North Vancouver Online Learning

Course Plan: Physics 12

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COURSE DESCRIPTION:

The Physics 12 is an algebra-based course geared towards those students interested in the fundamental understanding of physical phenomena. The three disciplines covered are Newtonian Mechanics, Electromagnetism, and Relativity. In Newtonian Mechanics students will explore 2-D momentum, circular motion, gravitation and equilibrium. From Electromagnetism students will study electrostatics, electricity, and magnetism. In relativity, students will learn about Einstein's theory of Special Relativity. Students will develop critical thinking skills through solving problems in familiar and unfamiliar situations. Students will also build skills in observation, measurement and analysis through hands on laboratory experiment.

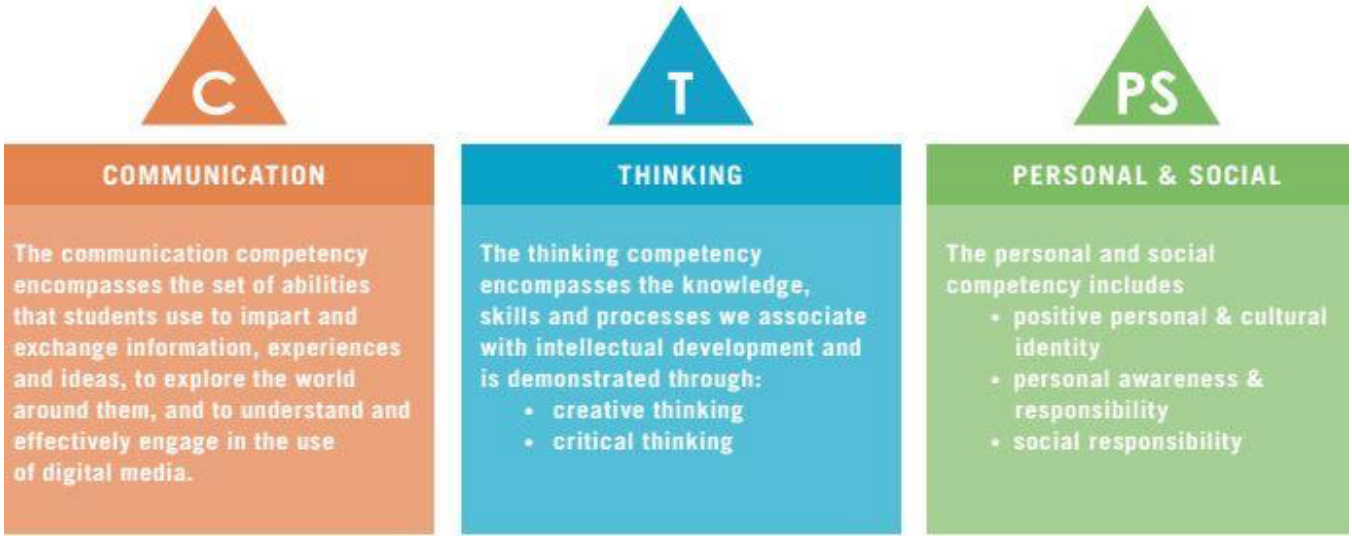
BIG IDEAS:

The Big Ideas consist of generalizations and principles and the key concepts important in an area of learning. They reflect the "Understand" component of the Know-Do-Understand model of learning. The big ideas represent what students will understand at the completion of the curriculum for their grade. They are intended to endure beyond a single grade and contribute to future understanding.

Measurement of motion depends on our frame of reference.	Forces and energy interactions occur within fields.
Forces can cause linear and circular motion.	Momentum is conserved within a closed and isolated system.

CORE COMPETENCIES:

A Core Competency is a skill that all learners need to have to be successful in all aspects of their life. There are 3 core competencies: Communication (Communicating & Collaborating), Thinking (Critical Thinking, Creative and Reflective Thinking), Personal (Personal Awareness and Responsibility, Social Awareness and Responsibility and Positive Personal and Cultural Identity).



COURSE EXPECTATIONS:

- Students are expected to work through course material asynchronously for each unit. If any assistance is needed, message Mr. Holt through Teams, Email, or Moodle and he will respond within 24 hours to answer your question or set up a video call.

- Each unit contains quizzes, a project, and a Learning Guide. Students must complete each of these and reach out if they need help at any point. Please make an effort to show your steps neatly and logically.

- Once all activities are completed for a given unit, students must contact Mr. Holt to set up a time to write their unit test. All tests and exams for this course require supervision. If a student is unable to write their assessments at the Mountainside OL center, Mr. Holt will set up a virtual invigilation.

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
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 their 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

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 and 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

Unit 1 (Substantive activity completion to be activated in the course) will cover the following Learning Outcomes (Curricular Competencies)

- Apply the concepts of accuracy and precision to experimental procedures and data:
  - significant figures
  - uncertainty
  - scientific notation
- Construct, analyze, and interpret graphs, models, and/or diagrams
- Seek and analyze patterns, trends, and connections in data, including describing relationships between variables, performing calculations, and identifying inconsistencies

These are 3 of the learning outcomes in the course curriculum, which comprises 10% of the course Learning Outcomes/Activities. (3/31 = 10%)

LEARNING STANDARDS: Course Content

Students are expected to know the following:

- frames of reference
- relative motion within a stationary reference frame
- postulates of special relativity
- relativistic effects within a moving reference frame
- static equilibrium
- uniform circular motion:
- centripetal force and acceleration
- changes to apparent weight
- First Peoples knowledge and applications of forces in traditional technologies
- gravitational field and Newton's law of universal gravitation
- gravitational potential energy
- gravitational dynamics and energy relationships
- electric field and Coulomb's law
- electric potential energy, electric potential, and electric potential difference
- electrostatic dynamics and energy relationships
- magnetic field and magnetic force
- electromagnetic induction
- applications of electromagnetic induction
- impulse and momentum
- conservation of momentum and energy in collisions
- graphical methods in physics

UNIT OVERVIEWS:

Unit 1: Physics Review

In this unit, students will review skills and content from Physics 11. The skills include unit conversions, algebra, graphing, and scientific notation. The content is primarily Kinematics, which is the study of moving objects including projectiles.

Big Idea: Measurement of motion depends on our frame of reference.
Core Competency: Communication
First Peoples Principle of Learning: Learning is embedded in memory, history, and story.

Unit 2: Equilibrium and Torque

Equilibrium is the study of situations with forces that at completely balanced, preventing motion. Torque is the study of leverage, which is force acting along a lever.

Big Idea: Forces can cause linear and circular motion.
Core Competency: Critial Thining
First Peoples Principle of Learning: Learning is holistic, reflexive, reflective, experiential, and relational

Unit 3: Centripetal Motion and Orbit

Centripetal Motion covers many situations, from a car making a simple turn on the road, to roller coasters, to the Earth itself orbiting the Sun.

Big Ideas: Forces can cause linear and circular motion.
Forces and energy interactions occur within fields.
Core Competency: Creative Thinking
First Peoples Principle of Learning: Learning is embedded in memory, history, and story.

Unit 4: Momentum

The momentum unit studies the physics behind collisions and explosions. Students will apply the law of conservation of momentum to gain a deeper understanding of any collision – from car crashes to baseball home-runs.

Big Idea: Momentum is conserved within a closed and isolated system.
Core Competency: Critial Thinking
First Peoples Principle of Learning: Learning involves recognizing the consequences of one‘s actions.

Unit 5: Electricity

The electricity unit explores how charged objects interact with each other. This includes electrostatic force, electric potential, and electric potential energy.

Big Idea: Forces and energy interactions occur within fields.
Core Competency: Critical Thinking

First Peoples Principle of Learning: Learning ultimately supports the well-being of the self, the family, the community, the land, the spirits, and the ancestors.

Unit 6: Electromagnetism

Electromagnetism is the study of magnetic fields interacting with charged objects. Examining the magnetic force on charges and wires will lead to an understanding of how electric motors work.

Big Idea: Forces and energy interactions occur within fields.
Forces can cause linear and circular motion.
Core Competency: Creative and Critical Thinking
First Peoples Principle of Learning: Learning is holistic, reflexive, reflective, experiential, and relational

Unit 7: Induction

Induction is the process of inducing a current by changing the magnetic field through a coil of wire. By exploring induction, students will come to understand how electricity is created by our Hydro dam for our community.

Big Idea: Forces and energy interactions occur within fields.
Core Competency: Personal Awareness and Social Responsibility
First Peoples Principle of Learning: Learning involves recognizing the consequences of one's actions.

Unit 8: Modern Physics

The Modern Physics unit explores current topics in physics such as Relativity, Nuclear Physics, and Quantum Mechanics.

Big Idea: Measurement of motion depends on our frame of reference.
Core Competency: Creative Thinking and Communication
First Peoples Principle of Learning: Learning involves patience and time.

STUDENT LEARNING ACTIVITIES AND STRATEGIES:

Tips for success

- Focus on visualizing a physical situation, not just numbers and formulas. Physics is LEARNING HOW THE WORLD WORKS. It will increase your chance of success to picture and/or sketch the situation as it would be in real life.
- DO NOT LEAVE EVERYTHING TO THE LAST MINUTE. Rushing the course at the end of the year leads to low marks, poor learning, and high stress
- Reach out to Mr. Holt for help any time, or use other online resources that you find helpful. Khan Academy is usually a good option for physics topics.

ASSESSMENT:

All test and Exam assessments must be invigilated. Message Mr. Holt when you are ready to take the test for a unit .

The North Vancouver Curriculum Hub Principles of Assessment - http://nvsd44curriculumhub.ca/assessment/

Formative may include:
Quizzes
Learning Guides

Summative may include:
Unit Projects
Unit Tests
Midterm and Final Exams

EVALUATION:

Evaluation	Percentage of Final Mark
Quizzes	10%
Learning Guides	10%
Projects	20%
Unit Tests	20%
Midterm and Final	40% (15% + 25%)

RESOURCES:

There are no textbooks required for this course.