

# Malvern Collegiate Institute – Physics

## SPH3U Course Outline 2023 - 2024

Teacher: Q. Zhu

Prerequisite: 10 Science (SNC2D)

### Scope and Sequence of Topics:

Dates are included as a guideline only. Summative evaluation will reflect the teaching/learning completed.

### Introduction:

This course develops students' understanding of the basic concepts of physics. Students will 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 will develop scientific-inquiry skills as they verify accepted laws and solve both assigned problems and those emerging from their investigations. Students will also analyse the interrelationships between physics and technology, and consider the impact of technological applications of physics on society and the environment.

### Unit One: Kinematics

By the end of this unit, students will:

- 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.

This unit focuses on the study of motion including the study of acceleration, relative motion (in 1 dimension AND 2 dimensions), and freefall. Students begin by learning accepted symbols, terminology and quantities used to describe motion. These conventions are then used to derive the equations necessary to describe and predict the motion (i.e. position, speed, acceleration etc...) of various objects in one and two dimensions. Students will be encouraged to evaluate the costs and benefits of technologies which have enabled us to travel faster and further than ever before.

### Unit Two: Forces

By the end of this unit, students will:

- 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.

The unit will revolve around the equations for classical mechanics derived by Sir Isaac Newton (i.e. Newton's Three Laws), the Universal Law of Gravitation and frictional forces. Students will also be introduced to free body diagrams and will be taught how to use them to solve problems involving complex motion.

### Unit Three: Energy and Society

By the end of this unit, students will:

- 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).

In this unit, the relationships between work, power and energy are introduced. Students will be given the opportunity to discover the law conservation of energy and this law will be used to highlight the relationship between different forms of energy (i.e. gravitational potential, elastic potential and kinetic). The unit will also attempt to build an appreciation for the importance of conservation of energy in today's society and the need to search for alternative sources of energy.

### Unit Four: Waves and Sound

By the end of this unit, students will:

- 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.

In this unit, the basic properties of mechanical waves are introduced. Students then use their knowledge of waves to explore the production, transmission, interaction and reception of sound. Students will be encouraged to develop an appreciation for different technologies that make use of mechanical waves and sound.

### Unit Five: Electricity & Magnetism

By the end of this unit, students will:

- Analyse the social, economic, and environmental impact of electrical energy production and technologies related to electromagnetism, 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.

This unit expands on the study of electricity that began in the SNC1D course. The fundamentals of electrostatics will be reviewed but the focus of this unit will involve the use of current electricity and magnetism to further investigate electric circuits, magnetic fields and electromagnetic induction. Students are expected to demonstrate an appreciation for domestic and industrial technologies that were developed around the understanding of magnetic fields.

### Assessment & Evaluation:

- Course work (test, quizzes, assignments, laboratory investigations and reports, projects, etc.) will account for 70% of the Year-to-Date mark (YTD).
- A summative evaluation (consisting of a written exam, performance task, and/or practical lab work) will account for the final 30% of the YTD mark.

### The Following Categories of Assessment and Evaluation apply to all course work:

Knowledge & Understanding	25%
Thinking and Investigation	25%
Communication	25%
Application	<u>25%</u>
	100%

The report card mark will be a cumulative Year-to-Date mark (YTD). The category weights given above are tentative and are therefore subject to modifications throughout the course of the year. Students will be notified of any changes.

### Assessment and Evaluation Policy:

Please refer to the MCI Evaluation Policy 2023 – 2024: Science Department and your agenda.

### Resource:

A variety of materials will be used throughout the course, including Physics 11, Maurice DiGiuseppe, et. al., Nelson 2011; Physicssource 11, Lionel Sandner, et. al., Pearson, 2011; Physics 11, Wolfe, et. al., Addison Wesley, 2001 and Physics for a Modern World, Alan J. Hirsch, John Wiley & Sons, 1986

**GOOD NOTES MAKE STUDYING FOR TESTS AND EXAMS MUCH EASIER!!**