TFS High School
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COURSE OUTLINE

Physics 11, University Preparation
SPH3U

Department	Science
Instructor	Ms. Shiva Shirkhani
Developed Date	2015
Course Code	SPH3U
Credit Value	1.00
Ministry Curriculum Document	Policy Document: *Science, the Ontario Curriculum, Grades 11 and 12, 2008 (Revised)* http://www.edu.gov.on.ca./eng/curriculum/secondary/2009science11_12.txt http://www.edu.gov.on.ca/eng/policyfunding/growsuccess.pdf
Prerequisites	SNC2D Grade 10 Science, Academic
Course Revision Date (TFS)	2020

COURSE DESCRIPTION

In this course students develop an understanding of the basic concepts of physics through an analysis of the interrelationships between physics and technology, and a consideration of the impact of technological applications of physics on society and the environment. Students study the laws of dynamics and explore different kinds of forces, the quantification and forms of energy (mechanical, sound, light, thermal, and electrical), and the way energy is transformed and transmitted. They develop scientific-inquiry skills as they verify accepted laws and solve both assigned problems and those emerging from their investigations. Each unit ends with an end-of-unit task, which not only facilitates assessment of the unit itself, but also leads the student to prepare for the final assessment tasks. The final assessment tasks, introduced at the start of Unit 1, include a practical component that uses the students' knowledge of physics principles developed throughout this course to make a labour-saving/useful device. The students must also report on this device with the inclusion of an explanation of the physics principles involved. This Profile offers one set of suggestions for achieving the Learning Expectations of the SPH3U Guideline. Teachers must adapt the Profile to suit their circumstances and to match the students' needs while ensuring that all Learning Expectations of the Guideline are addressed fully.

OVERALL EXPECTATIONS

Scientific Investigation Skills and Career Exploration

- Demonstrate scientific investigation skills (related to both inquiry and research) in the four areas of skills (initiating and planning, performing and recording, analyzing and interpreting, and communicating);
- Identify and describe careers related to the fields of science under study, and describe the contributions of scientists, including Canadians, to those fields.

Kinematics

- Represent an understanding in different kinds of motion, and apply quantitatively the relationships
- Among displacement, velocity, and acceleration in specific contexts;
- Analyze uniform motion in the horizontal plane in a variety of situations, using vector diagrams
- Analyze and carry out information from graph related to variety of motions.
- Demonstrate an understanding in concepts involving in two dimension motion, and solve vector problems related to the horizontal and vertical component of motion of a projectile.

Dynamics, Forces

- Demonstrate an understanding in concepts and units related to force and motion (e.g., vectors, scalars, displacement, uniform motion, instantaneous and average velocity, uniform acceleration, instantaneous and average acceleration, applied force, net force, static friction, kinetic friction, coefficients of friction)
- Identify and describe the fundamental forces of nature; analyze and describe the gravitational force acting on an object near, and at a distance from, the surface of the Earth;
- Analyze and describe the forces acting on an object, using free-body diagrams, and determine the acceleration of the object.
- State Newton's laws, and apply them to explain the motion of objects in a variety of contexts.
- Analyze in quantitative terms, using Newton's laws, the relationships among the net force acting on an object, its mass, and its acceleration.

Energy, Work, and Power

- Demonstrate an understanding, in qualitative and quantitative terms, of the concepts of work, energy (kinetic energy, gravitational potential energy, and thermal energy and its transfer, energy transformations, efficiency, and power.
- Analyze the costs and benefits of various energy sources and energy-transformation and explain how the application of scientific principles related to mechanical energy.
- Demonstrate an understanding in temperature, heat and thermal energy, also specific heat capacity, latent heat and changes of state matter

- Represent what an isotope is and identify its physical characteristics
- Explain what is meant by and solve problems related to half-life
- Describe and explain the concept of mass-energy equivalence
- Analyze and discuss social and environmental issues related to the applications of nuclear energy.

Waves and Sound

- Demonstrate an understanding of the properties of mechanical waves and sound and the principles underlying the production, transmission, interaction, and reception of mechanical waves and sound;
- Investigate the properties of mechanical waves and sound through experiments or simulations, and compare predicted results with actual results;
- Describe and explain ways in which mechanical waves and sound are produced in nature, and evaluate the contributions to entertainment, health, and safety of technologies that make use of mechanical waves and sound.

Electricity and Magnetism

- Demonstrate an understanding of the properties, physical quantities, principles, and laws related to electricity, magnetic fields, and electromagnetic induction.
- Carry out experiments or simulations, and construct a prototype device, to demonstrate characteristic properties of magnetic fields and electromagnetic induction.
- Identify and describe examples of domestic and industrial technologies that were developed on the basis of the scientific understanding of magnetic fields.
- Illustrate how the magnetic field can be produced by an electric current in a long straight

. SCOPE AND SEQUENCE OF CONTENTS

Unit	Unit Description	Time Frame
1.	**Kinematics** In this unit the technological applications of motion and societal influences on transportation and safety issues are studied. The students' will analyse technologies that apply concepts related to kinematics, and assess the technologies' social and environmental impact. analyze and predict in quantitative terms and explain the linear motion of objects in horizontal, vertical, and inclined planes Students also will analyse and predict in quantitative terms and explain the motion of a projectile in terms of the horizontal and vertical components of its motion. carry out experiments or simulations involving objects moving in two dimensions, and analyze and display the data in an appropriate form. predict the motion of an object given its initial speed and direction of motion, and test the prediction experimentally. design or construct technological devices based on the concepts and principles of projectile motion	**22 hrs**
2.	**Forces** In this unit student will review some fundamental and important physical concepts and principles essential to their success in the course: scientific notation, significant digits, vectors operations, and basic mathematical tools. Newton's laws, free body diagram and kinematics concepts will be reviewed and extended. They will also investigate forces involved in uniform motion acceleration and uniform circular motion and solve related problems. By the end of this unit student will demonstrate an understanding of inertia and non-inertia frames of reference and,they will also solve problems involving forces in one dimension using free body digram and newton's law. they analyse technological devices that apply the principles of dynamics of motion, with particular respect to g-forces on the human body.	**20 hrs**
3.	**Energy and society** In this unit students will analyze technologies that apply principal of and concepts related to energy and energy transformation, the costs and benefits of various energy sources and	**26 hrs**

	energy transformation technologies that are used around the world, and explain how the application of scientific principles related to mechanical energy has led to the enhancement of sports and recreational activities. Students will gain an understanding of the concepts of work, energy, energy transformations, efficiency, and power. They also will develop their knowledge on concept of heat and thermal energy and nuclear energy. Finally students will demonstrate an understanding of renewable energies and their affection on society and environment. They will design and carry out experiments and solve problems involving energy transformations and the law of conservation of energy.	
4.	**Waves and Sound** Students will describe and explain ways in which mechanical waves and sound are produced in nature, and evaluate the contributions to entertainment, health, and safety of technologies that make use of mechanical waves and sound. Students will gain an understanding of the properties of mechanical waves and sound and the principles underlying the production, transmission, interaction, and reception of mechanical waves and sound. They will investigate the properties of mechanical waves and sound through experiments or simulations, and compare predicted results with actual results. The end-of-unit task is a report on the prevalence of sound in society and nature and the construction of a model of a technological device related to sound. Students are also asked to link this to the practical	**20 hrs.**
5.	**Electricity and Magnetism** Students evaluate social, economic, and environmental costs and benefits associated with Electromagnetic fields and electrical energy production and distribution in Canada. In doing so students gain an understanding of electromagnetic fields through a study of their production. Using a variety of instruments and tools, they develop skills using qualitative and quantitative analysis. Students apply their knowledge of electrical circuits to design and construct devices that perform a specific function. The end-of-unit task is a report on systems based on electromagnetic fields, including a timeline and references to environmental costs and benefits. Students are also asked to link this to the practical component of the final assessment tasks – perhaps an electromagnetic device that is labour saving.	**22 hrs**
	Final Evaluation	**2 hrs**
	Total	**112 hrs**

ASSESSMENT/EVALUATION STRATEGIES:

Diagnostic assessment is used at the beginning of a unit to assist in determining a starting point for instruction. Assessment for Learning (AFL) provides information to students as they are learning and refining their skills. Assessment as Learning (AAL) acts as a stepping-stone for students to begin applying their understanding using critical thinking; it bridges the gap between AFL and AOL. Assessment of Learning (AOL), at the end of units and course, provides students with the opportunity to synthesize/apply/demonstrate their learning and the achievement of the expectations. The following is a list of specific assessment/evaluation strategies that the teacher may use but is not limited to:

EVALUATION SCHEME

Percentage of Final Mark	**Weight**	**Evaluation Categories**	Assessment will be ongoing to inform the students of their performance and the opportunity for success. Four achievement categories are illustrated in the chart. **K:** Knowledge and Understanding 30% **I**: Inquiry/Thinking 25% **C**: Communication 25% **MC**: Making Connections/Application 20%
70%	40%	Tests	
	15%	Labs, Quizzes and Assignments	
	15%	Performance Task	
30%	10% 20%	Research Project Final Written Examination	

TEACHING AND LEARNING STRATEGIES

- **Lecture**
- **Discussion**
- **Problem posing**
- **Brainstorming**
- **Demonstration**
- **Mathematical problem solving**
- **Homework**
- **Critical thinking**
- **Assignment**
- **Investigative Inquiry**
- **Lab report**
- **Note making**

ADDITIONAL RESOURCES

- **Access to computer**
- **Writing utensil**
- **3 Ring Binder**
- **Scientific calculator**
- **Ruler**
- **Graphing paper**
- **Section Divider**

Textbook: Nelson Physics
McGraw-Hill Ryerson physics (as reference)

Helpful Links:

www.science.nelson.com
http://www.physicsclassroom.com
http://ngsir.netfirms.com
http://physics.about.com

ACHIEVEMENT CHART: SCIENCE, GRADES 9-12

Category	50-59% (Level 1)	60-69% (Level 2)	70-79% (Level 3)	80-100% (Level 4)
Knowledge and Understanding - Subject-specific content acquired in each course (knowledge), and the comprehension of its meaning and significance (understanding)				
	The student:			
understanding of concepts, principles, laws, and theories (e.g., identifying assumptions;eliminating misconceptions; providing explanations)	demonstrates limited understanding of concepts, principles, laws, and theories	demonstrates some understanding of concepts, principles, laws, and theories	demonstrates considerable understanding of concepts, principles, laws, and theories	demonstrates thorough understanding of concepts, principles, laws, and theories
knowledge of facts and terms	demonstrates limited knowledge of facts and terms	demonstrates some knowledge of facts and terms	demonstrates considerable knowledge of facts and terms	demonstrates thorough knowledge of facts and terms
transfer of concepts to	infrequently transfers	sometimes transfers	usually transfers simple	routinely transfers simple

new contexts	simple concepts to new contexts	simple concepts to new contexts	concepts to new contexts	concepts to new contexts
understanding of relationships between concepts	demonstrates limited understanding of relationships between concepts	demonstrates some understanding of relationships between concepts	demonstrates considerable understanding of relationships between concepts	demonstrates thorough and insightful understanding of relationships between concepts
Thinking and Inquiry - The use of critical and creative thinking and inquiry skills and/or processes				
	The student:			
application of the skills and strategies of scientific inquiry (e.g., initiating and planning, performing and recording, analysing and interpreting, problem solving)	applies few of the skills and strategies of scientific inquiry	applies some of the skills and strategies of scientific inquiry	applies most of the skills and strategies of scientific inquiry	applies all or almost all of the skills and strategies of scientific inquiry
application of technical skills and procedures (e.g., microscopes)	applies technical skills and procedures with limited competence	applies technical skills and procedures with moderate competence	applies technical skills and procedures with considerable competence	applies technical skills and procedures with a high degree of competence
use of tools, equipment, and materials	uses tools, equipment, and materials safely and correctly only with supervision	uses tools, equipment, and materials safely and correctly with some supervision	uses tools, equipment, and materials safely and correctly	demonstrates and promotes the safe and correct use of tools, equipment, and materials
Communication - The conveying of meaning through various forms				
	The student:			
communication of information and ideas	communicates information and ideas with limited clarity and precision	communicates information and ideas with some clarity and precision	communicates information and ideas with considerable clarity and precision	communicates information and ideas with a high degree of clarity and precision
use of scientific terminology, symbols, conventions, and standard (SI) units	uses scientific terminology, symbols, conventions, and SI units with limited accuracy and effectiveness	uses scientific terminology, symbols, conventions, and SI units with some accuracy and effectiveness	uses scientific terminology, symbols, conventions, and SI units with considerable accuracy and effectiveness	uses scientific terminology, symbols, conventions, and SI units with a high degree of accuracy and effectiveness
communication for different audiences and purpose	communicates with a limited sense of audience and purpose	communicates with some sense of audience and purpose	communicates with a clear sense of audience and purpose	communicates with a strong sense of audience and purpose
use of various forms of communication (e.g., reports, essays)	demonstrates limited command of the various forms	demonstrates moderate command of the various forms	demonstrates considerable command of the various forms	demonstrates extensive command of the various forms
use of information technology for scientific purposes (e.g., specialized databases)	uses technology with limited appropriateness and effectiveness	uses technology with moderate appropriateness and effectiveness	uses appropriate technology with considerable effectiveness	uses appropriate technology with a high degree of effectiveness
Application - The use of knowledge and skills to make connections within and between various contexts				
	The student:			
understanding of connections among	shows limited understanding of	shows some understanding of	shows considerable understanding of	shows thorough understanding of

science, technology, society, and the environment	connections in familiar contexts	connections in familiar contexts	connections in familiar and some unfamiliar contexts	connections in familiar and unfamiliar contexts
analysis of social and economic issues involving science and technology	analyses social and economic issues with limited effectiveness	analyses social and economic issues with moderate effectiveness	analyses social and economic issues with considerable effectiveness	analyses complex social and economic issues with a high degree of effectiveness
assessment of impacts of science and technology on the environment	assesses environmental impacts with limited effectiveness	assesses environmental impacts with moderate effectiveness	assesses environmental impacts with considerable effectiveness	assesses environmental impacts with a high degree of effectiveness
proposing of courses of practical action in relation to science and technology-based problems	extends analyses of familiar problems into courses of practical action with limited effectiveness	extends analyses of familiar problems into courses of practical action with moderate effectiveness	extends analyses of familiar problems into courses of practical action with considerable effectiveness	extends analyses of familiar and unfamiliar problems into courses of practical action with a high degree of effectiveness

LEARNING SKILLS:

Learning Skills are skills and habits are essential to success in school and in the workplace. Teachers report achievement on the six Learning Skills shown below the table below using letter codes:

♦Responsibility ♦Organization♦ ♦Independent Work ♦Collaboration
♦Independent work ♦Self-regulation

E = Excellent **G** = Good **S** = Satisfactory **N** = Needs Improvement.

Academic Honesty: Cheating and Plagiarism:

Plagiarism is a serious offense. It is defined as taking words, phrasing, sentence structure, or any other element of the expression of another person's **ideas**, and using them as if they were your own. Plagiarism is a violation of another person's rights, whether the material taken is excessive or small. Students will be assisted in developing strategies and techniques to avoid plagiarism. They need to be aware that plagiarized term work will be penalized and could result in a mark of zero.

Assignment Policy, Missed Tests and Attendance: Please refer to Student Contract Form

The areas of concern to all teachers that are outlined there include the following:

Program Planning Considerations for Science

Teachers planning a program in Science must take into account considerations in a number of important areas. Essential information that pertains to all disciplines is provided in the companion piece to this document, *Science. The Ontario Curriculum, Grades 11 and 12: Some Considerations for Program Planning, 2008*. The areas of concern to all teachers include the following:

I. ***The Role of Technology in the Curriculum***. Using information technology will assist students in the achievement of many of the expectations in the curriculum regarding research, written work, analysis of information, and visual presentations.

II. ***English As a Second Language (ESL)*****:** Appropriate accommodations in teaching, learning, and evaluation strategies will be made to help ESL students gain proficiency in English, since students taking ESL at the secondary level have limited time in which to develop this proficiency.

III. Instructional Approaches:

a. Pairing and small group activities throughout the course to support learning
b. Student/teacher conferencing and tutoring as required

IV. Health and Safety in Science
V. Environmental Education
VI. Critical Thinking and Critical Literacy in Science
VII. Literacy, Mathematical Literacy, and Investigation (Inquiry/Research) Skills
VIII. The Role of Information and Communications Technology in Science