**Westbrook School Department**

**Course Blueprint**

| **Content Area / Grade Level:** Science / 10, 11, 12th | |
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| **Course Title**: Honors Physics | |
| **Course Description**  A full year laboratory course designed to prepare students who will take physics in college. Topics will include motion, forces, energy, waves, electricity, magnetism and heat. This class has extensive homework with several group projects to be completed throughout the year. Good study skills and a strong secondary math background are important for a student’s success in this class. | |
| **Westbrook K-12 Learning Standards**   * Developing and Using Models * Planning and Carrying Out Investigations * Analyzing and Interpreting Data * Using Mathematics and Computational Thinking * Constructing Explanations and Designing Solutions * Engaging in Argument from Evidence * Obtaining, Evaluating and Communicating Information | **Guiding Principles / Vision of the Graduate**   * A clear and effective communicator * A self-directed and lifelong learner * A creative and practical problem solver * An integrative and informed thinker |
| **Expected Outcomes -** Expectations for students upon completion of the course.  Students will be able to:   * Analyze data to create models, draw conclusions, and test theories about the natural world. * Use mathematical tools, suchs as graphs, algebra and trigonometry, to make predictions and draw conclusions. * Conduct labs in a safe and responsible manner. * Use evidence to explain phenomena and argue between different theories relating to wave phenomena, conservation of energy, and Newtonian motion * Write boring course descriptions which no one will ever read. * Apply concepts to build projects that demonstrate topics covered in class as the end of major units (Sound, Thermal Energy, and Fluids). | |
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| **Core Units of Study:**   * Unit 1: Harmonic Motion * Unit 2: Waves * Unit 3: Sound and Light * Unit 4: Conservation of Energy: Circuits * Unit 5: Mechanical Energy * Unit 6: Thermal Energy * Unit 7: Motion in 1-Dimension * Unit 8: Dynamics * Unit 9: Fluids | |

| **CORE UNIT # 1**  **Title: Harmonic Motion** | |
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| **Westbrook Learning Standards**   * Developing and Using Models * Planning and Carrying Out Investigations * Analyzing and Interpreting Data * Using Mathematics and Computational Thinking * Constructing Explanations and Designing Solutions   **Guiding Principles / Vision of the Graduate**   * A clear and effective communicator * A self-directed and lifelong learner * A creative and practical problem solver * An integrative and informed thinker | **Content for this Unit:**   * Measurement * Accuracy vs. Precision * Simple Harmonic Motion * Frequency * Period |
| **Performance Indicators (Skills)**  The students will be able to:   * Accurately measure and record data * Differentiate between accuracy and precision * S | **Essential Questions**   * What are the impacts of measuring time? |
| **Common Assessment**   * Harmonic Motion Quiz * Pendulum Lab | |
| **Instructional Suggestions / Resources** -   * Textbook * Demos | **Assessment (formative) Suggestions/Resources**   * Ball drop lab * Measurement reading * Procedure writing * SHM homework * Time research project |

| **CORE UNIT # 2**  **Title: Waves** | |
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| **Westbrook Learning Standards**   * Developing and Using Models * Planning and Carrying Out Investigations * Analyzing and Interpreting Data * Using Mathematics and Computational Thinking * Constructing Explanations and Designing Solutions   **Guiding Principles / Vision of the Graduate**   * A clear and effective communicator * A self-directed and lifelong learner * A creative and practical problem solver * An integrative and informed thinker | **Content for this Unit:**   * Speed definition and calculation * Properties of waves * Waves speed * Interference of waves * Characteristics and properties of waves * Velocity, frequency and wavelength of a waves * Transverse and longitudinal waves * Transmission of energy via waves * Interference of waves |
| **Performance Indicators (Skills)**  The students will be able to:   * Describe the characteristics, properties, and interference of waves * Differentiate between how transverse and longitudinal waves transmit energy * Complete calculations of speed | **Essential Questions**   * What is the importance of waves in physics? |
| **Common Assessment**   * Wave properties phet (In the well of a wave off Kanagawa) * Waves quiz | |
| **Instructional Suggestions / Resources** -   * Textbook * Videos * Demos | **Assessment (formative) Suggestions/Resources**   * Airplane speed procedure * Wave speed discovery * Waves reading * Interference of waves * Wave rankings |

| **CORE UNIT # 3**  **Title: Sound and Light** | |
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| **Westbrook Learning Standards**   * Analyzing and Interpreting Data * Constructing Explanations and Designing Solutions * Engaging in Argument from Evidence * Obtaining, Evaluating and Communicating Information   **Guiding Principles / Vision of the Graduate**   * A clear and effective communicator * A self-directed and lifelong learner * A creative and practical problem solver * An integrative and informed thinker | **Content for this Unit:**   * Conservation of energy * Electromagnetic spectrum * Energy of light waves * Wave nature of sound * Doppler effect |
| **Performance Indicators (Skills)**  The students will be able to:   * Apply wave properties to the EM and sound waves * Understand the energy associated with different types of EM waves * Identify academic vocabulary and summarize articles * Apply physics concepts in an engineering project | **Essential Questions**   * How is information communicated? |
| **Common Assessment**   * EM waves quiz * Animal Communication research project * Speaker Build | |
| **Instructional Suggestions / Resources** -   * Textbook * Videos * Demos | **Assessment (formative) Suggestions/Resources**   * EM research presentation * EM waves and Light classwork * Light reading * Light Notes * Filters classwork * Eyes classwork * Properties of sound reading * Doppler effect reading * Speakers |

| **CORE UNIT # 4**  **Title: Conservation of Energy Circuits** | |
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| **Westbrook Learning Standards**   * Developing and Using Models * Planning and Carrying Out Investigations * Analyzing and Interpreting Data * Using Mathematics and Computational Thinking * Constructing Explanations and Designing Solutions * Engaging in Argument from Evidence * Obtaining, Evaluating and Communicating Information   **Guiding Principles / Vision of the Graduate**   * A clear and effective communicator * A self-directed and lifelong learner * A creative and practical problem solver * An integrative and informed thinker | **Content for this Unit:**   * Conservation of energy in electric circuits * Circuit symbols and diagrams * Ohms Law * Power formula * Understand how a motor/generator works * Conservation of energy in motors/generators |
| **Performance Indicators (Skills)**  The students will be able to:   * Construct and diagram DC electric circuits * Calculate power and resistance of devices in a circuit * Estimate their electric bill * Understand Conservation of energy in motors/generators | **Essential Questions**   * How does energy change form in an electric circuit? * What is the cost of electricity in our lives? |
| **Common Assessment**   * Ohmic Lab * Circuits and Power * Circuits Applications | |
| **Instructional Suggestions / Resources** -   * Textbook * Videos * Demos | **Assessment (formative) Suggestions/Resources**   * Intro circuits classwork/reading * Phet Circuit basics * Ohms Law and Power homework * Measuring circuits investigation * Watts in your house * Phet Magnetism * Generator Lab * WHS Efficiency |

| **CORE UNIT # 5**  **Title: Mechanical Energy** | |
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| **Westbrook Learning Standards**   * Developing and Using Models * Planning and Carrying Out Investigations * Analyzing and Interpreting Data * Using Mathematics and Computational Thinking * Engaging in Argument from Evidence * Obtaining, Evaluating and Communicating Information   **Guiding Principles / Vision of the Graduate**   * A clear and effective communicator * A self-directed and lifelong learner * A creative and practical problem solver * An integrative and informed thinker | **Content for this Unit:**   * Mechanical Energy * Kinetic Energy * Gravitational Potential Energy * Graphing of multiple variables * Spreadsheet data entry and calculation |
| **Performance Indicators (Skills)**  The students will be able to:   * Complete calculations showing conservation of mechanical energy * Input data and equations in a spreadsheet | **Essential Questions**   * How can you graphically show whether mechanical energy is conserved in a system? |
| **Common Assessment**   * Work, power, and CoE * Rollercoaster Loses Lab | |
| **Instructional Suggestions / Resources** -   * Textbook * Videos * Demos | **Assessment (formative) Suggestions/Resources**   * Energy skate park classwork * Thinking Hard reading * Roller Coaster physics * CoE tracks classwork * What's your horsepower stair lab * Jumpy KE and PE * Sledding types of energy |

| **CORE UNIT # 6**  **Title: Thermal Energy** | |
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| **Westbrook Learning Standards**   * Developing and Using Models * Planning and Carrying Out Investigations * Analyzing and Interpreting Data * Using Mathematics and Computational Thinking * Constructing Explanations and Designing Solutions * Engaging in Argument from Evidence * Obtaining, Evaluating and Communicating Information   **Guiding Principles / Vision of the Graduate**   * A clear and effective communicator * A self-directed and lifelong learner * A creative and practical problem solver * An integrative and informed thinker | **Content for this Unit:**   * Thermal expansion * Temperature definition and properties * Thermal Energy * Specific heat equation * Heat * Thermal Equilibrium * Conservation of Thermal Energy |
| **Performance Indicators (Skills)**  The students will be able to: | **Essential Questions** |
| **Common Assessment**   * Trading Energy Lab * Shake that sand Lab * Thermal Device Build * Temperature and Thermal Energy Quiz | |
| **Instructional Suggestions / Resources** -   * Textbook * Videos * Demos | **Assessment (formative) Suggestions/Resources**   * Molecules in states of matter * What if? Articles * Thermal expansion demos * Methods of Heating * Heat transfer practice * Heat transfer snow melting * Temperature reading * Calculating Q Practice * Thermal Energy Review |

| **CORE UNIT # 7**  **Title: Motion in 1-Dimension** | |
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| **Westbrook Learning Standards**   * Developing and Using Models * Planning and Carrying Out Investigations * Analyzing and Interpreting Data * Using Mathematics and Computational Thinking * Constructing Explanations and Designing Solutions * Engaging in Argument from Evidence * Obtaining, Evaluating and Communicating Information   **Guiding Principles / Vision of the Graduate**   * A clear and effective communicator * A self-directed and lifelong learner * A creative and practical problem solver * An integrative and informed thinker | **Content for this Unit:**   * Distance * Displacement * Speed * Velocity * Acceleration * Scalar * Vector * Motion Graphs |
| **Performance Indicators (Skills)**  The students will be able to:   * Create motion graphs for situations * Complete calculations of kinematics in 1 dimension | **Essential Questions** |
| **Common Assessment**   * Graphing Changes in Position * Motion Graphs Quiz | |
| **Instructional Suggestions / Resources** -   * Textbook * Videos * Demos | **Assessment (formative) Suggestions/Resources**   * Vector computer activity * Vectors to describe motion * Acceleration Questions * Rocket Sled * Free fall reading * Reaction Time minilab * Rocket minilab * Graphing Accelerated motion * Velocity Graphs practice |

| **CORE UNIT # 8**  **Title: Dynamics** | |
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| **Westbrook Learning Standards**   * Developing and Using Models * Planning and Carrying Out Investigations * Analyzing and Interpreting Data * Using Mathematics and Computational Thinking * Constructing Explanations and Designing Solutions * Engaging in Argument from Evidence * Obtaining, Evaluating and Communicating Information   **Guiding Principles / Vision of the Graduate**   * A clear and effective communicator * A self-directed and lifelong learner * A creative and practical problem solver * An integrative and informed thinker | **Content for this Unit:**   * FBDs * Force * Net Force * Force types: Gravity, Normal, Tension, Frictional * Equilibrium |
| **Performance Indicators (Skills)**  The students will be able to:   * Understand forces in 2 dimension * Solve FBD problems | **Essential Questions** |
| **Common Assessment**   * Force in Equilibrium Lab * Dynamics Quiz | |
| **Instructional Suggestions / Resources** -   * Textbook * Videos * Demos | **Assessment (formative) Suggestions/Resources**   * Black hole reading * Skydiving * Newton’s Laws and FBD reading * Net Force in 2D * Book Problems |

| **CORE UNIT # 9**  **Title: Fluids** | |
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| **Westbrook Learning Standards**   * Developing and Using Models * Planning and Carrying Out Investigations * Analyzing and Interpreting Data * Using Mathematics and Computational Thinking * Constructing Explanations and Designing Solutions * Engaging in Argument from Evidence * Obtaining, Evaluating and Communicating Information   **Guiding Principles / Vision of the Graduate**   * A clear and effective communicator * A self-directed and lifelong learner * A creative and practical problem solver * An integrative and informed thinker | **Content for this Unit:**   * Density * Buoyancy * FBDs * Pressure |
| **Performance Indicators (Skills)**  The students will be able to: | **Essential Questions** |
| **Common Assessment**   * Buoyancy boat build * Fluids Quiz | |
| **Instructional Suggestions / Resources** -   * Textbook * Videos * Demos | **Assessment (formative) Suggestions/Resources**   * Archimedes reading * Phet sim will if sink or will it float * Crown affair * Pressure Reading * Buoyancy Review question |