

**Islamic Foundation School**

**Course Outline**

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| **Course Title: Physics, Grade 12, University Preparation** |
| **Course Code: SPH4U** |
| **Course Type: University Preparation** |
| **Grade: 12**  |
| **Credit Value: 01** |
| **Prerequisites: SPH3U, Grade 11 Physics** |
| **Co requisites: none**  |
| **Course developed by: Br. Hasan Malik** | **Date: 5/09/2012** |
| **Course revised by: Br. Hasan Malik**  | **Date: 2/02/2014** |
| **Course based on Ministry curriculum document: *The Ontario Curriculum: Grades 11 and 12, Science, 2008.*** |

**Course Outline – Physics 12 (SPH4U)**

**Course Type: University Preparation, Grade: 12, Credit Value: 1.0**

**Prerequisite: SPH3U, Co-requisite: None**

**Department: Science**

**Teacher: Br. Hasan Malik**

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.

Overall Expectations

By the end of this course, students will:

A1. 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);

A2. Identify and describe careers related to the fields of science under study, and describe the contributions of scientists, including Canadians, to those fields.

B1. Analyze technological devices that apply the principles of the dynamics of motion, and assess the technologies’ social and environmental impact;

B2. Investigate, in qualitative and quantitative terms, forces involved in uniform circular motion and motion in a plane, and solve related problems;

B3. Demonstrate an understanding of the forces involved in uniform circular motion and motion in a plane. C1. Analyze, and propose ways to improve, technologies or procedures that apply principles related to energy and momentum, and assess the social and environmental impact of these technologies or procedures;

C2. 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;

C3. Demonstrate an understanding of work, energy, momentum, and the laws of conservation of energy and conservation of momentum, in one and two dimensions.

D1. Analyze the operation of technologies that use gravitational, electric, or magnetic fields, and assess the technologies’ social and environmental impact;

D2. Investigate, in qualitative and quantitative terms, gravitational, electric, and magnetic fields, and solve related problems;

D3. Demonstrate an understanding of the concepts, properties, principles, and laws related to gravitational, electric, and magnetic fields and their interactions with matter.

E1. Analyze technologies that use the wave nature of light, and assess their impact on society and the environment;

E2. Investigate, in qualitative and quantitative terms, the properties of waves and light, and solve related problems;

E3. Demonstrate an understanding of the properties of waves and light in relation to diffraction, refraction, interference, and polarization.

F1. Analyze, 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;

F2. Investigate special relativity and quantum mechanics, and solve related problems;

F3. Demonstrate an understanding of the evidence that supports the basic concepts of quantum mechanics and Einstein’s theory of special relativity.

**Course Description: Units: Titles and Time**

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|  | Scientific Investigation skills and Career Exploration | Through out the course |
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| Unit 1 | Dynamics | 24 hours |
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| Unit 2 | Energy and Momentum | 24 hours |
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| Unit 3 | Gravitational, Electric, and Magnetic Fields | 18 hours |
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| Unit 4 | The Wave Nature of Light | 18 hours |
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| Unit 5 | Modern Physics: Quantum Mechanics and Special Relativity | 24hours |
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|  | Final | 02 hours |
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|  | Total | 110 hours |
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**Units Descriptions**

**Unit 1: Dynamics**

Analyze a technological device that applies the principles of linear or circular motion (e.g., a slingshot, a rocket launcher, a race car, a trebuchet). What aspects of the principles of motion are applied in archery? How does the equipment used by competitive skiers reduce friction and resistance? How does a “pop bottle” rocket use the principles of motion? How does the spin cycle of a washing machine use circular motion to remove water from clothes?. Assess the impact on society and the environment of technological devices that use linear or circular motion (e.g., projectile weapons, centrifuges, elevators). Satellites, which use principles of circular motion to revolve around Earth, support communications technologies and are used by governments to gather intelligence.

**Unit 2 Energy and Momentum**

Analyze, with reference to the principles of energy and momentum, and propose practical ways to improve, a technology or procedure that applies these principles (e.g., fireworks, rocket propulsion, protective equipment, forensic analysis of vehicle crashes, and demolition of buildings). Sports helmets are designed to absorb energy from falls and collisions, reducing the number and severity of head injuries. Helmets must be light enough not to hamper performance while providing optimal protection. How are principles of energy and momentum used in the design of amusement park rides, such as roller coasters and swing rides? How could the rides be improved, either in terms of their function or their safety? How does a child car seat help protect children riding in motor vehicles? How might the design of or materials used in standard child car seats is improved? Assess the impact on society and the environment of technologies or procedures that apply the principles of energy and momentum.

**Unit 3: Gravitational, Electric, and Magnetic Fields**

Analyze the operation of a technological system that uses gravitational, electric, or magnetic fields (e.g., a home entertainment system, a computer, magnetic strips on credit cards). How are gravitational field maps used to correct errors in navigational systems used in unmanned underwater vehicles (UUVs)? How are magneto-rheological (MR) fluid dampers used in buildings to absorb the shocks from earthquakes? How can radio frequency identification (RFID) chips be used for inventory tracking in stores and warehouses? Assess the impact on society and the environment of technologies that use gravitational, electric, or magnetic fields (e.g., satellites used in surveillance or storm tracking, particle accelerators that provide high-energy particles for medical imaging). The radiation produced by the magnetic and electric fields of electron accelerators is used to treat tumours. In conjunction with other therapies, radiation increases the survival rate of cancer patients,

**Unit 4: The Wave Nature of Light**

Analyze, with reference to the principles related to the wave nature of light, a technology that uses these principles (e.g., Xeon lights, spectroscopes, polarized sunglasses). How do geologists use the wave nature of light to find mineral deposits? How do surface Plasmon polaritons (SPPs) make use of the wave nature of light? What are some of the applications of SPPs? How does the global positioning system (GPS) use the wave nature of light? What are its applications? What are its shortcomings? Assess the impact on society and the environment of technologies that use the wave nature of light (e.g., DVDs, polarized lenses, night vision goggles, wireless networks). Fiber optical technology has revolutionized access to information. Some people argue that unrestricted access to information helps to open up societies and improve human rights and can be used as tools for prodemocracy groups. However, some totalitarian governments practice censorship by restricting citizens’ access to Internet sites promoting human rights and democracy.

**Unit 5: Revolutions in Modern Physics: Quantum Mechanics and Special Relativity**

Analyse the development of the two major revolutions in modern physics (e.g., the impact of the discovery of the photoelectric effect on the development of quantum mechanics; the impact of thought experiments on the development of the theory of relativity), and assess how they changed scientific thought. Which scientists made the most important contributions to the development of quantum mechanics? What kinds of experiments did they conduct? What sorts of discoveries did they make? In what ways did later discoveries build on earlier ones? What experiments and discoveries led to the development of the theory of relativity? What impact did Einstein’s theories have on later scientific thought?

Learning Skills and Work Habits

Students will develop learning skills and work habits through their classroom experience and with feedback from their teacher. In addition to the Final Grade you will be assessed in the following Learning Skills:

Responsibility, Organization, Independent Work, Collaborative, Initiative, and Self Regulation. Teachers will use the following letter symbols to report on student’s development of the six learning skills and work habits:

E-Excellent G-Good S-Satisfactory N-Needs Improvement. Resources required by student:

Text book: Physics 12 Nelson

Program Planning

Instructional approaches: Teacher will practice various instructional approaches to further the knowledge of the course and to capture the interest of the students.

Health and safety in Science: This course provides students with required reading and analytical skills to be able to explore the variety of concepts relating to health and safety in the workplace

Career education: Teacher encourages students to relate science to technology, society, and the environment (STSE), by using investigations, research projects etc. Teacher also ensures that the skills, knowledge and creativity that students acquire through this course are essential for a wide range of careers.

Late and missed assignments:

Students are expected to finish their assignments within a specified time frame. Teacher will accept late assignments with a valid explanation but student should not make a practice of handing the assignments late. It is up to the teacher to give a mark on late assignments. A mark of zero will be given on missing assignment.

Plagiarism:

Plagiarism is a serious academic offence. Anyone caught plagiarizing material will be assigned a mark of zero for that evaluation.

Eye protection is required for some laboratory activities. Students are required to supply their own safety goggles for splash protection and lab coats. Safety procedures must be followed.

**Learning Skills:** In addition to earning a mark on the report card, Learning Skills will be evaluated as outlined by **Growing  Success. Assessment, Evaluation and Reporting in Ontario Schools. 2010.**.  The Learning Skills are:  Responsibility, Organization, Independent Work, Collaboration, Initiative, and Self-Regulation. The Learning Skills are evaluated using four-point scale:  E for Excellent, G for Good, S for Satisfactory, and N for Needs Improvement.

**Resources required by the student:**

***Resources:***Nelson Physics 12 Textbook, various websites

**Note: No missed tests. All tests and assessments are mandatory.** If a student has not already procured an extension from a teacher and does not meet assignment deadlines, he/she has up until the time the marked assignments are returned to submit the work for a full mark. Any work submitted after this will be marked and given a mark up to 50.

Please sign that you have read the above outline. Feel free to contact the school if you have any questions or concerns.

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Parent/Guardian Student