BIG IDEAS

1D Kinematics	1D Dynamics	1D Momentum	Energy	Electric Circuits
Kinematics allows us to predict, describe, and analyze an object's motion.	Forces influence the motion of an object.	Momentum is conserved in a closed system.	Energy is found in different forms, is conserved, and has the ability to do work.	The application of conservation laws explains the flow of electricity within a circuit.

CHOOSE TWO MODULES

Waves and Optics	Quantum	Special Relativity	Nuclear Physics
Light can be modelled as a wave or a particle.	Quantum mechanics can be used to describe the behaviour of very small particles.	Special relativity helps explain the relationship between space and time.	Nuclear reactions involve changes in the atomic nucleus.

Learning Standards

Curricular Competencies

Students are expected to be able to do the following:

Questioning and predicting

- Demonstrate a sustained intellectual curiosity about a scientific topic or problem of personal, local, or global interest
- Make observations aimed at identifying their own questions, including increasingly abstract ones, about the natural world
- Formulate multiple hypotheses and predict multiple outcomes

Planning and conducting

- Collaboratively and individually plan, select, and use appropriate investigation methods, including field work and lab experiments, to collect reliable data (qualitative and quantitative)
- Assess risks and address ethical, cultural, and/or environmental issues associated with their proposed methods
- Use appropriate SI units and appropriate equipment, including digital technologies, to systematically and accurately collect and record data

Content

This course comprises seven modules — all students take five modules which are core to the course and teachers choose an additional two modules to complete the course.

Students are expected to know the following:

The following five modules are core to the course:

1D Kinematics

- **vector** and scalar quantities
- uniform motion
- accelerated motion
- **projectile motion**
- **the relationship between variables**

Learning Standards (continued)

Curricular Competencies	Content
• Apply the concepts of accuracy and precision to experimental procedures and data: – significant figures – uncertainty – scientific notation **Processing and analyzing data and information** • Experience and interpret the local environment • Apply First Peoples perspectives and knowledge, other ways of knowing, and local knowledge as sources of information • Seek and analyze patterns, trends, and connections in data, including describing relationships between variables, performing calculations, and identifying inconsistencies • Construct, analyze, and interpret graphs, models, and/or diagrams • Use knowledge of scientific concepts to draw conclusions that are consistent with evidence • Analyze cause-and-effect relationships **Evaluating** • Evaluate their methods and experimental conditions, including identifying sources of error or uncertainty, confounding variables, and possible alternative explanations and conclusions • Describe specific ways to improve their investigation methods and the quality of the data • Evaluate the validity and limitations of a model or analogy in relation to the phenomenon modelled • Demonstrate an awareness of assumptions, question information given, and identify bias in their own work and in primary and secondary sources • Consider the changes in knowledge over time as tools and technologies have developed • Connect scientific explorations to careers in science • Exercise a healthy, informed skepticism and use scientific knowledge and findings to form their own investigations to evaluate claims in primary and secondary sources • Consider social, ethical, and environmental implications of the findings from their own and others' investigations • Critically analyze the validity of information in primary and secondary sources and evaluate the approaches used to solve problems • Assess risks in the context of personal safety and social responsibility	**1D Dynamics** • the fundamental nature of forces • **gravitational force** • **spring force** • normal force • tension force • **frictional force** • **Newton's laws of motion** • **the relationship between variables** • **First Peoples knowledge** **1D Momentum** • momentum • **impulse** • **law of conservation of momentum** • **the relationship between variables** **Energy** • **potential and kinetic energy** • thermal energy • law of conservation of energy • **work** • **power and efficiency** • **the relationship between variables** **Electric Circuits** • **Ohm's law** • **Kirchoff's laws** • **power and efficiency** • **the relationship between variables**

Learning Standards (continued)

Curricular Competencies	Content
Applying and innovating • Contribute to care for self, others, community, and world through individual or collaborative approaches • Co-operatively design projects with local and/or global connections and applications • Contribute to finding solutions to problems at a local and/or global level through inquiry • Implement multiple strategies to solve problems in real-life, applied, and conceptual situations • Consider the role of scientists in innovation **Communicating** • Formulate physical or mental theoretical models to describe a phenomenon • Communicate scientific ideas, information, and perhaps a suggested course of action, for a specific purpose and audience, constructing evidence-based arguments and using appropriate scientific language, conventions, and representations • Express and reflect on a variety of experiences, perspectives, and worldviews through place	**Choose any two of the modules below to complete the course:** **Waves and Optics** • **types of waves** • **properties of waves** • **wave behaviours** • light behaviours • law of reflection • **refraction** • image formation • **mirrors** • **lenses** • ray diagrams • **applications of geometric optics** • **the relationship between variables** **Quantum** • **evidence** that led to the development of quantum theory • the wave-particle duality of light • photoelectric effect • **Heisenberg's uncertainty principle** • **de Broglie** and the wave nature of light • **applications of quantum theory**

Learning Standards (continued)

Curricular Competencies	Content
Applying and innovating • Contribute to care for self, others, community, and world through individual or collaborative approaches • Co-operatively design projects with local and/or global connections and applications • Contribute to finding solutions to problems at a local and/or global level through inquiry • Implement multiple strategies to solve problems in real-life, applied, and conceptual situations • Consider the role of scientists in innovation **Communicating** • Formulate physical or mental theoretical models to describe a phenomenon • Communicate scientific ideas, information, and perhaps a suggested course of action, for a specific purpose and audience, constructing evidence-based arguments and using appropriate scientific language, conventions, and representations • Express and reflect on a variety of experiences, perspectives, and worldviews through place	**Special Relativity** • development of the special relativity theory: – Michelson-Morley experiment – **postulates of special relativity** • **relative motion** and effects: – time dilation – length contraction – mass increase • equivalence of energy and mass • **the relationship between variables** **Nuclear Physics** • radioactivity: – **radioisotopes** – **radioactive decay** • **nuclear reactions:** – fission – fusion • **applications of nuclear processes** • **the relationship between variables**