Ontario eSecondary School
Course Outline
2018-2019

Course Title: Physics, 11	
Course Code: SPH3U	
Course Type: University Preparation	
Grade: 11	
Credit Value: 1.0	
Prerequisites: Science, Grade 10, Academic	
Department: Science	
Course developed by: Muhammad Hamza Qureshi	**Date: February 2011**
Course revised by: Muhammad Hamza Qureshi	**Date: August 2018**
Length: One Semester	**Hours:** 110
Course based on Ministry curriculum document: Science, The Ontario Curriculum, Grades 11 and 12, 2008, revised	

ONTARIO ESECONDARY SCHOOL
Course Outline – Physics, Grade 11 (SPH3U)
Department: Science
Teacher: Muhammad Hamza Qureshi

COURSE DESCRIPTION

This course develops students' understanding of the basic concepts of physics. Students will explore kinematics, with an emphasis on linear motion; different kinds of forces; energy transformations; the properties of mechanical waves and sound; and electricity and magnetism. They will enhance their scientific investigation skills as they test laws of physics. In addition, they will analyse the interrelationships between physics and technology, and consider the impact of technological applications of physics on society and the environment.

Prerequisite: Science, Grade 10, Academic

OVERALL EXPECTATIONS

A. Scientific Investigation Skills and Career Exploration
   Throughout 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.
B. Kinematics
   By the end of this course, students will:
   B1. analyse technologies that apply concepts related to kinematics, and assess the technologies' social and environmental impact;
   B2. investigate, in qualitative and quantitative terms, uniform and non-uniform linear motion, and solve related problems;
   B3. demonstrate an understanding of uniform and non-uniform linear motion, in one and two dimensions.
C. Forces
   By the end of this course, students will:
   C1. analyse and propose improvements to technologies that apply concepts related to dynamics and Newton's laws, and assess the technologies' social and environmental impact;
   C2. investigate, in qualitative and quantitative terms, net force, acceleration, and mass, and solve related problems;
   C3. demonstrate an understanding of the relationship between changes in velocity and unbalanced forces in one dimension.
D. Energy and Society
   By the end of this course, students will:
   D1. analyse technologies that apply principles of and concepts related to energy transformations, and assess the technologies' social and environmental impact;
   D2 . investigate energy transformations and the law of conservation of energy, and solve related problems;

D3 . demonstrate an understanding of work, efficiency, power, gravitational potential energy, kinetic energy, nuclear energy, and thermal energy and its transfer (heat).

E. Waves and Sound

By the end of this course, students will:

E1. analyse how mechanical waves and sound affect technology, structures, society, and the environment, and assess ways of reducing their negative effects;

E2. investigate, in qualitative and quantitative terms, the properties of mechanical waves and sound, and solve related problems;

E3. demonstrate an understanding of the properties of mechanical waves and sound and of the principles underlying their production, transmission, interaction, and reception.

F. Electricity and Magnetism

By the end of this course, students will:

F1. analyse the social, economic, and environmental impact of electrical energy production and technologies related to electromagnetism, and propose ways to improve the sustainability of electrical energy production;

F2. investigate, in qualitative and quantitative terms, magnetic fields and electric circuits, and solve related problems;

F3. demonstrate an understanding of the properties of magnetic fields, the principles of current and electron flow, and the operation of selected technologies that use these properties and principles to produce and transmit electrical energy.

OUTLINE OF COURSE CONTENT

Unit	<u>Length</u>
1. Scientific Investigation Skills and Career Exploration • During every unit, students will be learning about various careers, natural phenomena, technologies, lab techniques and societal issues associated with the concepts they are learning. • Students will learn about various careers associated with concepts learned in the course and hone various scientific investigation skills imperative to the application of the scientific method.	Throughout the course
2. Kinematics ▪ The study of kinematics in both one and two dimensions (motion in a plane), ▪ Use appropriate terminology related to kinematics, including, but not limited to*: time, distance, position, displacement, speed, velocity,* and *acceleration* ▪ Motion in a plane and several applications of accelerated motion. ▪ Motion involves a change in the position of an object over time. ▪ Motion can be described using mathematical relationships. ▪ Many technologies that apply concepts related to kinematics have societal and environmental implications.	17 hours
3. Forces ▪ Forces in nature, including the four fundamental forces (gravity, electromagnetism, strong nuclear forces, and weak nuclear forces) ▪ Forces needed to analyze problems in mechanics (normal force, friction force, and tension force). ▪ Drawing system and free-body diagrams, and use them to analyze forces. ▪ Forces can change the motion of an object.	18.5 hours

▪ Applications of Newton's laws of motion have led to technological developments that affect society and the environment.	
4. Energy and Society ▪ Energy can be transformed from one type to another. ▪ Energy transformation systems often involve thermal energy losses and are never 100% efficient. ▪ Although technological applications that involve energy transformations can affect society and the environment in positive ways, they can also have negative effects, and therefore must be used responsibly.	24.5 hours
5. Waves and Sounds ▪ Mechanical waves have specific characteristics and predictable properties. ▪ Sound is a mechanical wave. ▪ Mechanical waves can affect structures, society, and the environment in positive and negative ways.	16.5 hours
Culminating Task (5 Hours + Exam 3 Hours) Total	8 Hours

TEACHING/LEARNING STRATEGIES

- Readings
- Structured Discussion within Moodle
- Brainstorming
- Conference through video chat
- Group Work/Pair Work when applicable based on enrolment
- Simulations
- Questioning within discussion and lessons
- Visual Organizers
- Demonstration
- Handouts
- Labs (Gizmos)
- Gaming

Since the aims of this course are to develop scientific literacy in all students and to prepare students for science courses at university, a wide variety of instructional strategies that accommodate an equally wide variety of learning styles and interests will be used. These may include lectures, Socratic teachings, Demonstrations, Reading, Structured discussions, Research essays, Seminars, Lab investigations, Computer simulations, animations and PowerPoint.

Percentage Breakdown	Units	Assessment of Learning's	√ Assessed Categories K 20%	T/I 15%	C 15%	A 20%
70%	1: Scientific Investigation Skills and Career Exploration	Research Assignments / Labs/problem sets	√	√	√	√
	2: Kinematics	Problem Sets	√	√	√	√
		Watch Your Speed Lab		√	√	√
		Electronic Speed Limits Assignment *(financial literacy)*		√	√	√
		Unit Test	√	√	√	√
	3: Forces	Problem Sets	√	√	√	√
		Mechanical Engineering Research assignment		√	√	√
		Coefficients of Friction Lab		√	√	√
		Unit Test	√	√	√	√
	4: Energy and Society	Conservation of energy lab		√	√	√
		Problem Sets	√	√	√	√
		Explore an Issue in Thermal Energy Project *(financial literacy)*	√	√	√	√
		Unit Test	√	√	√	√
	5: Waves and Sound	Energy conversion buoys research assignment		√	√	√
		Problem sets	√	√		√
		Waveform Lab	√	√	√	√
		Unit Test	√	√	√	√
		Research Project	√		√	√
	6: Electricity and Magnetism	Electromagnetic medical technologies assignment	√	√	√	√
		Problem sets	√	√		√
		Analyzing Circuits Lab	√	√	√	√
		Unit Test	√	√	√	√
		Environmental impact of electrical energy production assignment*(financial literacy)*	√	√		√
30 %	Culminating Task	- A Culminating Project assessing research, investigation and problem-solving skills covering every unit in the course (10%) [Exam part 1] - A written final exam covering the entire course (20%) [Exam part 2]	√	√	√	√

Percentage of Final Mark	Weight	Categories of Mark Breakdown
70%	30%	*Labs*
	30%	*Tests*
	10%	*Assignments, Conversations, Observations*
30%	10%	*Culminating Project*
	20%	*Final Exam*

ASSESSMENT, EVALUATION AND REPORTING:

Assessment: The process of gathering information that accurately reflects how well a student is achieving the identified curriculum expectations. Teachers provide students with descriptive feedback that guides their efforts towards improved performance.

<u>Evaluation:</u> Assessment of Learning focuses on Evaluation which is the process of making a judgement about the quality of student work on the basis of established criteria over a limited, reasonable period of time.

<u>Reporting:</u> Involves communicating student achievement of the curriculum expectations and Learning Skills and Work Habits in the form of marks and comments as determined by the teacher's use of professional judgement.

<u>Achievement Policy</u>
For Grades 9 to 12, a final grade (percentage mark) is recorded for every course. The final grade will be determined as follows:

• Seventy per cent of the grade will be based on evaluation conducted throughout the course. This portion of the grade should reflect the student's most consistent level of achievement throughout the course, although special consideration should be given to more recent evidence of achievement.

• Thirty per cent of the grade will be based on a final evaluation administered at or towards the end of the course. This evaluation will be based on evidence from one or a combination of the following: an examination, a performance, an essay, and/or another method of evaluation suitable to the course content. The final evaluation allows the student an opportunity to demonstrate comprehensive achievement of the overall expectations for the course. **<u>Growing Success. Assessment, Evaluation and Reporting in Ontario Schools. 2010</u>**

Strategies for Assessment and Evaluation	
Assessment *for* learning	**Assessment *as* Learning**
● Anecdotal notes ● Homework assignments ● Observations ● Individual conference meetings ● Diagnostic quizzes or questionnaires ●	● Learning logs ● Reference charts ● Self-assessment rubrics ● Graphic organizers (Venn Diagrams, KWHL table, etc.)

Program Planning

A much more effective way to learn is for students to be actively involved in thinking and discussing during both class and investigation activities, with the goal of having the students develop a deep understanding of scientific concepts.

Students come to secondary school with a natural curiosity developed throughout the elementary grades. They also bring with them individual interests and abilities as well as diverse personal and cultural experiences, all of which have an impact on their prior knowledge about science, technology, the environment, and the world they live in. Effective instructional approaches and learning activities draw on students' prior knowledge, capture their interest, and encourage meaningful practice both inside and outside the classroom. Students will be engaged when they are able to see the connection between the scientific concepts they are learning and their application in the world around them and in real-life situations.

Students in a science class typically demonstrate diversity in the ways they learn best. It is important, therefore, that students have opportunities to learn in a variety of ways - individually, cooperatively, independently, with teacher direction, through hands-on experiences, and through examples followed by practice. In science, students are required to learn concepts and procedures, acquire skills, and learn and apply scientific processes, and they become competent in these various areas with the aid of instructional and learning strategies that are suited to the particular type of learning. The approaches and strategies teachers use will vary according to both the object of the learning and the needs of the students.

Differentiated Instruction is responsive instruction. It occurs as teachers become increasingly proficient in understanding their students as individuals, increasingly comfortable with the meaning and structure of the disciplines they teach, and increasingly expert at teaching flexibly in order to match instruction to student need with the goal of maximizing the potential of each learner in a given area.

In order to learn science and to apply their knowledge and skills effectively, students must develop a solid understanding of scientific concepts. Research and successful classroom practice have shown that an inquiry approach, with emphasis on learning through concrete, hands-on experiences, best enables students to develop the conceptual foundation they need. When planning science programs, teachers will provide activities and challenges that actively engage students in inquiries that honour the ideas and skills students bring to them, while further deepening their conceptual understandings and essential skills.

Students will investigate scientific concepts using a variety of equipment, materials, and strategies. Activities are necessary for supporting the effective learning of science by all students. These active learning opportunities invite students to explore and investigate abstract scientific ideas in rich, varied, and hands-on ways. Moreover, the use of a variety of equipment and materials helps deepen and extend students' understanding of scientific concepts and further extends their development of scientific investigation skills.

All learning, especially new learning, should be embedded in well-chosen contexts for learning - that is, contexts that are broad enough to allow students to investigate initial understandings, identify and develop relevant supporting skills, and gain experience with varied and interesting applications of the new knowledge. In the secondary science curriculum, many of these contexts come from the Relating Science to Technology, Society, and the Environment (STSE) expectations. Such rich contexts for learning enable students to see the "big ideas" of science. This understanding of "big ideas" will enable and encourage students to use scientific thinking throughout their lives. As well, contextualized teaching and learning provides teachers with useful insights into their students' thinking, their understanding of concepts, and their ability to reflect on what they have done. This insight allows teachers to provide supports to help enhance students' learning.

Health and Safety in Science

Teachers must model safe practices at all times and communicate safety expectations to students in accordance with school board and Ministry of Education policies and Ministry of Labour regulations. Teachers are responsible for ensuring the safety of students during classroom activities and also for encouraging and motivating students to assume responsibility for their own safety and the safety of others. Teachers must also ensure that students have the knowledge and skills needed for safe participation in science activities. To carry out their responsibilities with regard to safety, it is important for teachers to have:

- concern for their own safety and that of their students
- the knowledge necessary to use the materials, equipment, and procedures involved in science safely
- knowledge concerning the care of living things – plants and animals – that are brought into the classroom;
- the skills needed to perform tasks efficiently and safely

Students demonstrate that they have the knowledge, skills, and habits of mind required for safe participation in science activities when they:

- maintain a well-organized and uncluttered work space;
- follow established safety procedures;
- identify possible safety concerns;

- suggest and implement appropriate safety procedures;
- carefully follow the instructions and example of the teacher;
- consistently show care and concern for their own safety and that of others

Accommodations
Accommodations will be based on meeting with parent, teachers, administration and external educational assessment report. The following three types of accommodations may be provided:

- ***Instructional accommodations*** such as changes in teaching strategies, including styles of presentation, methods of organization, or use of technology and multimedia
- ***Environmental accommodations*** such as preferential seating or special lighting.
- ***Assessment accommodations*** such as allowing additional time to complete tests or assignments or permitting oral responses to test questions.

Other examples of modifications and aids which may be used in this course are:

- ➢ Provide step-by-step instructions.
- ➢ Help students create organizers for planning writing tasks.
- ➢ Record key words on the board or overhead when students are expected to make their own notes.
- ➢ Allow students to report verbally to a scribe (teacher or student) who can then help in note taking.
- ➢ Permit students a range of options for reading and writing tasks.
- ➢ Where an activity requires reading, provide it in advance.
- ➢ Provide opportunities for enrichment.

The Role of Technology, Society and the Environment
Information and communications technology (ICT) provides a range of tools that can significantly extend and enrich teachers' instructional strategies and support students' learning in science. Computer programs can help students collect, organize, and sort the data they gather and to write, edit, and present multimedia reports on their findings. ICT can also be used to connect students to other schools, at home and abroad, and to bring the global community into the local classroom. Technology also makes it possible to use simulations - for instance, when field studies on a particular topic are not feasible or dissections are not acceptable.

Whenever appropriate, therefore, students should be encouraged to use ICT to support and communicate their learning. For example, students working individually or in groups can use computers and portable storage devices, CD-ROM and DVD technologies, Google classroom and Internet websites to gain access to science institutions in Canada and around the world. Students can also use digital or video cameras to record laboratory inquiries or findings on field trips, or for multimedia presentations on scientific issues.
Although the Internet is a powerful learning tool, all students must be made aware of issues of privacy, safety, and responsible use, as well as of the potential for abuse of this technology, particularly when it is used to promote hatred.

ICT tools are also useful for teachers in their teaching practice, both for whole class instruction and for the design of curriculum units that contain varied approaches to learning to meet diverse student needs. A number of educational software programs to support science are licensed through the ministry and are listed at www.osapac.org/software.asp.

RESOURCES

Textbooks:

Physics 11, Published by Nelson
(Alan Hirsch, David Martindale, Steve Bibla, Chalres Stewart – 2002)

Heimbecker, Briabn. *Physics: Concepts and Connections*. Toronto: Irwin, 2002. Print

Website: http://www.physicsclassroom.com/