Bernabei

PHYSICS 11 Honours - COURSE OUTLINE – 2023/24

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Textbook: ***College Physics for the AP Physics 1 Course, 2nd Edition***
Authors: Gay Stewart, Roger A. Freedman, Todd Ruskell, Philip R. Kesten
Publisher: W. H. Freeman; 2nd ed. edition (2019)

The Physics 11 Honours program includes all required topics of BC's Physics 11 course, with most topics covered at Physics 12 level of difficulty. In the Physics AP-1/12 Honours course the following year, student complete the BC Physics 12 curriculum, and the Physics AP-1 curriculum.

Concepts are explored by delving into theory, mathematical analysis, experimental investigations, and creative inquiry activities and projects. Scientific literacy and communication skills are essential course objectives (e.g. interpreting and creating scientific writing such as formal lab reports and research projects).

Important consideration regarding your future post-secondary studies:
Students who choose to major in Science or Engineering must take a calculus based physics course in first year University. Physics AP-1 and AP-2 are algebra based, and do not exempt Science and Engineering majors from taking first year Physics courses that are designed for those fields. Nonetheless, the breadth and depth of the Honours/AP program provides students a strong foundation in physics theory, making their first year University calculus based physics courses both more manageable and richer in depth. If you do not choose to major in Science/Engineering, you may be able use your Physics AP-1 plus AP-2 courses for credits as an elective course (you should check with the specific College/University regarding their policies). Physics AP-1 alone is not sufficient for University course credit, but AP-1 plus AP-2 is accepted by many post-secondary institutions.

Required Materials:

- ***Required:*** Scientific Calculator. Graphing calculators are permitted, but are not required or necessary for any high school physics course. Calculator functions must include: **x^2, 1/x or x^{-1}, sine, cosine, tangent, square root, exponent (e.g. EE, or EXP), and π**. 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 1 mm, with larger divisions (thick lines) every 0.5 cm and 1.0 cm. This is the standard graph paper for physics: you will also use this type of graph paper in College/University 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).

Assessment:

Achievement in Physics will be assessed based on demonstrations of ***content knowledge***, and ***skills and competencies*** that are important in the practice of science and the work of scientists (*questioning and predicting; planning and conducting; processing and analyzing data and information; evaluating; applying and innovating; and, communicating*). Course marks will be determined based your achievement on a variety of activities, including regular assignments and major assessments.

- Regular Assignments include informal mini-labs, small projects, assignments
- Major Assessments include tests, quizzes, formal lab reports, and projects

Tests and quizzes:
You will be informed of test dates at least one week in advance. Check the whiteboard in the classroom and the class website regularly for test/quiz dates. Quizzes could be given at any time, with or without prior notice. 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 miss a test or quiz you must e-mail the teacher right away to make arrangements to write the test on an alternate date/time. You should write the test on your first day back at school.

Assignments, activities, and labs:
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. Worksheets with answer keys will be posted on the website, providing examples of problem solving strategies.

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

Physics is a cumulative subject – in most cases, in order to understand a newly introduced concept, you must have a solid understanding of the previous topics. If you are having difficulty with any of the skills or 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 will be 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. during Flex time, lunch, or after school) ***

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.

Physics 11 Honours – Topic List

Textbook: ***College Physics for the AP Physics 1 Course, 2nd Edition***

Topic	Chapter Reference	BC Physics Curriculum	AP-1 Unit
First Peoples Technology: Applications of Physics ➢ 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.	*Additional resources supplied throughout the course*	11 and 12	Not applicable
Scientific Skills, Methods, and the Nature of Physics: ➢ Skills of Physics: Scientific notation, significant figures, collecting and organizing data, determining relationships between variables in equations and graphs ➢ Graphing skills:	*Ch 1, and Math Tutorial (pg 739) M-1 to M-8*	11 and 12	*Throughout the course*

○ *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)*			
Mechanical waves and sound: The Nature of Sound ➢ 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), standing waves, interference patterns* ➢ Resonance and frequency of sound: *harmonics, fundamental/natural frequency, beat frequency*	Ch 13	11	Not applicable
Kinematics: linear kinematics in 1 and 2 dimensions ➢ 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)* ➢ Vector addition and subtraction ➢ Frames of Reference: *relative motion within a stationary reference frame* ➢ Vector kinematics	Ch 2 and 3	11 (1D) and 12 (2D)	AP 1 Unit 1
Dynamics: Newton's laws of motion – Dynamic and Static conditions; gravitational force; elastic force ➢ 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:	Ch 4, and 5 Ch 6 for Gravitation *(note: Circular motion will be studied*	11 (1D) and 12 (2D)	AP 1 Unit 2

○ *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	*in the 2nd year of the program, in Physics 12/AP-1)*		
Energy: Work, energy (kinetic and potential), power, efficiency; Gravitational PE at Universal scale ➢ 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)* ➢ Thermal equilibrium: *temperature, thermal energy, specific heat capacity (conservation of energy)* ➢ 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	Ch 7 and 8	11 and 12	AP 1 Unit 4
Momentum: Linear, in one and two dimensions; perfectly elastic, partially elastic, and perfectly inelastic collisions ➢ 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 in 1-D and 2-D ➢ Ballistic pendulum	Ch 9	11 (1D) and 12 (2D)	AP 1 Unit 5
DC Circuits ➢ Electromotive Force and Current ➢ Ohm's Law ➢ Resistance ➢ Series and Parallel resistor circuits ➢ Kirchhoff's Laws ➢ Current, voltage, power	Ch 15	11	AP 2 Unit 4

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Physics AP-1 – Topic List

Textbook Chapter Summary: Physics (Cutnell and Johnson, 9th Edition)

AP 1 Content Area	**Topic**	**Chapter Reference for the 2nd year of the program: *Textbook: Physics (Cutnell and Johnson, 9th Edition)***
Unit 1	Kinematics: - Position, velocity, and acceleration - Representations of motion	1, 2, 3
Unit 2	Dynamics: - Systems - The gravitational field - Contact forces - Newton's First Law - Newton's Third Law and free-body diagrams - Newton's Second Law - Applications of Newton's Second Law	4
Unit 3	Circular motion (ch 5) and Gravitation (ch 4) - Vector fields - Fundamental forces - Gravitational and electric forces - Gravitational field/acceleration due to gravity on different planets - Inertial vs. gravitational mass - Centripetal acceleration vs. centripetal force - Free-body diagrams for objects in uniform circular motion	5 + 4
Unit 4	Energy: - Open and closed systems: Energy - Work and mechanical energy - Conservation of energy, the work–energy principle, and power	6
Unit 5	Momentum: Linear, in one and two dimensions - Momentum and impulse - Representations of changes in momentum - Open and closed systems: momentum - Conservation of linear momentum	7
Unit 6	Simple Harmonic Motion - Period of simple harmonic oscillators - Energy of a simple harmonic oscillator	10.1 to 10.4
Unit 7	Torque - Rotational kinematics - Torque and angular acceleration - Angular momentum and torque - Conservation of angular momentum	8 9.1 to 9.7