Black Horse Pike Regional School District
Highland Timber Creek Triton
Science Department

Syllabus
Physics A
Course Content

Physics A will provide students with a practical knowledge of the principles of physics that are needed for working and competing in a technical environment. This course will develop the critical thinking skills of students through many discussions and problem-solving sessions. The course will reinforce various principles through laboratory activities. Basic topics for the course are: mechanics, and, waves. Only sections with * and no * will be taught all ** sections will be skipped.

September: **Basic Skills (HS-ETS1-2)**

- Develop problem-solving, decision-making, and inquiry skills
    - Rearranging equations
- Plan and conduct experiments
- Collect, analyze and evaluate evidence to build and revise models of natural phenomena
    - Graph Scientific Data
    - Convert units

October/November: **Kinematics (HS-ETS1-2, HS-ETS1-4)**

- Motion in one dimension
- Vectors vs. scalars
- Displacement vs. Distance
- Velocity vs. Speed
- Using the four kinematics equations to solve problems:
    - $x = xo + v_o t + \frac{1}{2} at^2$
    - $v = v^o + at$
    - $v^2 = v_o^2 + 2aDx$
    - $v_{avg} = (v + v_o)/2$
- Graphical interpretation of motion

November/December: **Dynamics (HS-PS2-1, HS-PS2-2, HS-PS2-3)**

- Newton's Laws
- Free body Diagrams
- Gravity near the earth's surface and "g"
- Mass versus weight (W = mg)
- Use ΣF = ma and free body diagrams to solve problems in one dimension
- Surface Forces: Normal Force and Friction
- Apparent weight
- Static and Kinetic Friction

December/January: **Uniform circular motion and universal gravitation (HS-PS2-4)**

- Net force required for circular motion ($a = mv^2/r$)
- Application of Free Body diagrams and Newton's Laws to circular motion problems
- Universal gravitation
- Solve problems with universal gravitation ($F = GMm/r^2$)
- Satellites and 'weightless"
- Kepler's Laws and Newton's Synthesis

February/March: **Energy (HS-PS3-1, HS-PS3-3)**

- Work done by a constant force ($W = Fd_{parallel}$)
- Conservation of Energy ($E_o + W = E_f$)
- Kinetic Energy ($KE = ½\ mv^2$)
- Gravitational Potential Energy ($GPE = mgh$)
- Elastic Potential Energy ($EPE = ½\ kx^2$)
- Internal Energy and Joule's Principle
- Conservative and non-conservative forces
- Problem solving with the Principle of Conservation of Energy.

March/April**: Momentum (HS-PS2-2, HS-PS2-3)**

- Momentum ($p = mv$)
- Impulse ($I = FDt = Dp$)
- Momentum and its relation to force ($F = Dp/Dt$)
- Conservation of momentum ($Sp = Sp'$)
- Collision and Impulse Problems
- Elastic collisions in one dimension ($v_1 – v_2 = v_2' – v_1'$)
- Perfectly inelastic collisions in one dimension ($m' = m_1 + m_2$)
- Inelastic collisions in one dimension

May: **Simple Harmonic Motion (HS-PS3-1, HS-PS3-2)**

- Period and frequency
- Mass-spring systems
- The simple pendulum
- Wave Motion

June: **Waves** (HS-PS4-1)

- Wavelength, frequency and wave velocity
- Interference
- Refraction
- Diffraction
- Standing Waves

Labs by Unit:

Kinematics:

Bowling Law Lab
Stomp Rockets
Free Fall Lab
Hopper Lab
Marble Launchers
Wooden Loop Lab- Inertia demonstration

Dynamics:

Newton's Law Demo
Friction Lab
Inertia Lab
Hooke's Law Lab

Centripetal Force:

Centripetal force lab:
Loop-de- Loop

Energy:

Energy Lab
Power Lab
Marble Launcher Lab
Roller coaster project

Momentum:

Momentum Observation Lab:

Simple Harmonic Motion:

Mass-Spring Lab
Pendulum Lab

Waves

Wave Transmission and Reflection
String Vibrator
Doppler Effect Demo

Course Expectations & Skills

- Create an organized notebook
- Synthesize an assessment using technology as an educational medium (e.g. students make a power point
- presentation, use excel to interpret lab data graphically, digital video, web design, etc.).
- Develop a creative way to convey physical science information or explain a societal phenomenon to a high
- school audience.

- Use math to analyze, express, and predict and model the effects of energy and forces on the physical world

Textbook

None

Grading Policy

Major Assessments 40%
Minor Assessments 10%
Labs 30%
Homework /Classwork 20%