Ontario eSecondary School
Course Outline
2024-2025

Ministry of Education Course Title: Gr. 11 Physics, University Preparation	
Ministry Course Code: SPH3U	
Course Type: University Preparation	
Grade: 11	
Credit Value: 1.0	
Prerequisite(s): Science, Grade 10, Academic (SNC2D)	
Department: Science	
Course developed by: **Andrew Lee**	**Date: June 1, 2020**
Length: **One Semester**	**Hours:** **110**
This course has been developed based on the following Ministry documents: 1. *Science, The Ontario Curriculum, Grades 11 and 12*, 2008, (revised) 2. *Growing Success: Assessment, Evaluation, and Reporting in Ontario Schools (2010)* 3. *Learning for All (2013)*	

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 analyze the interrelationships between physics and technology, and consider the impact of technological applications of physics on society and the environment.

OVERALL CURRICULUM EXPECTATIONS

By the end of the course, students will:

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.

Work & 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 & 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 & 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*
Unit 1: Kinematics	20.5 hours
Unit 2: Forces	17.5 hours
Unit 3: Energy	22.5 hours
Unit 4: Waves and Sound	18.5 hours
Unit 5: Electricity and Magnetism	21 hours
Unit 6: Review and Final Assessments	10 hours
Total	**110 Hours**

UNIT DESCRIPTIONS

Unit 1 - Kinematics

In this unit, students will learn about the concept of Motion and Vectors and will use these skills to work through problems. In doing so, they will develop and demonstrate essential skills. Students will analyse technologies that apply concepts related to kinematics, and assess the technologies' social and environmental impact. They will investigate in qualitative and quantitative terms, uniform and non-uniform linear motion, and solve related problems. Finally, they will demonstrate an understanding of uniform and non-uniform linear motion, in one and two dimensions.

Unit 2 - Forces

In this unit, students will learn about the concept of Force and Newton's Laws and will use these skills to work through problems. They will be able to explain Newton's laws and draw free body diagrams, use Newton's second law equation to find mass, distinguish between different scenarios involving the law, and contrast the different ways to transfer thermal energy.

Unit 3 - Energy

In this unit, students will learn about the concept of Energy and will use these skills to work through problems. Students will calculate work, given all types of conditions, list the different forms of energy with examples, apply the law of conservation of energy to real life situations, and contrast the different ways to transfer thermal energy and make calculations finding the energy lost or gained in these transfers.

Unit 4- Wages and Sound

In this unit, students will learn about the concept of Waves and Sound and will use these skills to work through problems. Students will explain the different types of vibrations and the motion of waves, describe different properties of sound and sound waves, make calculations involving the speed of sound and explain the Doppler Effect, and describe different terminology related to music such as harmonics, overtones, and octaves.

Unit 5 - Electricity
In this unit, students will learn about the concept of Waves and Sound and will use these skills to work through problems. Students will explain the different types of vibration and the motion of waves, use the Universal Wave Equation to solve problems for wavelength and period of wave, and describe different properties of sound and sound waves. Students will apply calculations involving the speed of sound and describe different terminology.

Unit 6 - Review and Final Assessments
In this unit, students will learn about the concept of Electricity and Magnetism and will use these skills to work through problems. Students will explain electric fields and the properties that accompany them. They will use the equations related to current and voltage as well as explain how they are found in a circuit. Students will explain how resistance is found throughout a circuit using the equations for parallel and series circuits.

TEACHING AND LEARNING STRATEGIES

In this course, students will experience the following activities.

Presentations with embedded videos are utilized to outline concepts, explain theory with the use of examples and practice questions, and incorporate multi-media opportunities for students to learn more (e.g. online simulations, quizzes, etc.).

End of unit conversations and Poodlls are opportunities for students to express their ideas, problem solving, and thought processes with a teacher who provides timely feedback.

Reflection is an opportunity for students to look back at concepts and theories with new eyes, to relate theory to practice, and to align learning with their own values and beliefs.

Discussions with the instructor are facilitated through video conferencing, discussing the concepts and skills being studied. This enables two-way communication between the student and the instructor, to share ideas and ask questions in dialogue. This also helps to build a relationship between the student and instructor.

Instructor demonstrations (research skills, etc.) are opportunities for the instructor to lead a student through a concept or skill through video conferencing, videos, or emailing with the student.

Discussion forums are an opportunity for students to summarize and share their ideas and perspectives with their peers, which deepens understanding through expression. It also provides an opportunity for peer-to-peer feedback.

Practical extension and application of knowledge are integrated throughout the course. The goal is to help students make connections between what they learn in the classroom and how they understand and relate to the world around them and their own lives. Learning becomes a dynamic opportunity for students to be more aware that their learning is all around them and enable them to create more meaning in their lives.

Individual activities/assignments assessments are completed individually at a student's own pace and are intended to expand and consolidate the learning in each lesson. Individual activities allow the teacher to accommodate interests and needs and to assess the progress of individual students. For this reason, students are encouraged to discuss IEPs (Individual Education Plans) with their teacher and to ask to modify assessments if they have a unique interest that they feel could be pursued in the assessment. The teacher plays an important role in supporting these activities by providing ongoing feedback to students, both orally and in writing.

Research is an opportunity to apply inquiry skills to a practical problem or question. Students perform research to gather information, evaluate quality sources, analyze findings, evaluate their analysis, and synthesize their findings into conclusions. Throughout, students apply both creative thinking and critical thinking. New questions are also developed to further learning.

Writing as a learning tool helps students to think critically about course material while grasping, organizing, and integrating prior knowledge with new concepts. Good communication skills are important both in and out of the classroom.

Virtual simulations are interactive websites that provide students with an opportunity to ask questions, explore hypotheses, relate variables, examine relationships, and make connections between theory and application in a safe environment that promotes intellectual risk taking and curiosity.

Virtual labs are interactive websites that provide students with an opportunity to follow a procedure to test hypotheses using scientific apparatus, gather and record observations, analyze observations using formula and relevant theory/concepts, and then formulate conclusions that relate hypotheses to analysis.

Diagrams are visual representations of scientific ideas and concepts. They provide another perspective to organize ideas. Visuals are thought to promote cognitive plasticity - meaning, they can help us change our minds or help us to remember an idea.

Graphics/images are visual representations of ideas/concepts. Visuals are thought to promote cognitive plasticity - meaning, they can help us change our minds or help us to remember an idea.

Charts are visual representations of scientific ideas and concepts using math that support analysis. For example, you can have a pie chart that shows Canada's energy sources.

Tables involve organizing information in terms of categories (rows and columns). This helps us to understand the relationships between ideas and data, as well as highlight trends.

Drawings and schematics are scientific and engineering ideas explained visually. For example, an electric circuit can be explained using symbols, which makes it possible to communicate ideas universally, clearly, and succinctly.

Articles are examples of concepts and theories being discussed in the public realm and with respect to current events. They are snapshots not only of why scientific theories/concepts/applications are relevant but also provide a window into the broader context of scientific knowledge and understanding. Students learn through reading and analysis that science is deeply related to, and intertwined with, society and the diverse perspectives of lived experience.

Practice problems provide students with a scenario/problem to solve by applying concepts and skills learned in a context. This helps students to understand the relevance of their learning.

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.

Evaluation: 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.

Reporting: 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.

STRATEGIES FOR ASSESSMENT

Assessment practices can nurture students' sense of progress and competency and information instruction. Many diagnostic tools, e.g. checklists and inventories, are used at regular intervals throughout the units to encourage students' understanding of their current status as learners and to provide frequent and timely reviews of their progress.

Teachers are encouraged to share goals with students early in the course and to connect Unit learning experiences frequently and explicitly with big ideas, overall expectations, and performance tasks.

Students are also allowed a one-page (two sided) study sheet for the course. Teachers are recommended to encourage their students to create these sheets as a way of preparing for the tests.

ASSESSMENT ACTIVITIES

- ❑ Virtual lab assignments
- ❑ Practice (formative) worksheets
- ❑ Oral presentations
- ❑ Research projects
- ❑ Inquiry Assignments
- ❑ Tests & Exam

Weightings	
Course Work	**70**
Knowledge/Understanding (K)	17.5
Thinking/Inquiry (T)	17.5
Communication (C)	17.5
Application (A)	17.5
Final	**30**
Performance Task (2.5K, 2.5T, 2.5C, 2.5A)	10
Final Exam (5K, 5T, 5C, 5A)	20

TERM WORK EVALUATIONS (70%)

Evaluation Item	Description	Category	Weight
Unit 1: Quiz	Students will complete the quiz on Moodle.	K, A	14
Unit 1: Unit Test	Students will complete a Unit Test consisting of multiple choice, true and false, and short answer.	K, T, C, A	
Unit 1: End of Unit Conversation	Students will contact their teacher to have the end of unit conversation.	K, T, C, A	
Unit 2: Quiz	Students will complete the quiz on Moodle.	K, A	14
Unit 2: Unit Test	Students will complete a Unit Test consisting of multiple choice, true and false, and short answer.	K, T, C, A	
Unit 2: End of Unit Conversation	Students will contact their teacher to have the end of unit conversation.	K, T, C, A	
Unit 3: Assignment	Students will complete an assignment on Power Generations Plants.	K, T, C, A	14
Unit 3: Unit Test	Students will complete a Unit Test consisting of multiple choice, true and false, and short answer.	K, T, C, A	
Unit 3: End of Unit Conversation	Students will contact their teacher to have the end of unit conversation.	K, T, C, A	
Unit 4: Quiz	Students will complete the quiz on Moodle.	K, A	14
Unit 4: Unit Test	Students will complete a Unit Test consisting of multiple choice, true and false, and short answer.	K, T, C, A	
Unit 4: End of Unit Conversation	Students will contact their teacher to have the end of unit conversation.	K, T, C, A	
Unit 5: Quiz	Students will complete the quiz on Moodle.	K, A	14
Unit 5: Unit Test	Students will complete a Unit Test consisting of multiple choice, true and false, and short answer.	K, T, C, A	
Unit 5: End of Unit Conversation	Students will contact their teacher to have the end of unit conversation.	K, T, C, A	

FINAL EVALUATIONS (30%)

Evaluation Item	Description	Category	Weight
Culminating Activity	A video research project.	K, T, C, A	10
Final Exam	An exam to cover the major units studied through this course. This will be 3 hours in length.	K, T, C, A	20

AFL/AAL/AOL Tracking Sheet:

Unit 1:Kinematics

AAL	AFL	AOL
-Lesson Notes -Handout Solutions -Discussion Forum Post -Test Review	-Gizmo worksheets	-Quiz -Unit Test -End of unit discussion

Unit 2: Forces

AAL	AFL	AOL
-Lesson Notes -Handout Solutions -Discussion Forum Post -Test Review	-Gizmo worksheets	-Quiz -Unit Test -End of unit discussion

Unit 3: Energy

AAL	AFL	AOL
-Lesson Notes -Handout Solutions -Discussion Forum Post -Test Review	-Gizmo worksheets	-Assignment -Unit Test -End of unit discussion

Unit 4: Waves and Sound

AAL	AFL	AOL
-Lesson Notes -Handout Solutions -Discussion Forum Post -Test Review	-Gizmo worksheets	-Quiz -Unit Test -End of unit discussion

Unit 5: Electricity and Magnetism

AAL	AFL	AOL
-Lesson Notes -Handout Solutions -Discussion Forum Post -Test Review	-Gizmo worksheets	-Quiz -Unit Test -End of unit discussion

Unit 6: Review and Final Assessments

AOL
-Culminating Activity -Final Exam

EVALUATION

The final grade will be determined as follows:

- ❑ 70% 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 will be given to more recent evidence of achievement.
- ❑ 30% 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 a combination of the following: an

examination and a performance task, 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.
(*Growing Success: Assessment, Evaluation and Reporting in Ontario Schools*. Ontario Ministry of Education Publication, 2010 p.41)

CONSIDERATION FOR PROGRAM PLANNING

PLANNING PROGRAMS FOR STUDENTS WITH SPECIAL EDUCATION NEEDS

Classroom teachers are the key educators of students who have special education needs. They have a responsibility to help all students learn, and they work collaboratively with special education teachers, where appropriate, to achieve this goal. Special Education Transformation: The Report of the Co-Chairs with the Recommendations of the Working Table on Special Education, 2006 endorses a set of beliefs that should guide program planning for students with special education needs in all disciplines. Those beliefs are as follows: All students can succeed. Universal design and differentiated instruction are effective and interconnected means of meeting the learning or productivity needs of any group of students. Successful instructional practices are founded on evidence-based research, tempered by experience.

PROGRAM CONSIDERATIONS FOR ENGLISH LANGUAGE LEARNERS

Ontario schools have some of the most multilingual student populations in the world. The first language of approximately 20 percent of the students in Ontario's English language schools is a language other than English. Ontario's linguistic heritage includes several Aboriginal languages; many African, Asian, and European languages; and some varieties of English, such as Jamaican Creole. Many English language learners were born in Canada and raised in families and communities in which languages other than English were spoken, or in which the variety of English spoken differed significantly from the English of Ontario classrooms. Other English language learners arrive in Ontario as newcomers from other countries; they may have experience of highly sophisticated educational systems, or they may have come from regions where access to formal schooling was limited. When they start school in Ontario, many of these students are entering a new linguistic and cultural environment.

THE ROLE OF TECHNOLOGY IN THE PROGRAM

Information and communications technologies (ICT) provide a range of tools that can significantly extend and enrich teachers' instructional strategies and support students' language learning. ICT tools include multimedia resources, databases, Internet websites, digital cameras, and word-processing programs. Tools such as these can help students to collect, organize, and sort the data they gather and to write, edit, and present reports on their findings. Information and communications technologies can also be used to connect students to other schools, at home and abroad, and to bring the global community into the local classroom. Whenever appropriate, therefore, students should be encouraged to use ICT to support and communicate their learning.

ACCOMMODATIONS

Accommodations will be based on meeting with parents, teachers, administration and external educational assessment reports. 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.
- ***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.
- ❑ Allow students to report verbally to a scribe (teacher/ student) who can 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.