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

Syllabus
Honors Physics
Course Content

Honors Physics will provide students with a practical knowledge of the principles of physics that are needed for working and competing in highly technical environments. 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, waves, sound, and electricity. All sections will be taught including ** sections.

Summer + Week: **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

September/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

January/February: **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

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

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

May/June: **Waves/Sound Waves** (HS-PS4-1)

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

June: **Circuits (If time allows) (HS-PS2-4)**

- Resistors in series ($R_{series} = R_1 + R_2 + ...$)
- Adding resistors in parallel ($1/R_{parallel} = 1/R_1 + 1/R_2 + ...$)
- Equivalent Circuit resistance
- Calculating current in circuits and circuit branches
- Calculating power in circuits and circuit branches
- EMF and terminal voltage (VT = E - Ir
- EMF's in series and in parallel

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 50%
Minor Assessments 15%
Labs 25%
Homework /Classwork 10%