PHYSICS 11 - COURSE OUTLINE – 2021/22

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Textbook: *Physics – Principles and Problems (Glencoe, 2013)*

In addition, throughout the course you will be given handouts and notes on topics not included in the textbook. All of the handouts will also be posted on the class website, as pdf files that you can download.

Required Materials:

- ***Required:*** Scientific Calculator. Graphing calculators are permitted, but are not necessary. Calculator functions must include: **x^2, 1/x or x^{-1}, sin, cos, tan, square root, π, and power of 10** (the power of 10 key on your calculator will be shown as *[EE], [10^x],* or *[EXP]*).
  - Devices such as cell phones, computers, iPads, calculators with a QWERTY keyboard, electronic translators, etc, are NOT permitted for use on tests, quizzes, or exams.
- ***Required:*** Geometry set: a ruler and a protractor are necessary.
- ***Optional but useful:*** A set of coloured pencils or coloured pens.
- ***Optional but useful****:* mm rule graph paper (NOT grid paper!). The smallest divisions must be mm, with larger divisions (thick lines) every 0.5 cm and 1.0 cm. This is the standard graph paper for the discipline of physics – you will also use this type of graph paper in College/University physics. Graph paper with larger divisions is not acceptable for physics. If you do not have your own graph paper, you may use the photocopied graph paper supplied by your physics teacher (available in the classroom).

Additional Resources that you may find useful:

- You may wish to purchase physics guidebooks/workbooks with examples of solved problems, and sample problems for you to try (looking at a variety of examples of problem solving strategies is very helpful) - a variety of guides are available (e.g. from College and University bookstores)
- Many on-line simulation and instructional websites are available to support your learning. For examples, refer to: http://msbernabei.weebly.com/science-links.html

Physics 11 Topics

Scientific Skills, Methods, and the Nature of Physics: ***Throughout the course***

- Skills of Physics, including: Scientific notation, significant figures, collecting and organizing data, determining relationships between variables in equations and graphs

- Graphing skills:
  - *Plotting linear relationships given a physical model (e.g., uniform motion, electrical resistance)*
  - *Calculation of the slope of a line of best fit, including significant figures and appropriate units*
  - *Interpolation and extrapolation from a constructed graph (e.g. position, instantaneous velocity)*
  - *Calculations and interpretations of area under the curve on a constructed graph (e.g., displacement, work)*

First Peoples Technology: Applications of Physics ***Throughout the course/Project***

- Apply your understanding of physics to an analysis of tools and technological strategies that have traditionally been utilized by First Peoples of Western North America. For example:
  - Simple machines such as the canoe paddle, wedge shaped tools (e.g. used for cutting, building and farming), pulley systems, fishing tools and strategies
  - Tools for transportation such as the canoe (buoyancy, pros and cons of various shapes for different purposes – e.g. river canoe vs lake canoe vs ocean canoe; or, canoe meant primarily for transportation vs hunting/fishing vs gathering food plants)
  - Architectural designs for structural integrity and efficiency
  - The physics of rope making (braiding/twisting) and knots (physics and uses of different types of knots)
  - Thermal energy and efficiency applied to cooking technologies, or to clothing and housing designs that are adapted to suit the environment (e.g., designs and materials that are cool in the summer, or warm in the winter)

Wave motion and sound: ***Chapters 14, 15, and supplemental handouts***

- Generation and propagation of waves: *transverse vs longitudinal; linear vs circular; periodic vs pulse*
- *Universal wave equation*
- Wave properties as applied to sound: *amplitude, frequency, period, wavelength, phase, speed, types of waves, speed dependence on properties of the medium*
- Characteristics of sound: *pitch, volume, speed (dependence on medium), Doppler effect, sonic boom*
- Wave behaviour: *reflection (open and fixed end), refraction, diffraction, transmission, interference (superposition principle), Doppler shift, standing waves, interference patterns*
- Resonance and frequency of sound: *harmonics, fundamental/natural frequency, beat frequency*

Kinematics in one and two dimensions: ***Chapters 2, 3, section 1 of ch 6, and handouts***

- Differentiate between scalar and vector quantities – e.g. distance vs displacement, speed vs velocity
- Vector addition and subtraction in 1 and 2 dimensions (right angle trigonometry)
- Uniform and accelerated motion: *apply knowledge of relationships between time, velocity, displacement, and acceleration, including projectile motion in 1 and 2 dimensions (graphical and analytical methods of analysis)*
- Interpreting graphs – d vs t; v vs t; and, a vs t
  - *Interpret d vs t graph to determine position, average velocity, and instantaneous velocity*
  - *Use v vs t graph to determine velocity, displacement, and acceleration*
- Projectile motion: *1D and 2D (launch angles from zero to 90° above or below the horizontal)*

Dynamics in one and two dimensions: ***Chapters 4, 5, 7 and supplemental handouts***

- Contact forces: *normal force, spring force, tension, friction*
- Mass vs gravitational force (weight), gravitational field strength
  - *Inverse square law, e.g. Law of Universal Gravitation*
- Newton's Laws of motion:
  - *First Law = Law of Inertia: the concept of mass as a measure of inertia*
  - *Second Law: net force from one or more forces ($\Sigma F = ma$)*
  - *Third Law: actions/reactions happen at the same time in pairs*
- Static and kinetic friction, coefficient of friction
  - *Effect of normal force, surface properties, surface area, and speed, on force of friction*
- Forces in systems: *single body and multi-body systems, elevators, inclined planes, angled forces.*
- Apparent weight vs true weight

Work, Energy, Power, and Efficiency of mechanical and thermal systems: ***Chapters 9 to 12, and handouts***

- Work, time, power, efficiency
- Work, gravitational potential energy, kinetic energy
- Work-energy theorem
- Law of conservation of energy – *solve problems including changes in gravitational potential energy, kinetic energy, and thermal energy*
- Simple machines and mechanical advantage *(lever, ramp, wedge, pulley, screw, wheel and axle)*
- Momentum in one dimension, conservation of momentum, conservation of energy and efficiency in collisions
- Thermal equilibrium: *temperature, thermal energy, specific heat capacity (conservation of energy)*

Electric Circuits (Direct Current: DC): ***Chapters 22, 23 and handouts***

- Ohm's Law and Kirchhoff's Laws: *terminal voltage vs EMF, safety, power distribution, fuses and circuit breakers, switches, overload, short circuits, alternators*
- Electrical power and efficiency *(e.g. light bulbs, motors, kettle, electrical heaters)*

Assessment – Evidence of Understanding

Throughout the year you will demonstrate your learning and understanding in a variety of ways, including:

- *Assignments and in-class activities*
- *Formal and informal laboratory reports*
- *Project(s)*
- *Tests, quizzes, exams*

The major assessment items such as tests/quizzes/exams, formal labs, and major projects, will be worth about 80% of the overall mark.

Policy re: Tests and quizzes:

Tests provide you opportunities to review and demonstrate your understanding of the course material. Quizzes do the same, and provide your teacher with an indication as to how well the class is progressing with the work.

You will be informed of the test date at least one week in advance. Quizzes could be given at any time, with or without prior notice (you will usually be given at least 1 day notice). Check the website and the notice board in the classroom for test and quiz dates.

If you have a valid reason for being away on the day of a test or quiz you must discuss it with your teacher **before** the test day to make alternate arrangements. If you are ill on the day of a test, your parent or guardian must call or e-mail your teacher **on the day of your absence**. *You must communicate directly with your teacher by e-mail to arrange an alternate date/time to write the test.*

Assignments, activities, and labs:

You will be given assignments regularly. The assignments and activities are designed to help deepen your understanding of concepts and prepare you for success on the tests and quizzes. It is essential for your understanding of physics that you get into the habit of completing your assignments regularly, and on time.

Research skills, including laboratory design and writing reports, are essential to the work of scientists. Throughout the year you will complete several informal labs and inquiry activities, and one or two formal laboratory reports.

Physics is a cumulative subject – in most cases, in order to understand each concept, you must have a solid understanding of the previous concept. If you are having difficulty with any of the concepts, seek help right away.

*** **Note:** *Absence from class is not an excuse for not doing assignments! You are expected to keep up with your work. If you miss a class, it is **your** responsibility to find out what was assigned, and when it is due. This information is typically posted on the website. If you don't see the information on the website, e-mail the teacher to ask. If you miss a lab, you must make arrangements with your teacher to complete the lab at an alternate time (e.g. lunch, after school, or during Flex time)* **

Extra help: You are encouraged to ask your teacher for extra help whenever you feel that you need it, and to work with other students in study teams. Sharing ideas and understandings with other students is an extremely effective way to learn (and it's more fun than struggling on your own). If you would like to meet with your teacher for extra help, please make an appointment in advance.