INSTITUTE OF CANADIAN EDUCATION

Course Title: Physics, Grade 12, University Preparation (SPH4U)

Course Name: Physics

Course Code: SPH4U

Grade: 12

Course Type: University Preparation

Credit Value: 1.0

Prerequisite: Grade 11 Physics, University Preparation (SPH3U)

Curriculum Policy Document: Science, The Ontario Curriculum, Grades 11 and 12, 2008 (Revised);*Growing Success: Assessment, Evaluation, and Reporting in Ontario Schools* (2010)

Course Developer: Institute of Canadian Education.

Department: SCIENCE

Development Date:

Most Recent Revision Date: 2026

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.

Prerequisite: Physics, Grade 11, University Preparation

COURSE EXPECTATION

Unit	Title	Description	Time
1	Motion in a Plane	Review of essential concepts: scientific notation, significant digits, vector operations, and fundamental mathematical tools; principles of kinematics in two dimensions; analysis of motion in a plane.	11 hours
2	Dynamics	Investigation of forces acting on objects in uniform circular motion and general motion; use of free body diagrams; analysis of technological applications of dynamics and their social/environmental impact.	11 hours
3	Energy and Momentum	Work, energy, and momentum; conservation of energy and momentum in 1D and 2D; investigations through simulations and labs; evaluation of technology applications.	20 hours
	MID TERM EXAM		2 Hours
4	Gravitational, Electric and Magnetic Fields	Concepts, properties, and laws of fields; graphical and model-based investigations; analysis of technology using these fields and their social/environmental impact.	22 hours

5	Wave Nature of Light	Study of waves and light; diffraction, refraction, interference, polarization; theoretical and simulation-based investigations; analysis of technologies using wave principles.	21 hours
6	Revolutions in Modern Physics: Quantum Mechanics & Special Relativity	Quantum mechanics, photoelectric effect, particle physics, Einstein's relativity; mathematical investigations and problem solving; analysis of scientific paradigms and technology development.	20 hours
7	Final Assessment	Proctored exam, 30% of final grade	3 hours
Total			110 hours

Overall Curriculum Expectations:

A. Scientific Investigation skills and Career Exploration

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.

B. Dynamics

By the end of this course, students will:

B1. analyse 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.

C. Energy and Momentum

By the end of this course, students will:

C1. analyse, 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.

D. Gravitational, Electric, and Magnetic Fields

By the end of this course, students will:

D1. analyse 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

E. The wave nature of Light

By the end of this course, students will:

E1. analyse 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.

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 Pools 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.

Assessment

Students will be provided with numerous and varied opportunities to demonstrate the full extent of their achievement of the curriculum expectations, across all four categories of the Achievement Chart. Progress will be monitored on an on-going basis using a variety of assessment tools, including written work, formal testing, quizzes, teacher-student communication, discussion boards and chat rooms.

As required by the Ministry of Education, students will be assessed in the four areas of the achievement chart. The suggested breakdown for this course is as follows:

Rubrics and marking schemes are outlined where appropriate, and students are encouraged to self-evaluate their work using these tools.

Assessment FOR Learning	Assessment AS Learning	Assessment OF Learning
Quizzes and tests	Self- and peer-assessment	Unit tests
Assignments and worksheets	Reflections and learning journals	Research projects
Ongoing teacher feedback	Learning checklists and goal setting	Case studies
Simulations and practical activities	Peer feedback	Presentations
Teacher questioning and discussions	Self-reflection	Midterm examination
	Student learning reflections	Final examination

Evaluation

Final Grade

The final grade will be determined as follows (in accordance with Ministry of Education standards):

Term Work Based on evaluations conducted throughout the course.	65%
Final Evaluation A final evaluation in the form of a written exam.	20%
Attendance and Participation	15%

Final evaluation breakdown:

- 20% written exam

ATTENDANCE POLICY

Regular attendance and active engagement are important for student success. Attendance and participation are monitored through the school's Learning Management System (LMS).
All online credit courses at ICE are designed to meet or exceed the **minimum 110 hours of instructional time** required for a credit course.

Online instructional time and engagement are monitored through:

- **LMS Engagement:** Students are expected to log in regularly and actively participate in online learning activities. LMS activity records are used to monitor engagement.
- **Biweekly Check-Ins:** Students complete a brief check-in every two weeks to review their progress and engagement. Additional support may be provided when concerns are identified.
- **Post-Unit Quizzes:** Short formative quizzes are completed at the end of each unit to monitor student progress and pacing.
- **Discussion Forums:** Students participate in required unit discussions and peer activities. Participation is monitored based on completion and engagement.

Students are responsible for maintaining regular participation and completing required learning activities within the course schedule.

EVALUATION MODEL – 10% TOTAL ATTENDANCE AND ENGAGEMENT WEIGHT

Component	Weight	Quantifiable Metric	Criteria
Biweekly Check-In	3%	Completed every two weeks	Students completes the required check-in within the scheduled time frame.
Post-Unit Formative Quiz	4%	Completed after each unit	Student completes the formative quiz by the assigned deadline.
Discussion Forum Participation	3%	Required posts and responses	Student submits the required original response and completes assigned peer responses.

Required Software, Equipment, Textbooks

Texts & Resources

- Grade 12 Physics textbook (Ontario approved)
- Teacher-provided worksheets and inquiry packages

Digital Resources

- Google Drive
- Microsoft Office / Google Workspace
- Online physics simulations (PhET, Desmos)

Teacher Considerations

- Assistive technology (speech-to-text, text-to-speech)
- Flexible submission formats

CONSIDERATION FOR PROGRAM PLANNING

Students with Special Education Needs: Instruction and assessment will provide appropriate accommodations, differentiation, scaffolding, and multiple ways for students to demonstrate learning, in accordance with individual needs and IEPs where applicable.

English Language Learners: Visual supports, scientific vocabulary, glossaries, graphic organizers, multimedia, and opportunities for oral and written communication will support students in developing scientific language and understanding.

Environmental Education: Students will examine sustainability, climate change, biodiversity, natural resources, pollution, and the environmental impacts of science and technology.

Equity and Inclusive Education: Learning activities will respect diverse identities, perspectives, cultures, abilities, and lived experiences and will promote a safe, respectful, and inclusive learning environment.

First Nations, Métis, and Inuit Education: Where appropriate, students will explore Indigenous perspectives, knowledge, relationships with the environment, and contributions to science and technology.

Information and Communications Technology (ICT): Digital tools, simulations, online research, spreadsheets, presentations, and other technologies will be used to support investigation, data analysis, collaboration, and communication.

Career Education: Students will explore careers related to science, technology, engineering, health, environmental science, and other STEM fields, including relevant skills and pathways.

Health and Safety: Students will develop safe practices when conducting scientific investigations, using equipment, handling materials, working with electricity, and participating in online learning and research.

Tips for Success – SPH4U

Welcome to SPH4U: Grade 12 Physics

Welcome to SPH4U! This course will deepen your understanding of physics concepts such as motion, forces, energy, fields, waves, and modern physics. You will strengthen your **problem-solving, mathematical reasoning, scientific inquiry, and critical thinking skills**, all of which are essential for **university and college STEM programs**.

To be successful in SPH4U, especially in an online learning environment, please review the following tips carefully.

Stay Organized & Informed

- Check **Announcements**, **What's New**, and your **mailbox daily** for important updates.
- Review the **course calendar regularly** and note all due dates.
- Physics builds on previous concepts — stay current to avoid falling behind.

Manage Your Time Effectively

- Plan for **1–2 hours of focused study per day**.
- Break large assignments into smaller steps (reading, practice problems, labs, submission).
- Avoid last-minute work, especially for tests and labs.

Understand Expectations

- Carefully read **assignment instructions, rubrics, and evaluation criteria**.
- Create a checklist to ensure:
    - All questions are answered
    - Units, diagrams, and calculations are shown clearly

- Work is submitted in the correct format and on time

Practice Consistently

- Physics requires **regular practice**, not memorization.
- Complete practice problems, review feedback, and revisit challenging concepts.
- Use simulations, videos, and worked examples provided in the course.

Remember, this course is designed to help you think critically, apply mathematical models, and explain physical phenomena using evidence and reasoning. Approach each activity with curiosity, patience, and confidence in your ability to learn and improve.

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.