Physics 12 - Course Outline – 2018/19

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Textbook: **Physics (9th edition),** John D. Cutnell & Kenneth W. Johnson.

Additional Resources:

- College Physics guides with solved problems - a variety of guides are available, usually 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

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.
- ***Recommended:*** A set of coloured pencils or coloured pens.
- ***Recommended:*** 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).

Physics 12 Topics – 2018/19

** Note: As of Sept 2018 a new Physics 11 curriculum is being implemented across BC. In Sept 2019 a new Physics 12 curriculum will be implemented. The topics described here are appropriate to students who completed BC Physics 11 before Sept 2018.*

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, communicating ideas and understandings
- **Graphing skills:**
  - *Plotting linear, exponential, and inverse relationships given a physical model (e.g., electric and gravitational forces and fields vs distance)*
  - *Determining the linear regression that results from exponential and inverse relationships*
  - *Calculation of the slope of a line of best fit, including significant figures and appropriate units*
  - *Interpolation and extrapolation from a constructed graph*
  - *Calculations and interpretations of area under the curve on a constructed graph (e.g., displacement, work, impulse)*

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

- 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:
  - Machines such as the canoe paddle, Salmon wheel, deadfall traps
  - Architectural designs for structural integrity and efficiency

Vector Kinematics in 1 and 2 Dimensions ***Chapters 1 to 3, and additional handouts***

- Vector addition and subtraction
- Frames of Reference: *relative motion within a stationary reference frame*
- Vector kinematics

Postulates of Special Relativity ***Handouts***

- Relativistic effects within a moving reference frame: *for example, changes in time, length, and mass*

Vector Dynamics ***Chapter 4***

- Newton's Laws of motion: *applications in 2-D*
- Gravitational field and Newton's Law of Universal Gravitation

Static Equilibrium and Torque ***Chapters 4 and 9 (sections 9.1 and 9.2)***

- Translational equilibrium: *net force equals zero in 2-D (application of Chapter 4)*
- Rotational equilibrium: *net torque equals zero (application of Chapter 9.1 and 9.2)*

Work, Energy, and Power ***Chapter 6, and handout from Serway (GPE at Universal Scale)***

- Applications of work, energy, and power in mechanical systems
- Gravitational potential energy applied close to the surface of the Earth
- Gravitational potential energy at Universal scale: Launch velocity and escape velocity

Impulse, Momentum, and Collisions in 2-D ***Chapter 7 (Sections 1 to 4)***

- Impulse and momentum in relation to Newton's 2nd Law in a closed, isolated, system
- Conservation of momentum in collisions
- Conservation and transformations of energy in collisions (perfectly elastic, partially elastic, and perfectly inelastic)
- Collisions and explosions with multiple objects in 1-D and 2-D
- Ballistic pendulum

Circular motion and Gravitation ***Chapter 5 (omit section 5.4), 4.7, and 6.3***

- Centripetal force and acceleration
- Uniform circular motion: *horizontal and vertical circles; apparent weight (i.e. normal force)*
- Gravitational dynamics: *satellite motion, orbit changes*

Electrostatics ***Chapter 18 (sections 1, 2, 5 to 7, 11), and Chapter 19 (sections 1 to 4, 7)***

- Electric field: *vector field due to point charges (non-uniform field) and parallel plates (uniform field)*
- Coulomb's Law
- Electric potential energy, electric potential, and electric potential difference
- Electrostatic dynamics and energy relationships
    - *Force vs charge and distance in 1-D and 2-D*
    - *In orbits and between parallel plates*
- Application of the Law of Conservation of Energy and the work-energy principle *(e.g. cathode ray tube, mass spectrometer, particle accelerator)*

Electric Circuits ***Chapter 20 (sections 1, 2, 4, 6 to 10, 15)***

- Ohm's Law and Kirchhoff's Laws applied to series and parallel circuits: *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)*

[note: as of 2018/19 this section will be included within Physics 11]

Electromagnetism ***Chapter 21 (sections 1 to 3, 5, 7) and Ch 22 (sections 1 to 5, 7 [back emf], 9, 10)***

- Magnetic field:
  - *has polarity, and is induced by moving charges*
  - *sources include permanent magnets, straight wires, and solenoids*
- Magnetic force:
  - *can be attractive or repulsive*
  - *can act on a moving charge or current carrying wire within a magnetic field*
  - *right-hand rules*
- Electromagnetic induction:
  - *Faraday's law, Lenz's law*
  - *current can be induced by:*
    - *a change in magnetic flux through a coil/loop*
    - *moving a bar, wire, single charge within a magnetic field*
  - applications of electromagnetic induction: *back electromotive force (back EMF), motors, generators, transformers*

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*
- *Final Exam in June*

The marks weighting of the various assignments, labs, and tests (etc) will vary somewhat throughout the year, based on the level of difficulty and complexity of each task. The major assessment items such as tests/quizzes/exams, formal labs, and major projects, will be worth about 80% of the overall mark.

Your term and final marks will be tallied cumulatively (i.e. marks throughout the year will be totaled, rather than the final mark being the average of all terms).

Policy re: Tests and quizzes:

Tests are an important measure of your understanding of the course material, and provide opportunities to review and practice your skills. Quizzes do the same, and also provide your teacher with an indication as to how well the class is progressing with the work.

Unit tests will be given approximately every 3 to 4 weeks. 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. For test and quiz dates, check the website and the notice board in the classroom.

If you have a valid reason for being away on the day of a test or quiz (e.g. work experience), 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.

Policy re: 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 section you must have a solid understanding of the previous section. If you are having difficulty with any of the assignments, seek help right away.

*** **Note:** Absence from class, even for a legitimate reason, 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 come in at lunch or after school to complete the lab ***

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. You may find that teaching and learning from other students is an extremely effective way to learn (and it's more fun than struggling through on your own). If you would like to meet with your teacher for extra help at lunch or after school, please make an appointment in advance.

SUCCESS PEER TUTORING (Room 32/33):
Monday to Thursday, after school 3:15pm to 4pm [tutors for all subject areas, including physics]

TNT - PHYSICS PEER TUTORING (Room 111):
Monday to Thursday, after school 3:15pm to 4pm