COQUITLAM COLLEGE
Established 1982

COURSE OUTLINE

Last Revised: September 2021

COURSE INFORMATION

Course Title: Principles of Physics I

Course Number: PHYS 101 **Credits:** 3

Total Weeks: 14 (Fall, Spring)
12 (Summer)

Total Hours: 78

Course Level: ☒ First Year ☐ Second Year
☐ New ☐ Revised Course
☐ Replacement Course

Department: Science **Department Head:** S. Girdhar

Former Course Code(s) and Number(s) (if applicable): N/A

Pre-requisites (If there are no prerequisites, type NONE): Physics 12

Co-requisite Statement (List if applicable or type NONE): MATH 101

Precluded Courses:

COURSE DESCRIPTION

A general survey and introduction to mechanics, emphasizing the motion of particles and rigid bodies, work and energy, harmonic motion and sound. A brief introduction to thermal physics is given at the end of the course. Laboratory work is included as an integral part of the course, bridging theory and experiment. This is a calculus-based course.

LEARNING OUTCOMES

Upon successful completion of the course, students will be able to:

- Metric system, SI system, fundamental units, scientific notations, and prefixes.
- Particle motion in one and three dimensions, displacement, velocity, and acceleration. Vectors, scalars, Cartesian coordinate system.
- Force, momentum, Newton's laws of motion. Gravitational forces, centripetal forces, free-body diagrams, Hooke's law. Static and kinematic friction.
- Work, energy, power, conservative and non-conservative forces, conservation of energy. Work-energy theorem. Scalar/dot product of two vectors.
- Centre of mass, motion of rigid bodies, internal and external forces, collisions in one and two dimensions.
- Centre of gravity, conditions of static equilibrium.
- Kepler's laws, Newton's law of gravitation, motion of planets, gravitational energy, gravitational field.
- Hydrostatic equilibrium, Archimedes', Pascal, and Bernoulli's laws. Lift, turbulent and laminar flow of fluids.
- Oscillatory motion, simple harmonic motion, pendulums, damping, driven oscillations, resonance.
- Wave motion, longitudinal and transverse waves, wavelength, phase of motion, amplitude, frequency, superposition principle.
- Interference, diffraction of waves. Sound waves, speed of sound. Intensity of sound /decibel scale.
- Thermodynamics, thermodynamic equilibrium, heat, temperature, Celsius and Kelvin temperature scales.
- Calorimetry. Heat capacity and specific heat. First law of thermodynamics. Thermal expansion.
- Ideal gas. Clapeyron equation for ideal gas. Reversible and irreversible processes. Second law of thermodynamics.

INSTRUCTION AND GRADING

Instructional (Contact) Hours:

Type	Duration
Lecture	39
Seminars/Tutorials	
Laboratory	39
Field Experience	
Other (*specify):*	
Total	78

Grading System: Letter Grades ☒ Percentage ☐ Pass/Fail ☐ Satisfactory/Unsatisfactory ☐ Other ☐

Specify passing grade: 50%

Evaluation Activities and Weighting (total must equal 100%)

Assignments: 20% *Specify number of, variety, and nature of assignments:*	Lab Work: 20%	Participation: % *Specify nature of participation:*	Project: % *Specify nature of project:*
Quizzes/Test: 20%	Midterm Exam: 30%	Final Exam: 30%	Other: %

TEXT(S) AND RESOURCE MATERIALS

Provide a full reference for each text and/or resource material and include whether required/not required.

REQUIRED TEXTBOOK: Physics for Scientist and Engineers by P. A. Tipler and G. Mosca, 6th edition (Freeman)

COURSE TOPICS

List topics and sequence covered.

Week	Topic	Chapter
Week 1	Introduction to Physics. Units, conversion of units, dimensions of physical quantities, scientific notation, and problem solving.	1
Week 2	Kinematics. The description of motion in one dimension; displacement, velocity, and acceleration. Vectors. The description of motion in two and three dimensions. Projectile motion and circular motion.	2 - 3
Week 3	Dynamics. Motion and force. Newton's Laws. mass and weight, the force due to Gravity. Applications of Newton's laws. Friction.	4 - 5
Week 4	Work and Energy. Work and kinetic energy. Potential energy. Conservation of Mechanical Energy.	6 - 7

Week 5	Conservation of Momentum. The center of mass reference frame. The conservation of momentum. Elastic and inelastic collisions. Collision in one and two dimensions.	8
Week 6	Rotation. Angular velocity and angular acceleration of a rigid body. Torque and moment of inertia. Rotational kinetic energy. Angular momentum.	9 - 10
Week 7	Gravity. Kepler's laws. Newton's law of gravitation. Gravitational potential energy. Gravitational field.	11
	MIDTERM EXAM	
Week 8	Static equilibrium and elasticity. The conditions of static equilibrium. Centre of gravity. Elastic properties of solids. Tension and compression	12
Week 9	Mechanics of fluids. Density. Hydrostatic pressure. Buoyancy and Archimedes' principle. Fluids in motion. Bernoulli's equation.	13
Week 10	Oscillations. Simple harmonic motion. Frequency, period, displacement, velocity, and acceleration is shm. Energy in shm. Pendulums. Dumped and driven oscillators. Resonance.	14
Week 11	Waves and sound. Transverse and longitudinal waves. Speed of waves. Harmonic waves, wavelength, and amplitude. Superposition and interference of harmonic waves.	15
Week 12	Standing waves and resonances. Sound waves. Speed of sound waves in different media (gases, liquids, and solids).	16
Week 13	Temperature and heat. The Celsius and Kelvin temperature scales. Thermal expansion. The first and the second law of thermodynamics.	17/20
Week 14	**FINAL EXAM**	

NOTES

1. Students are required to follow all College policies. Policies are available on the website at: Coquitlam College Policies
2. To find out how this course transfers, visit the BC Transfer Guide at: bctransferguide.ca
3. Midterm Exam – TBA. The format for this exam is a combination of multiple-choice questions and the problems from the textbook. The same format applies to the final examination.
4. Lab Exams: There are no lab examinations in this course.