



<b>Course Name:</b> Physics, Grade 12	<b>Course Code:</b> SPH 4U	<b>Course Pre-requisite:</b> SPH 3U
<b>Course Type:</b> University Preparation	<b>Grade Level:</b> 12	<b>Credit Value:</b> 1
<b>Textbook:</b> Physics 12	<b>Publisher:</b> Nelson	<b>Textbook Value:</b> \$ 106.92
<b>Teachers:</b> C. Janzen		

**Course Description:**

This course enables students to deepen their understanding of physics concepts and theories. Students will continue their exploration of energy transformations and the forces that affect motion, and will investigate electrical, gravitational, and magnetic fields and electromagnetic radiation. Students will also explore the wave nature of light, quantum mechanics, and special relativity. They will further develop their scientific investigation skills, learning, for example, how to analyse, qualitatively and quantitatively, data related to a variety of physics concepts and principles. Students will also consider the impact of technological applications of physics on society and the environment.

**Link 11-12 Science - [http://www.edu.gov.on.ca/eng/curriculum/secondary/2009science11\\_12.pdf](http://www.edu.gov.on.ca/eng/curriculum/secondary/2009science11_12.pdf)**

**Course Overall Expectations:**

Strand	Overall Expectations
Scientific Investigation Skills and Career Exploration	<p><b>As a component of every strand:</b></p> <ul style="list-style-type: none"> <li>● demonstrate scientific investigation skills (related to both inquiry and research) in the four areas of skills (initiating and planning, performing and recording, analysing and interpreting, and communicating);</li> <li>● identify and describe a variety of careers related to the fields of science under study, and identify scientists, including Canadians, who have made contributions to those fields.</li> </ul>
Dynamics	<ul style="list-style-type: none"> <li>● analyse technological devices that apply the principles of the dynamics of motion, and assess the technologies' social and environmental impact;</li> <li>● investigate, in qualitative and quantitative terms, forces involved in uniform circular motion and motion in a plane, and solve related problems;</li> <li>● demonstrate an understanding of forces involved in uniform circular motion and motion in a plane.</li> </ul>
Energy and Momentum	<ul style="list-style-type: none"> <li>● analyse, and propose ways to improve, technologies/procedures that apply principles related to energy and momentum, and assess the social and environmental impact of these technologies or procedures;</li> <li>● investigate, in qualitative and quantitative terms, through laboratory inquiry or computer simulation, the relationship between the laws of conservation of energy and conservation of momentum, and solve related problems;</li> <li>● demonstrate an understanding of work, energy, momentum, and the laws of conservation of energy and conservation of momentum, in one and two dimensions.</li> </ul>
Gravitational, Electric and Magnetic Fields	<ul style="list-style-type: none"> <li>● analyse the operation of technologies that use gravitational, electric, or magnetic fields, and assess the technologies' social and environmental impact;</li> <li>● investigate, in qualitative and quantitative terms, gravitational, electric, and magnetic fields, and solve related problems;</li> <li>● demonstrate an understanding of the concepts, properties, principles, and laws related to gravitational, electric, and magnetic fields and their interactions with matter.</li> </ul>
The Wave Nature of Light	<ul style="list-style-type: none"> <li>● analyse technologies that use the wave nature of light, and assess their impact on society/the environment;</li> <li>● investigate, in qualitative and quantitative terms, properties of waves and light, and solve related problems;</li> <li>● demonstrate an understanding of the properties of waves and light in relation to diffraction, refraction, interference, and polarization.</li> </ul>
Revolutions in Modern Physics: Quantum Mechanics and Special Relativity	<ul style="list-style-type: none"> <li>● analyse, with reference to quantum mechanics and relativity, how the introduction of new conceptual models and theories can influence and/or change scientific thought and lead to the development of new technologies;</li> <li>● investigate special relativity and quantum mechanics, and solve related problems;</li> <li>● demonstrate an understanding of the evidence that supports the basic concepts of quantum mechanics and Einstein's theory of special relativity.</li> </ul>

## Assessment and Evaluation Strategies:

The purpose of assessment and evaluation is to improve student learning. Assessment and evaluation is based on the provincial curriculum expectations and the achievement levels outlined in the curriculum document. In order to ensure that assessment and evaluation are valid and reliable, and that they lead to the improvement of student learning, teachers use a variety of strategies throughout the course, including: providing students with feedback about their work (known as assessment for learning), helping to set learning goals and monitor their own progress (known as assessment as learning), and evaluation and reporting of progress in the form of grades and marks (known as assessment of learning).

<p style="text-align: center;"><b>Unit Overview</b></p> <p style="text-align: center;">Students will work with related scientific investigation skills and explore scientific careers as part of each unit.</p>	<p style="text-align: center;"><b>Assessment and Evaluation Methods</b></p> <p style="text-align: center;">(May include major evaluations)</p>
<p>Dynamics Topics</p> <ul style="list-style-type: none"> <li>reference systems with respect to the real/apparent forces; advantages/disadvantages of static and kinetic friction; projectile and relative motion; two-dimensional vector quantities, using vector diagrams, vector components, and algebraic calculations; qualitative/quantitative relationships between forces; free-body diagrams; derivation of equations for uniform circular motion; a technological device that applies the principles of linear or circular motion; and impact on society/environment of technological devices that use linear or circular motion</li> </ul>	<ul style="list-style-type: none"> <li>assignments, debates, exam, group work, laboratory investigations, presentations, projects, quizzes, reports and tests</li> </ul>
<p>Energy and Momentum Topics</p> <ul style="list-style-type: none"> <li>Hooke's law; simple harmonic motion and its relationship to Hooke's law and uniform circular motion; elastic and inelastic collisions; relationships between work and energy; application of the laws of conservation of energy and conservation of momentum; analysis of situations involving work, gravitational potential energy, kinetic energy, thermal energy, and elastic potential energy; relationships between mass, velocity, kinetic energy, momentum, and impulse for a system of objects; propose ways to improve, a technology/procedure that applies the principles of energy and momentum; and impacts on society/environment of technologies/procedures that apply the principles of energy and momentum</li> </ul>	<ul style="list-style-type: none"> <li>assignments, debates, exam, group work, laboratory investigations, presentations, projects, quizzes, reports and tests</li> </ul>
<p>Gravitational, Electric and Magnetic Fields Topics</p> <ul style="list-style-type: none"> <li>identify/properties of fundamental forces associated with different theories and models of physics; Newton's law of universal gravitation and circular motion; properties of gravitational, electric, and magnetic fields; use field diagrams to explain differences in the sources and directions of fields, including, but not limited to, differences between near-Earth and distant fields, parallel plates and point charges, straight line conductors and solenoids; operation of a technological system that uses gravitational, electric, or magnetic fields; and impacts on society/environment of technologies that use gravitational, electric, or magnetic fields</li> </ul>	<ul style="list-style-type: none"> <li>assignments, debates, exam, group work, laboratory investigations, presentations, projects, quizzes, reports and tests</li> </ul>
<p>The Wave Nature of Light Topics</p> <ul style="list-style-type: none"> <li>diffraction and interference of water waves; diffraction, refraction, polarization, and interference of light waves; separation of light into colours in various situations; qualitative analysis of the production of electromagnetic radiation by an oscillating electric dipole; technology that uses the principles related to the wave nature of light and impacts on society/environment of technologies that use the wave nature of light</li> </ul>	<ul style="list-style-type: none"> <li>assignments, debates, exam, group work, laboratory investigations, presentations, projects, quizzes, reports and tests</li> </ul>
<p>Revolutions in Modern Physics: Quantum Mechanics and Special Relativity Topics</p> <ul style="list-style-type: none"> <li>experimental evidence that supports a particle model of light and a wave model of matter; the photoelectric effect, the Compton effect, and de Broglie's matter waves; identify Einstein's two postulates for the theory of special relativity, and the evidence supporting the theory; the standard model of elementary particles; development and impact of the two major revolutions in modern physics and the importance of relativity and quantum mechanics to the development of various technologies</li> </ul>	<ul style="list-style-type: none"> <li>assignments, debates, exam, group work, laboratory investigations, presentations, projects, quizzes, reports and tests</li> </ul>
<p><b>Course Culminating Activity/Independent Study</b></p> <ul style="list-style-type: none"> <li>Momentum/Force Performance Task and Analysis</li> <li>Investigation/Presentation on the Technological Application of Wave Theory</li> <li>Analysis of the Technological Application of Dynamics and Energy</li> </ul>	<ul style="list-style-type: none"> <li>at the conclusion of all the required strands</li> </ul>
<p><b>Exam</b></p>	<ul style="list-style-type: none"> <li>written exam in June</li> </ul>

## Assessment and Evaluation Categories and Weights:

Achievement Chart Categories	
Term Achievement Category	Comprises
Application/Making Connections	<ul style="list-style-type: none"> <li>● transfer of concepts between self and science</li> <li>● transfer of concepts between science and other subjects</li> <li>● transfer of concepts between subjects and the world outside</li> <li>● access impacts of science</li> </ul>
Communication	<ul style="list-style-type: none"> <li>● oral, writing, listening and visual skills</li> <li>● mathematical/data communication, presentation and precision/accuracy</li> <li>● journals, portfolios and models</li> </ul>
Knowledge/Understanding	<ul style="list-style-type: none"> <li>● facts, terms and relationships between concepts</li> <li>● transfer of concepts to new contexts</li> <li>● solving math/formula problems</li> </ul>
Thinking/Inquiry	<ul style="list-style-type: none"> <li>● design skills (formulate hypotheses, create and test procedures)</li> <li>● thinking skills (inductive reasoning, deductive reasoning and data analysis, interpretation and evaluation)</li> </ul>

Evaluation/Weight of Marks			
Evaluation	Components	Component Percentage	Overall Percentage
Term Evaluation	Application/Making Connections	25	70
	Communication	25	
	Knowledge/Understanding	25	
	Thinking/Inquiry	25	
Final Evaluation	Culminating Activity	10	30
	Exam	20	

## Learning Skills and Work Habits Assessment:

The development of learning skills and work habits is an integral part of student learning. These skills are:

- Responsibility
- Organization
- Independent Work
- Collaboration
- Initiative
- Self-Regulation

Learning skills and work habits influence student achievement and are included as a formal part of the assessment and evaluation process. Learning skills and work habits will be assessed through a variety of teacher strategies. ( e.g. observation, student /teacher conference, self-reflection, checklists, exit cards, etc.) These important learning skills and work habits will be formally reported on the Provincial Report Card according to the following scale: E- Excellent, G- Good, S- Satisfactory, N- Needs Improvement.

## Academic Dishonesty - Cheating and Plagiarism:

Learning tasks that students complete as well as the assignments, tests and exams that students submit for evaluation must be their own work. Cheating and plagiarism is a serious offence that will not be condoned. Academic consequences will result.

## Late and Missed Assignments - Student Roles and Responsibilities - Students are expected to:

- be responsible for providing evidence of their achievement of the overall expectations within the time frame specified by the teacher, and in a form approved by the teacher;
- understand that there will be consequences for not completing assignments for evaluation and/or for submitting those assignments late;
- use class time productively;
- in extenuating circumstances, request an extension from the teacher before the due date.

Mark deductions for late and missed assignments may apply to **major assignments only**.

**References:** *TVDSB Assessment & Evaluation Policy, September 2011; Growing Success - Assessment and Evaluation, and Reporting in Ontario Schools, 2010. Student Planner and School Web site*