 3  Target #1 &8 | Constant/linear velocity  Acceleration  Vectors  Projectile Motion | Unit test  Ball toss Lab  Trebuchet Project |
| **Quarter 2** | Dynamics  Forces in One Dimension, Forces in Two Dimensions  Reference Text Chapter 4, 7  Target #2 &8 | Newton’s Laws  Friction  Statics  Gravitation | Unit Test  Force of Friction Lab |
| **Quarter 2** | Dynamics:  Momentum and its Conservation  Reference Text Chapter 6  Target #2 &8 | Impulse  Conservation of momentum  Collisions | Unit Test  Momentum Lab |
|  |  |  | **MIDTERM** |
| **Quarter 3** | Energy and Its conservation  Energy, Work and Power, Energy and its Conservation  Reference Text Chapter 5  Target #3, 4 & 8 | Work  Power  Energy: Kinetic and Potential  Relationship between matter and energy | Energy of a Tossed Ball Lab  Unit Test  Rube Goldberg Project |
| **Quarter 3** | Composition and Properties of Matter  Reference Text Chapter 21, 22, Appendices  Target #5 and 6 | Atomic Theory  Particle Physics  Description of Matter  Atomic Structure  Strong Force  Weak Force | Letter to Roosevelt Project |
| **Quarter 4** | Electricity and Magnetism  Static Electricity Electric Fields (Electrostatics), Current Electricity, Series and Parallel Circuits  Reference Text Chapter 16, 17, 18  Target #7 &8 | Electrostatic force  Electric field  Electric potential difference Circuits and resistance  Capacitance  Power  Series and parallel circuits | Series and Parallel Circuit Lab  Unit Test |
| **Quarter 4** | Vibrations and Waves  Sound & Light  Reference Text Chapter 11, 12, 13, 14  Target #7 & 8 | Wave properties  Frequency, wavelength  Standing waves  Sound  Intensity scale  Speed of sound  Effect of temperature on speed of sound  Resonance  Pipes and strings  Doppler effect  Light  Reflection & Refraction | Speed of Sound Lab  Unit Test |
|  |  |  | **FINAL** |

**\*** Text: Serway, Raymond A., Faughn, Jerry S.. Holt Physics. New York, New York: Holt, Rinehart and Winston, 2006.

**Summative Assessments**: (in addition to unit tests)

Year-long Subject Assignment

Quarter One:

* Ball Toss Lab: Students carry out an investigation to determine the value of the acceleration of gravity using a ball and motion detector and write a lab report to summarize their findings.
* Trebuchet Project: Students build a trebuchet/catapult to launch water balloons to a distance of 30 m and write a report with calculations and design considerations.

Quarter Two:

* Students carry out an investigation to determine coefficients of static and sliding friction and write a formal lab report on their findings.
* Students carry out an investigation to determine law of conservation of momentum in collisions write a formal lab report on their findings.

Quarter Three:

* Students carry out an investigation to determine conservation of energy using a ball and motion detector and write a lab report to summarize their findings.
* Students build a “Rube Goldberg” device to carry out a simple task and analyze each step with respect to energy and physics principles.
* Students write a response to Einstein’s letter to Roosevelt after studying the development of the atomic bomb and the Manhattan Project.

Quarter Four:

* Students carry out an investigation on parallel and series circuits and write a formal lab report on their findings.
* Students carry out an investigation to determine the speed of sound and write a formal lab report on their findings.