



SCIENCE DEPARTMENT

COURSE: Grade 12 University Physics

COURSE CODE: SPH4U0

OVERARCHING LEARNING GOALS

<p><b>Scientific Investigation and Skills and Career Exploration</b></p> <ul style="list-style-type: none"> <li>• Demonstrate scientific investigation skills in four areas: 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>	<p><b>Gravitational, Electric and Magnetic Field</b></p> <ul style="list-style-type: none"> <li>• Demonstrate an understanding of the concepts, properties, principles, and laws related to gravitational, electric, and magnetic fields and their interactions with matter.</li> <li>• Understand that the behaviour of matter in gravitational, electric, and magnetic fields can be described mathematically.</li> <li>• Analyse technological systems that involve gravitational, electric, and magnetic fields and their impact on society and the environment.</li> </ul>
<p><b>Dynamics</b></p> <ul style="list-style-type: none"> <li>• Understand that forces acting on an object will determine the motion of that object.</li> <li>• Solve a variety of 2D problems by using vector and scalar quantities.</li> <li>• Analyse technological devices that apply the dynamics principles and assess their impact on society and environment.</li> </ul>	<p><b>The Wave Nature of Light</b></p> <ul style="list-style-type: none"> <li>• Demonstrate an understanding of the properties of waves and light in relation to diffraction, refraction, interference, and polarization.</li> <li>• Analyse diffraction and interference of water and light waves, and solve related problems.</li> <li>• Understand the applications of light and assess their impact on society and environment.</li> </ul>
<p><b>Energy and Momentum</b></p> <ul style="list-style-type: none"> <li>• Investigate the relationship between the laws of conservation of energy and conservation of momentum.</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> <li>• Solve problems related to work, energy and momentum.</li> </ul>	<p><b>Revolutions in Modern Physics: Quantum Mechanics and Special Relativity</b></p> <ul style="list-style-type: none"> <li>• Understand the developments that led to Einstein’s theory of Special Relativity and Quantum Mechanics.</li> <li>• Understand that light can show particle-like and wave-like behaviour, and particles can show wave-like behaviour.</li> <li>• Solve problems related to time dilation, length contraction, mass, momentum, and energy.</li> <li>• Describe the standard model of particle physics.</li> </ul>

SUCCESS CRITERIA

**Dynamics**

- I can investigate, analyze and represent motion using graphs and equations.
- I can solve a variety of 2D problems including projectile and relative motion problems by adding and subtracting two-dimensional vector quantities, using vector diagrams, vector components and algebraic equations.
- I can analyse and apply Newton’s laws to solve a variety of 2D problems including inclines, pulleys and circular motion.
- I can identify inertial and non-inertial reference frames.
- I can analyse technological devices that apply the principles of circular motion and assess their impact on society and environment.

## Energy and Momentum

- I can calculate kinetic, gravitational, elastic energy, impulse and momentum of objects in motion or at rest.
- I can solve problems using the work-energy theorem and the law of conservation of energy.
- I can investigate and analyse the conservation of energy on inclines and vertical loops, and the conservation of energy and momentum in collisions.

## Gravitational, Electric and Magnetic Field

- I can describe properties of gravitational, electric and magnetic fields and their interaction with matter.
- I can solve problems involving objects/charged particles in gravitational, electric and magnetic fields.
- I can understand the applications of electric and magnetic fields and their impact on society and environment.

## The Wave Nature of Light

- I can describe properties of light and solve problems related to reflection, refraction, total internal reflection, diffraction, interference, diffraction grating, and polarization.
- I can research and analyze light technologies and their impact on society and environment.

## Revolutions in Modern Physics: Quantum Mechanics and Special Relativity

- I can describe and solve problems related to the effects of relativistic velocity on time, length, momentum, energy and mass.
- I can describe the photon theory of light, the wave properties of matter and solve related problems.
- I can describe the overall organization of the standard model of particle physics.
- I can assess the importance of quantum mechanics to the development of various technologies.

## ASSESSMENT & EVALUATION

### TERM EVALUATION – 70%

Assessment and evaluation in this course will be based on provincial curriculum expectations. Evaluation throughout the course and the final evaluation will incorporate four broad categories:

<b>Knowledge and Understanding</b>	<b>Thinking/ Inquiry</b>	<b>Communication</b>	<b>Application</b>
-knowledge of content -understanding of content	-planning and performing lab investigations -problem solving, critical thinking processes and skills	-expression and organization of ideas and information -use of conventions and terminology	-making connections to society, technology and the environment -transfer of knowledge and skills to unfamiliar contexts

Students will also receive descriptive feedback as part of the learning process which may not be assigned a mark. More detailed information regarding the Port Credit Secondary School Assessment and Evaluation policy can be found in the Student Agenda.

### FINAL EVALUATION – 30%

The final evaluation will consist of an in-class, practical culminating task and/or a formal written exam.

## LEARNING SKILLS

The following learning skills will be taught and assessed throughout the course and rated on the report card:

**\*Responsibility**  
**\*Organization**

**\*Independent Work**  
**\*Collaboration**

**\*Initiative**  
**\*Self-regulation**

These skills will not be included in the final numeric mark. However, it is important to remember that the development of these skills is critical to academic achievement and does have a direct bearing on the final mark.