North Vancouver Online Learning

Course Plan: Physics 12
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Course Description:

Physics 12 extends some of the concepts introduced in Physics 11. Kinematics (motion) and Dynamics are examined from a two dimensional perspective. Added to the mix is two-dimensional Momentum and Energy. In dizzying speed, circular motion and gravitation is also covered. The second half of the course has its electrifying and magnetic personality as Electrostatics, Circuits, Magnetism, and Magnetic Induction are examined. Many of society's modern conveniences (TV's, computers, cell phones, lights) work because of the basic concepts studied in this course.
For the complete Ministry curriculum Physics 12 document go to:
https://curriculum.gov.bc.ca/sites/curriculum.gov.bc.ca/files/curriculum/science/en_science_12_physics.pdf

BIG IDEAS:

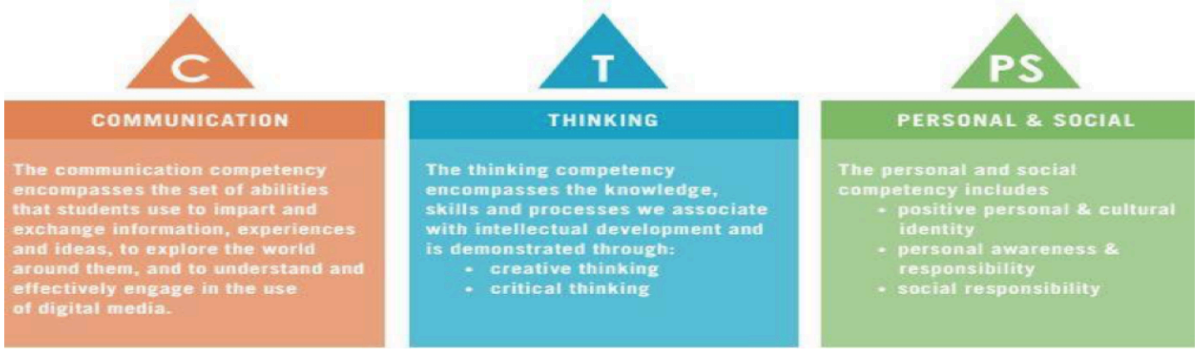
The Big Ideas consist of generalizations and principles and the key concepts important in an area of learning. They reflect the "Understand" component of the Know-Do-Understand model of learning. The big ideas represent what students will understand at the completion of the curriculum for their grade. They are intended to endure beyond a single grade and contribute to future understanding. Students will explore and understand the following four Big Ideas throughout the Physics 12 course:

Measurement of motion depends on our frame of reference.	Forces can cause **linear and circular motion**.

Forces and energy interactions occur within **fields**.	**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 Thinking), and Personal & Social (Positive Personal & Cultural Identity, Personal Awareness & Responsibility, and Social Responsibility).



Course Expectations:

Resources:

There is no text required for this course. All information is delivered online using a variety of methods (videos, interactive tutorials, text, external links to other websites)
A supplemental paper text book can be offered if necessary.

Communication:

Please check the courseware regularly for updates and changes as it will evolve over the semester / year.

While this course is primarily asynchronous (self directed one way communication) hopefully, there will be opportunities to make the course more synchronous (teacher directed two way communication) by utilizing discussion boards, virtual classroom time as well as other on-line tools.

Be sure to use your Brightspace / Remind message system for communication and I will do my best to respond in a timely manner. Every new student is required to set up an appointment for an orientation meeting with the teacher.

Exam Supervision:

****NOTE: NVDL TEST POLICY: You must show picture id whenever writing a test***
All unit exams are "closed book" and require supervision. Please make sure to use the “Test Sign Up” button to book a time for an IN PERSON test at the OL Centre in Mountainside or message Naresh to discuss the process of signing up for ONLINE assessments.

Assignments

Before you write a unit exam, you must submit all assignments and labs leading up to the exam. Paper copies are preferred and should be submitted at a OL Centre.

Assignment and lab submissions MUST be very neat and well organized. All “Learning Guide” assignments MUST be self assessed and a marking rubric attached to the front of each one before submitting.

You will be asked to verify that you have submitted all your unit assignments before attempting the unit exam and missing assignments will be given a mark of “ZERO”.
It is essential that you do not attempt unit exams until all assignments have been submitted.
Success on the Unit, and Final Exams depends upon exposure to a large variety of questions and lots of practice.

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 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

Applying and innovating
• Contribute to care for self, others, community, and world through individual or collaborative approaches

• Cooperatively 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

Student Substantive Activities 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
- Use appropriate SI units and appropriate equipment, including digital technologies, to systematically and accurately collect and record data
- 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

These are 5 of the 30 learning outcomes in the course curriculum, which comprises ~15% of the course Learning Outcomes/Activities. (5/30 =17%)

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 collision graphical methods in physics

- conduct appropriate experiments
- se graphical methods to analyze results of experiment
- produce and interpret graphs (e.g., slope and intercept)
- apply mathematical models to solve a variety of problems
- draw vector diagrams and add and subtract vectors
- describe objects in motion in one or two dimensions, using the principles of kinematics.
- students will be able to apply Newton's laws of motion to one- and two-dimensional situations.
- understanding of momentum and impulse and the roles they play in one- or two-dimensional collisions and explosions.
- understand the nature of static equilibrium
- understand the nature of circular motion and the net force associated with it.
- understand the implications of a non-constant gravitational field for work and energy.
- basic understanding of electrostatic principles and be able to apply them to solve problems
- apply Kirchhoff's laws to simple DC circuits.
- understanding of the relationship between electricity and magnetism.

UNIT OVERVIEWS AND LEARNING ACTIVITIES:

The course is broken down as follows:

U1: Math, Motion and Projectiles

Big Idea:

- Measurement of motion depends on our frame of reference.

Core Competency Focus:

Communication, Critical Thinking

First Peoples Principle of Learning:

Learning involves recognizing the consequences of one's actions

Learning involves patience and time

Unit Overview:

The **Math, Motion and Projectiles** unit will focus on scientific method, measurements, math methods related to the analysis of scientific data. The skills practiced in this unit will a broad review of concepts covered in Physics 11 with specific focus on the 3 types of projectile motion. Representing data graphically and applying the concepts of significant figures, precision, and accuracy will be practiced in the assignment section. Graphs will be explored further to show how the same data can be manipulated to support or dis credit and the reader's task is to reach scientifically sound conclusions. The lab section will allow students to become familiar with technology that will be used to analyze video files which will be used throughout the course.

U2: Equilibrium and Torque

Big Idea:

- Measurement of motion depends on our frame of reference.
- Forces can cause linear and circular motion.

Core Competency Focus:

Communication, Critical Thinking

First Peoples Principle of Learning:

Learning involves recognizing the consequences of one's actions

Learning involves patience and time

Unit Overview:

The **Equilibrium and Torque** unit will focus on understanding the difference between a body in static, translational, and rotational equilibrium. Students will review concepts of dynamics from Physic 11 and will be able to apply Newton's laws of motion to one- and two-dimensional situations. Analysis of one-dimensional or two-dimensional situation will include careful application of vector analysis. The assignments will be related to using the knowledge of force, torque, and equilibrium to analyse various situations and make conclusions about bodies in equilibrium.

U3: Centripetal Acceleration

Big Idea:

- Forces can cause linear and circular motion.

Core Competency Focus:

Communication, Critical Thinking

First Peoples Principle of Learning:

Learning involves recognizing the consequences of one's actions

Learning involves patience and time

Unit Overview:

In the **Centripetal Acceleration** unit, students will demonstrate an understanding of the forces involved in uniform circular motion and motion in a plane. They will have investigated forces involved in these modes of motion and have solved related problems. They will analyse technological devices that apply the principles of dynamics of motion, with particular respect to the effect of g-forces on the human body. Students will also use knowledge of uniform circular motion to analyse various situations including the gravitational attraction between masses.

U4: Momentum

Big Idea:

- Momentum is conserved within a closed and isolated system
- Forces can cause linear and circular motion.

Core Competency Focus:

Communication, Critical Thinking

First Peoples Principle of Learning:

Learning involves recognizing the consequences of one's actions

Learning involves patience and time

Unit Overview:

The **Momentum** unit will focus on understanding how work, energy and momentum are inter connected. Drawing from Grade 11 concepts of the laws of conservation of energy, they will extend these ideas to conservation of momentum in one and two dimensions. Through computer simulation and other modes of inquiry they will investigate these phenomena and solve related problems.

U5-7: Electricity, Magnetism, Induction

Big Idea:

- Forces and energy interactions occur within fields.

Core Competency Focus:

Communication, Critical Thinking

First Peoples Principle of Learning:

Learning involves recognizing the consequences of one's actions

Learning involves patience and time

Unit Overview:

By the end of these units, students will demonstrate an understanding of the concepts, properties, principles and laws related to gravitational, electric and magnetic fields, particularly with respect to their interactions with matter. They will investigate these phenomena graphically and through the use of other electronic models. They will analyse the operation of technologies that use these fields, and discuss the social and environmental impact of these technologies.

U8: Modern Physics

Big Idea:

- **Measurement of motion** depends on our frame of reference.

Core Competency Focus:

Communication, Critical Thinking

First Peoples Principle of Learning:

Learning involves recognizing the consequences of one's actions

Learning involves patience and time

Unit Overview:

In this unit, some of the most exciting and counterintuitive concepts in physics, including Einstein's ideas about relativity, photoelectric effect, and particle physics, will be examined. Quantum mechanics and special relativity will be investigated mathematically and related problems will be solved. In light of the revolutionary ideas studied in this unit, students will discuss how the introduction of new conceptual models can influence and change scientific thought, and lead to the development of new technologies.

Student Learning Activities and Strategies:

Students may engage in the following learning activities and strategies:

- conduct appropriate experiments (*virtual or real*)
- systematically gather and organize data from experiments
- make use of award winning Phet simulation browser based software to conduct virtual simulations

- watch video explanations and interactive tutorials
- attend virtual classroom tutorial support
- Possibly design and build a simple machine (mouse trap car / projectile launcher)
- participate in forum discussions related to course content and current trends in physics

Keys to Success:

1. Study the Lesson and take good notes for reference when working on homework. Make sure you can do and understand the problems you are shown in the many examples given in each lesson.
2. Once you have completed a Learning Guide and assignments to the best of your ability submit it to the drop box area in the course and write the end of unit assessment shortly after. You will be self assessing your Learning Guide by using the key provided and attaching a marking rubric to the front of each learning guide package. All Learning Guides must be 100% complete and correct.
3. Make sure you understand any learning guide and quiz question you get wrong. If you can't figure it out - ASK!
4. Physics 12 is an academic course. Work out a schedule for yourself of how many lessons you will complete each week. You need to consider either a schedule for completion and you will choose a pace that the course will move forward. There is a Pacing and Progress Tool available in the course that you are strongly encouraged to use to help map out a path to completion.
5. **IMPORTANT SCHEDULING / DEADLINE INFORMATION: This online course is a *partially self paced course.* You have the ability to control the pace of the course but must clearly communicate your intentions.** You will have to choose a pace that the course will move forward at. Once you have chosen a pace, you will have to try and meet the unit completion deadlines based on the pace you have chosen. *You can adjust your pace as required so do not feel too pressured to meet every deadline BUT our online courses are meant to be completed within 12 months of registering.Reach out to your teacher for assistance with staying on pace as our goal is for you to be successful and finish in a timely fashion.*
6.

<u>Assessment:</u>

***NOTE: NVDL TEST POLICY: You must show picture id whenever writing a test**

Assessment of student performance will include some or all of the following strategies:

o online quizzes , unit exams and a final exam (written and OPTIONAL* M/C)

o worksheets, assignments and virtual labs (variety of self marked and submitted work)

o researching, designing and building a "projectile launcher". The launcher will be tested and data collected so that a final report can be submitted to summarize the results of the project

Evaluation:

Item	Weight*
Meeting Deadlines / Course Pacing*	~?%
Quizzes	~7 %
Learning Guides	~8%
Lab Guides / Assignments	~15 %
Unit Exams	~40 %
Major Project	TBA
Part A: Final Exam (covers Units 1-8) (M/C) **optional** **make-up marks"*	~? %
Part B: Final Exam (covers Units 1-8) Written **mandatory**	~25 %

* This weighting may change without notice

(***Meeting Deadlines / Course Pacing is a percentage of your mark reserved to encourage you to move through the course at a consistent pace which will improve your chances for success. Please ask Naresh for more details)***