Course Outline

School Name:	KEEWAYTINOOK INTERNET HIGH SCHOOL
Department Name:	Science
Ministry of Education Course Title:	Physics
Grade Level:	11
Ministry Course Code:	SPH3U

Teacher's Name: Sanghul Yu

Developed by: Raj Budhram Date: August 2017

Revision Date: September 2022

Developed from:

Ontario Ministry of Education. (2008). *The Ontario curriculum, grades 11 and 12: Science.* Toronto ON: Queen's Printer for Ontario.

Text: None

Prerequisite: SNC2D

Credits: One

Length: 110 hours

Principal's Name: Angela Batsford-Mermans

Principal's Approval: 

Approval Date: September 14, 2022

Course Description/Rationale

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.

Overall Curriculum 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, analysing 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

- Analyse technologies that apply concepts related to kinematics, and assess the technologies' social and environmental impact.
- Investigate, in qualitative and quantitative terms, uniform and non-uniform linear motion, and solve related problems.
- Demonstrate an understanding of uniform and non-uniform linear motion, in one and two dimensions.

Forces

- Analyse and propose improvements to technologies that apply concepts related to dynamics and Newton's laws, and assess the technologies' social and environmental impact.
- Investigate, in qualitative and quantitative terms, net force, acceleration, and mass, and solve related problems.
- Demonstrate an understanding of the relationship between changes in velocity and unbalanced forces in one dimension.

Personal and Social Responsibilities

- Demonstrate an understanding of the role of personal responsibility in independent living, and of the strategies that can be used to meet individual needs;
- Demonstrate an understanding of the rights and responsibilities of employers and employees, including both personal and legal responsibilities;
- Demonstrate an understanding of the role that responsible consumerism plays in living independently.

Energy and Society

- Analyse technologies that apply principles of and concepts related to energy transformations, and assess the technologies' social and environmental impact.
- Investigate energy transformations and the law of conservation of energy, and solve related problems.
- Demonstrate an understanding of work, efficiency, power, gravitational potential energy, kinetic energy, nuclear energy, and thermal energy and its transfer (heat).

Waves and Sound

- Analyse how mechanical waves and sound affect technology, structures, society, and the environment, and assess ways of reducing their negative effects.
- Investigate, in qualitative and quantitative terms, the properties of mechanical waves and sound, and solve related problems.
- Demonstrate an understanding of the properties of mechanical waves and sound and of the principles underlying their production, transmission, interaction, and reception.

Electricity and Magnetism

- 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.
- Investigate, in qualitative and quantitative terms, magnetic fields and electric circuits, and solve related problems.
- 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.

Course Content

Unit	Length
1. Kinematics	22 hours
2. Forces	25 hours
3. Energy and Society	22 hours
4. Waves and Sound	19 hours
5. Electricity and Magnetism	22 hours
Total	110 hours

Unit Descriptions

Unit 1 – Kinematics

In this unit, students learn the basic concepts of kinematics and apply their knowledge in solving problems related to kinematics and in understanding some technologies that are used in society. In the first two activities of this unit, students review the concepts of vectors and learn about the terminology related to kinematics as well as how to use the equations for average velocity and displacement to solve problems in kinematics. In the third and fourth activities, students learn about projectile motion and how to apply the concepts learned in the first two activities to solve problems related to projectile motion. In the final two activities, students are immersed in applying concepts learned in the unit to fully understand accelerometers, GPS, Reac Time, speed limiters and tracking devices. Students explore how they use kinematics in their lives.

Unit 2 – Forces

In this unit, students learn in the first two activities about the forces acting on a body and how to solve related problems involving forces in one dimension, using free-body diagrams and algebraic equations. In the third and fourth activities, students are engaged in the applications of Newton's laws of motion to technological developments in society and the environment. Finally, in the last two activities of this unit students will apply their knowledge of forces and Newton's laws of motion to relevant and real life applications used in motor vehicles such as antilock brakes, traction control, electronic stability control, air bags, and seat belts.

Unit 3 – Energy and Society

In this unit, students learn that energy can be transformed from one type to another and energy transformation systems often involve thermal energy losses and are never 100% efficient. Moreover, students use the law of conservation of energy to solve problems in simple situations involving work, gravitational potential energy, kinetic energy, and thermal energy and its transfer. Additionally, in this unit, students investigate the determination of the specific heat capacity of aluminum and they conduct inquiries and solve problems involving the relationship between power and work. Finally, at the end of the unit, students learn that 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.

Unit 4 – Waves and Sound

In this unit, students learn that mechanical waves have specific characteristics and predictable properties. Students investigate, in qualitative and quantitative terms, the properties of mechanical waves and sound, and solve related problems. Also, they predict the conditions needed to produce resonance in a stringed musical instruments, and test their predictions through inquiry. Finally, students learn that mechanical waves can affect structures, society, and the environment in positive and negative ways and how to eliminate or reduce the negative effects of mechanical waves and to enhance the positive effects of mechanical waves.

Unit 3 – Electricity and Magnetism
In this unit, students learn about magnetic fields and electric circuits, and that the relationship between electricity and magnetism are predictable. Students design and build mixed circuits and investigate, in qualitative and quantitative terms, magnetic fields and electric circuits, and solve related problems. Also, students learn that the technological applications that involve electromagnetism and energy transformations can affect their community and larger society and the environment in positive and negative ways, and they will investigate ways to reduce or eliminate the negative effects.

Teaching/Learning Strategies

This course is organized into an eight-week series of lessons and activities that is presented to students in remote northern communities via the internet. The eighth week is used for course consolidation, review, and the final examination. Teacher and students communicate over the internet through timely activity feedback, emails, messages, video and audio calls. Classroom mentors assume the role of liaison between the teacher and student while also supporting a holistic approach to motivate, engage and support each individual student.

A variety of strategies will be used in the online delivery of this course. Some instructional strategies include:

- Academic vocabulary and language
- Cooperative learning
- Adapting to learning styles/multiple intelligences
- Analysis of student work
- Conferencing
- Discovery/Inquiry based learning
- Generating and testing hypotheses
- Graphic organizers
- Hands on learning
- Homework and practice
- Identifying similarities and differences
- Modelling
- Sketching to learn
- Mentoring
- Visualization

Learning goals will be discussed at the beginning of each assignment and success criteria will be provided to students. The success criteria are used to develop the assessment tools in this course, including rubrics and checklists.

Evaluation

The final grade will be determined as follows (Ontario Ministry of Education, 2010):

- 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 percent 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 (p. 41).

Ontario Ministry of Education. (2010). *Growing success: Assessment, evaluation and reporting in Ontario schools*. Toronto ON: Queen's Printer for Ontario.

Type of Assessment	Category	Details	Weighting (%)
Term Work (70%)	Knowledge/ Understanding	Demonstrate an understanding of uniform and non-uniform linear motion, in one and two dimensions. Demonstrate an understanding of the relationship between changes in velocity and unbalanced forces in one dimension. Demonstrate an understanding of work, efficiency, power, gravitational potential energy, kinetic energy, nuclear energy, and thermal energy and its transfer (heat). Demonstrate an understanding of the properties of mechanical waves and sound and of the principles underlying their production, transmission, interaction, and reception.	12
	Thinking	Investigate, in qualitative and quantitative terms, uniform and non-uniform linear motion, and solve related problems. Investigate, in qualitative and quantitative terms, net force, acceleration, and mass, and solve related problems. Investigate energy transformations and the law of conservation of energy, and solve related problems. Investigate, in qualitative and quantitative terms, the properties of mechanical waves and sound, and solve related problems.	18
	Communication	Expression and organization of ideas and information. Communication for different audiences and purposes in oral, visual, and/or written forms. Use of conventions, vocabulary, and terminology of the discipline in oral, visual, and/or written forms.	17
	Application	Analyse technologies that apply concepts related to kinematics, and assess the technologies' social and environmental impact. Analyse and propose improvements to technologies that apply concepts related to dynamics and Newton's laws, and assess the technologies' social and environmental impact. Analyse technologies that apply principles of and concepts related to energy transformations, and assess the technologies' social and environmental impact. Analyse how mechanical waves and sound affect technology, structures, society, and the	23

		environment, and assess ways of reducing their negative effects.	
Final Evaluation (30%)	Culminating Activity (15%)	Knowledge/Understanding	2.5
		Thinking	4
		Communication	4
		Application	4.5
	Exam (15%)	Knowledge/Understanding	2.5
		Thinking	4
		Communication	4
		Application	4.5
		TOTAL	**100**

Assessment/Evaluation Strategies

A variety of assessment and evaluation methods, strategies and tools are required as appropriate to the expectation being assessed. These include diagnostic, formative, and summative within the course and within each unit.

Assessment *for* learning and assessment *as* learning is obtained through a variety of means, including the following:

- Ongoing descriptive feedback
- Small-group conversations to develop their opinions and communication skills
- Mentor observations of student's performance while conducting experiments and scientific research
- Conversations with student on a regular basis to verbalize observations, ask questions, and clarify understanding
- Self-assessment (e.g., weekly self-assessment of learning)

Evidence of student achievement (assessment *of* learning) is collected from various sources, including the following:

- Ongoing assessment/observations of most consistent work, with consideration given to most recent work
- Summative unit activities
- Culminating Activity
- Final Exam

The Ministry of Education's 2010 document, *Growing Success*, outlines the seven fundamental principles that guide best practice in the assessment and evaluation of students. KiHS teachers use practices that:

- are fair, transparent, and equitable for all students;
- support all students, including those with special education needs, those who are learning the language of instruction (English or French), and those who are First Nation, Métis, or Inuit;
- are carefully planned to relate to the curriculum expectations and learning goals and, as much as possible, to the interests, learning styles and preferences, needs, and experiences of all students;
- are communicated clearly to students and parents at the beginning of the course and at other points throughout the school year or course;
- are ongoing, varied in nature, and administered over a period of time to provide multiple opportunities for students to demonstrate the full range of their learning;
- provide ongoing descriptive feedback that is clear, specific, meaningful, and timely to support improved learning and achievement;
- develop students' self-assessment skills to enable them to assess their own learning, set specific goals, and plan next steps for their learning (p.6).

Resources

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Additional Resources

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Program Planning

This course is offered to Indigenous students living in isolated, northern Ontario communities. It is offered by qualified teachers in a blended classroom with a balance of academic, wellness, land-based learning, local language and culture to support the success of the whole student. This course uses the internet for instruction, demonstration and research. It utilizes a student-centered semi-virtual classroom which capitalizes on the strengths of internet program delivery to minimize the disadvantages of geographic remoteness.

Students are presented with 1320 minutes of instruction/activity via the internet over the period of one week. All lessons, assignments, questions and course material is presented in this manner, with approved print materials available as a student resource in each classroom. The student and

instructor communicate via the internet, while a classroom mentor (a fully qualified teacher) assists students in completing tasks in a timely manner and provides support as required.

Indigenous and local content is used throughout the course to meet students' learning needs. Opportunities for outdoor activities and land-based learning are also incorporated and students are encouraged to use local knowledge in their products. Considerations are made to the learning preferences of the student population and lessons can be adjusted for individual students as required. Opportunities have been provided for students to apply ideas and concepts encountered in this course to their lives as an individual and as a member of a First Nations community. Teachers consult the Ontario Ministry of Education policies, guidelines and important initiatives when planning a comprehensive program in this area.