Course: Physics 12

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Course Description:

Physics 12 aims to build on student's understanding of motion from Physics 11 and relies on student's comfortability in applying their mathematical skills to real life problems. The course reinforces data processing skills using video tracking software and MS Excel graphing software to visualize motion. We will be Interpreting and using graphs to model and understand phenomenon. We will apply these skills on the following topics: relative motion, conservation of momentum, comparing linear and circular motion, vector fields – gravitational and electric, and electromagnetism.

Summer Learning Beliefs:

Summer Learning provides an engaging learning environment where all students can challenge themselves academically and fulfill their learning goals. To ensure this, students will:

- abide by the student Code of Conduct
- adhere to the Academic Honesty Policy
- adhere to the Summer Learning Student Engagement policy
- respect themselves and others
- attend every class and be punctual
- inquire, think, and engage to the best of their ability
- access technology in class when instructed to do so and for learning purposes only
- challenge themselves and have fun learning

All Summer Learning policies can be accessed at: https://www.sd44.ca/school/summer/About/Pages/default.aspx#/=

Course Syllabus:

Unit	Essential Questions	Content	Curricular Competencies	Assessment Task
Relative Motion	How does Newtonian relativity compare with Einstein's theory on special relativity?	• Vector addition/subtraction • frames of reference • relative motion within a stationary reference frame • postulates of special relativity • relativistic effects within a moving reference frame	• Construct vector diagrams and derive equations that use vector addition or subtraction to determine a resultant. • Collaboratively plan a way to determine the upstream angle needed to land a motorized boat directly	Collaborative, individual activities. Laboratory and hands-on activities. Formative and summative assessments.

			across a body of moving water in the local area. • Visually represent an effect of special relativity.	
Static Equilibrium	"How does the position of an applied force relative to an object's centre of gravity affect its motion?"	• translational: sum of all forces equals zero (vertical and horizontal) • rotational: sum of all torques equals zero, location of centre of gravity of a uniform body	• Demonstrate the difference between a beam in static, translational, and rotational equilibrium. • Using systems of equations to solve body systems in translational and rotational equilibrium	Collaborative, individual activities. Laboratory and hands-on activities. Formative and summative assessments.
Momentum and Collisions	How are Newton's Laws of motion derived from conservation of momentum?	• impulse • conservation of momentum • 1D and 2D collisions • ballistic pendulums	• Determine the effect of the impulse delivered by a bumper car as it hits a wall at different angles. • Determine whether a collision is elastic or inelastic and identify ways of improving the quality of the data collected.	Collaborative, individual activities. Laboratory and hands-on activities. Formative and summative assessments.
Circular Motion and Gravitation	Under what conditions do forces cause circular as opposed to linear motion? How does circular motion affect our perception of our weight (apparent weight)? What is the role of mass in controlling the trajectory of an object's orbit?	• Horizontal and vertical circles • Changes to apparent weight • satellite motion, orbit changes, launch velocity, escape velocity	• Visually show the direction of the net force through a free-body diagram of an object in circular motion • Analyze and interpret stellar data to deduce the presence of dark matter	Collaborative, individual activities. Laboratory and hands-on activities. Formative and summative assessments.
Electrostatics and vector fields	How does an electric field differ from a gravitational field?	• electric field: • vector field	• Visually represent the electric fields around a variety of point charges and plates.	Collaborative, individual activities. Laboratory and hands-on

	What is the visual relationship between electric field and electric potential? How does the motion of a charged object differ in a uniform as opposed to a non-uniform electric field?	• interacts with positive/negative elementary charge • attractive or repulsive • electrostatic dynamics and energy relationships: • relationships between force, charge, and distance on a single point charge: ▪ 1D and 2D with other charges ▪ in orbits ▪ between parallel plates	• Formulate and evaluate physical or mental theoretical models to describe a phenomenon • Implement multiple strategies to solve problems in real-life, applied, and conceptual situations	activities. Formative and summative assessments.
Magnetism and Electromagnetic Induction	How are magnetic and electric fields interconnected? What are the advantages and disadvantages of harnessing AC versus DC current?	• magnetic field: • vector field • induced by moving charges • interacts with polarity (north/south) • magnetic force: • acting on a moving charge or current carrying wire within a magnetic field • right-hand rules • electromagnetic induction: • Faraday's law • Lenz's law	• Use the relativistic mass of a particle in a particle accelerator to determine the radius of curvature needed to keep it within the walls of the device. • Implement multiple strategies to solve problems in real-life, applied, and conceptual situations	Collaborative, individual activities. Laboratory and hands-on activities. Formative and summative assessments.
Modern Physics	How does the development of modern physics pave the conveniences of our society?	Topics include and are not limited to: • Quantum physics • Astrophysics • Nuclear physics • Relativity • Solid-state physics	• Demonstrate a sustained intellectual curiosity about a scientific topic or problem of personal, local, or global interest • Communicate scientific ideas and information, and perhaps a suggested course of action, for a specific purpose and audience, constructing evidence-based arguments and using appropriate scientific language, conventions, and representations • Critically analyze the validity of information in	Project-based exploration. Formative, in-person check ins. Final oral presentation.

			primary and secondary sources and evaluate the approaches used to solve problems • Use knowledge of scientific concepts to draw conclusions that are consistent with evidence • Analyze cause-and-effect relationships	

Grade Descriptors:

"A" quality evidence of learning….

Produce high-quality, frequently innovative work. Communicate scientific ideas to connect and synthesize concepts and skills learned over time. Consistently demonstrate sophisticated critical and creative thinking.
Collect, present, and (correctly) transform experimental data. Interpret, analyze and critique scientific findings and experimental data. Frequently transfers knowledge and skills and use concepts to solve non-routine problems.

"B" quality evidence of learning….

Sometimes produces high-quality, innovative work. Communicate scientific ideas to compare and critique concepts and skills learned over time. Consistently demonstrate a degree of critical and creative thinking. Collect and present scientific data in an appropriate manner. Assess, interpret, and revise scientific findings and experimental data. Transfer knowledge and skills and use concepts to consistently solve routine problems correctly with few mistakes.

"C" quality evidence of learning….

Produce work of an acceptable quality. Communicate a basic understanding of scientific concepts and operate superficially within a scientific contextual framework. Display an emergent level of application when it comes to critical thinking skills. Collect scientific data in an appropriate manner. Be inflexible in the use of knowledge and skills, requiring support even in familiar classroom situations. Make attempts to use knowledge, skills and scientific concepts to solve routine problems, with occasional mistakes.

Resources:

Resources
All notes, worksheets, and material will be provided online using MS Teams

We would like to thank the Coast Salish people, specifically the Skwxwú7mesh Nation and Tsleil-Waututh Nation, on whose unceded traditional territory the North Vancouver School District resides. We value the opportunity to learn, share and grow on this traditional territory.