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 IntroductionReference Text Chapter 1Target #1 and 8 | SafetyIntroduction to physicsUnits of MeasurementMetric SystemDimensional AnalysisUncertainty in Measurement: Significant Figures, Precision, Accuracy, and Percent ErrorEquations | Safety QuizUnit Test |
| **Quarter 1** | KinematicsMotion (1-Dimensional motion), Introduction to Vectors, Motion in Two DimensionsReference Text Chapter 2, 3Target #1 &8 | Constant/linear velocityAccelerationVectorsProjectile Motion | Unit testBall toss LabTrebuchet Project |
| **Quarter 2** | DynamicsForces in One Dimension, Forces in Two Dimensions Reference Text Chapter 4, 7Target #2 &8 | Newton’s LawsFrictionStaticsGravitation | Unit TestForce of Friction Lab |
| **Quarter 2** | Dynamics:Momentum and its ConservationReference Text Chapter 6Target #2 &8 | ImpulseConservation of momentumCollisions | Unit TestMomentum Lab |
|  |  |  | **MIDTERM** |
| **Quarter 3** | Energy and Its conservationEnergy, Work and Power, Energy and its ConservationReference Text Chapter 5Target #3, 4 & 8 | WorkPowerEnergy: Kinetic and PotentialRelationship between matter and energy | Energy of a Tossed Ball LabUnit TestRube Goldberg Project |
| **Quarter 3** | Composition and Properties of MatterReference Text Chapter 21, 22, AppendicesTarget #5 and 6 | Atomic TheoryParticle PhysicsDescription of MatterAtomic StructureStrong ForceWeak Force | Letter to Roosevelt Project |
| **Quarter 4** | Electricity and MagnetismStatic Electricity Electric Fields (Electrostatics), Current Electricity, Series and Parallel CircuitsReference Text Chapter 16, 17, 18Target #7 &8 | Electrostatic forceElectric fieldElectric potential difference Circuits and resistanceCapacitancePowerSeries and parallel circuits | Series and Parallel Circuit LabUnit Test |
|  **Quarter 4** | Vibrations and WavesSound & LightReference Text Chapter 11, 12, 13, 14Target #7 & 8 | Wave propertiesFrequency, wavelengthStanding waves SoundIntensity scaleSpeed of soundEffect of temperature on speed of soundResonancePipes and stringsDoppler effectLightReflection & Refraction | Speed of Sound LabUnit 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.