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| **Lesson Plan:** |

**Prior learning and thinking:** Students have covered kinematics, forces, but not energy. They're only aware of power and how energy may be related to power. They have some sense of space having learned vectors and scalars.

**Prescribed learning outcomes**

**B1** analyse the behaviour of light and other waves under various conditions, with reference to the properties of waves and using the universal wave equation

**Big Ideas**

1. Decouple displacement-position vs. displacement-time graphs and use these to solve problems
2. Waves transfer energy via oscillations of particles in the medium. Matter does not transfer.

**IB specific criteria**

4.2 – Travelling waves

- Sketch and interpret displacement–distance graphs and displacement–time graphs for transverse and longitudinal waves

- Investigate the speed of sound experimentally

- Derive v = fλ

**Material and equipment needed**

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| laptop | projector | problem sets | unit overview | problem set |  |
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**Assessment Plan:**

**Formative -** Inquiry questions discussed in class and worksheet handed in this class or next class

**Hook and Introduction**

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| **Time** | **Activity** | **Teaching notes** | **Assessment** |
| 10 min | * Introduction to class and the structure of the classes * Social expectations | * Introduce teacher candidate, learning outcomes, lesson structures, and assessment * Video to start the day every lesson Kute Kayoubi |  |

**Development**

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| **Time** | **Activity** | **Teaching notes** | **Assessment** |
| 10 min | * Inquiry question | * https://www.youtube.com/watch?v=pnbJEg9r1o8 * Stop midway to ask some questions and get some responses and rationale * Notice the bending of light - refraction * Leads right into waves | * Question: is this a wave? What is a wave? |
| 15 min | * Go over unit overview and intro to waves | * Stress the late assignments and make up test/quizzes * Ask questions to see what students remember of waves * Bounce ball off wall vs. laser off mirror - what is the difference? * v = fL = L/T | * Traverse/Longitudinal wave? * Do they remember period, frequency, speed, amplitude, and wavelength? * Matter not being transmitted? |
| 15 min | * Draw diagram of a particle on a displacement-time graph | * Show PhET simulation and window block until only one particle on the wave is visible * Draw displacement - time graph for this particle * Teacher will give them speed of the wave | * Label or calculate: amplitude, period (wave), wavelength, and frequency |
| 15 min | * Explain difference between displacement-time and displacement-displacement graph | * Use PhET for assistance * Cover where do we calculate from where Amplitude - either Period - displacement/time only Wavelength - displacement/displacement only Speed uses period and wavelength Frequency from period * Can analyze what particle on string would do given 1 graph or the other |  |
| 10 min | * Sample question = Exit slip | * 2 graphs, calculate the above and find how the particle would move given a position on the 2 graphs | * Exit slip |

**Closure**

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| **Time** | **Activity** | **Teaching notes** | **Assessment** |
| 5 min | * Check in with the class | Go over HMK for next class  Happy intro to Waves! | **HWK**  1) Propose a method to predict how far away is the thunderstorm after seeing lightning and hearing the thunder  2) Derive v = fλ from speed = distance/time  3) Problem solving package |