

**PHYSICS 12
COURSE OUTLINE
- 2002 -**

KINEMATICS

6.5 periods

KINEMATICS IN ONE DIMENSION

Period 1	Speed, Velocity & Acceleration	1 period	Apr 23
Period 2	Falling Bodies & Graphs	1 period	Apr 23

VECTORS

Period 3/4 Kinematics Quiz	Vectors	2 periods	Apr 25
Period 5	Investigation #1 Projectile Motion	1 period	Apr 29
Period 6	Projectile Motion	1 period	Apr 29
	Kinematics Test	0.5 period	May 1

DYNAMICS

6 periods

MOTION AND FORCE: DYNAMICS

Period 7	Newton's Laws of Motion	0.5 period	May 1
Period 8	Force Vectors, Friction and Inclines	1.0 period	May 1

CIRCULAR MOTION: GRAVITATION

Period 9/10	Circular Motion	1.5 period	May 3
Period 10/11	Newton's Law of Universal Gravitation	1.5 period	May 3
Period 12	Kepler's Laws	0.5 period	
Period 12	Investigation #5 Circular Motion	0.5 period	May 7
	Dynamics Test	0.5 period	May 7

MECHANICAL ENERGY AND VECTOR MOMENTUM

6.5 periods

WORK AND ENERGY

Period 13	Work and Kinetic Energy	0.5 period	May 9
Period 14	Work and Gravitational Energy	1.0 period	May 9
Period 15	Conservation of Energy	1.0 period	May 13
Period 16	Power	0.5 period	May 13

LINEAR MOMENTUM

Period 16	Impulse and Momentum	1.0 period	May 15
Period 17	Conservation of Momentum	1.0 period	May 15
Period 18	Investigation #2 Oblique Collisions in Two Dimensions	1.0 period	May 17
	Energy and Momentum Test	0.5 period	May 17

EQUILIBRIUM**4 periods**

Period 19	Investigation #3 Equilibrium of Forces	0.5 period	May 17
Period 20	Translational Equilibrium	1 periods	May 22
Period 21	Rotational Equilibrium	1.5 period	May 22
Period 22	Investigation #4 Equilibrium of a Loaded Beam	0.5 period	May 24
	Equilibrium Test	0.5 period	May 24

ELECTROSTATICS**5.0 periods*****ELECTRIC CHARGE AND ELECTRIC FIELD***

Period 23	Electric Charge	0.5 period	May 24
Period 24	Electric Force and Electric Field	1 period	May 28
Period 25	Investigation #7 Coulomb's Law	1 period	if time allows

ELECTRIC POTENTIAL AND ELECTRIC ENERGY

Period 26	Electric Potential & Electric Energy	1 periods	May 28
Period 27	Investigation #8 Deflection of an electron beam by an electric field***	1 period	if time allows
	Electrostatics Test	0.5 period	May 30

CIRCUITRY**4 periods*****ELECTRIC CURRENTS***

Period 28	Electric Currents	0.5 period	May 30
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DC CIRCUITS AND INSTRUMENTS

Period 29	Kirchhoff Rules	1 period	May 30
Period 30	Investigation #9 Series and Parallel Circuits***	1 period	if time allows
Period 31	emf & Potentiometers	1 period	June 3
	Circuitry Test	0.5 period	June 3

ELECTROMAGNETISM 7 periods***MAGNETISM***

Period 32	Magnetic Fields	0.5 period	June 3
Period 33	Magnetic Forces	1.0 period	June 5
Period 34	Inv. #10 Deflection of an electron beam by a magnetic field***	1.0 period	if time allows
Period 35	Solenoids & Torques	1.0 period	June 5

ELECTROMAGNETIC INDUCTION AND FARADAY'S LAW: AC CIRCUITS

Period 36	Inv. #11 The Current Balance	1.0 period	June 7
Period 37	Magnetic Induction	1.0 period	June 7
Period 38	Back emf & Transformers	1.0 period	June 11
	Electromagnetism Test	0.5 period	June 13

REVIEW***REMAINING PERIODS PRIOR TO FINAL EXAM WILL BE FOR TUTORIAL***

CLASSROOM RULES

You are senior science students and are expected to behave as such. Inappropriate behavior will not be tolerated. You are expected to be prompt, particularly returning from breaks. Morning break is over at 10:15 am and the afternoon break is over at 1:46.

All missed work will result in a mark of 0 being assigned. In case of absences, you must bring me a note in order to have the missed work and quizzes permitted.

COURSE EVALUATION

LABS & ASSIGNMENTS	40%
TESTS & QUIZZES	60%

QUIZZES: Quizzes will be given regularly. A data table containing constants, trigonometric and physics equations will be supplied.

TESTS: Unit tests will be given after completion of each Unit. A data table containing constants, trigonometric and physics equations will be supplied.

RETESTS : You may rewrite each test once. Your best mark of the two tests will be recorded as your final mark. You have to schedule your rewrite after school when it is convenient for both you and myself. The last day for rewrites is June 12th.

GOVERNMENT EXAM IS MANDATORY AND IS WORTH 40% OF FINAL GRADE.

PREScribed LEARNING OUTCOMES FOR PHYSICS 12



A: Vector Kinematics in Two Dimensions (Vectors and Relative Velocity)

It is expected that students will demonstrate an ability to use vector analysis to solve problems in determining velocities, displacement, and time of travel of objects.

- A1. identify scalars and vectors
- A2. identify the resultant vector and component vectors on vector diagrams
- A3. write vector equations describing the vector addition of two or more velocities or displacements
- A4. write vector equations describing the subtraction of two velocities or displacements
- A5. use graphical methods to resolve a vector into two perpendicular components
- A6. resolve a vector into components using trigonometry
- A7. use graphical methods or trigonometry to add or subtract vectors
- A8. describe relative velocity
- A9. use vector analysis to determine velocities, displacement, and time of travel for navigation problems
- A10. gather and organize data, produce and interpret graphs, and determine relationships between variables

B: Vector Kinematics in Two Dimensions (Motion with Constant Acceleration)

It is expected that students will apply the concepts of motion with constant acceleration to various real-life situations.

- B1. identify situations involving the use of kinematics
- B2. solve problems involving:
 - displacement •initial velocity •final velocity •average velocity •acceleration •time
- B3. describe the shape of the path taken by a projectile fired at some angle above the horizon if friction is negligible
- B4. determine from experimental data that the horizontal motion of a projectile is independent of its vertical motion if friction is negligible
- B5. demonstrate that the horizontal velocity of a projectile is constant if friction is ignored
- B6. state that a projectile experiences a constant downward acceleration due to gravity if friction is negligible
- B7. resolve a projectile's velocity into horizontal and vertical components
- B8. solve projectile motion problems involving:
 - range •maximum height •time of flight •displacement •velocity •acceleration

C: Dynamics (Forces)

It is expected that students will analyse forces acting on an object and predict their effects on it.

- C1. state Newton's laws of motion
- C2. identify workplace and community situations involving Newton's three laws
- C3. apply Newton's laws of motion to common situations
- C4. solve problems involving:
 - force •mass •acceleration
- C5. describe force as a vector quantity
- C6. define gravitational field strength
- C7. solve problems involving:
 - the force of gravity (weight) •gravitational field strength •mass
- C8. solve problems involving:
 - force of friction •coefficient of friction •normal force

D: Vector Dynamics(Two-Dimensional Dynamics)

It is expected that students will use the concepts of two-dimensional dynamics to analyse common situations.

- D1. resolve a force into two orthogonal components
- D2. determine the magnitude and direction of a force given its two orthogonal components
- D3. determine the net force from two or more forces
- D4. construct free-body diagrams for objects in various situations
- D5. use free-body diagrams to solve problems involving balanced or unbalanced forces
- D6. solve problems involving objects on inclines

E: Work, Energy, and Power

It is expected that students will demonstrate an ability to apply energy transformations and the concept of power to everyday situations.

- E1. define work

- E2. solve problems involving:
 - work •force •displacement
- E3. determine graphically the amount of work done on objects by constant or linearly varying forces
- E4. define energy
- E5. state the work-energy theorem
- E6. differentiate between kinetic energy and gravitational potential energy and give examples of each
- E7. solve problems involving:
 - kinetic energy •mass •gravitational potential energy •height •velocity
- E8. state the law of conservation of energy and apply it to real-life situations
- E9. define power
- E10. solve problems involving:
 - power •work •time •efficiency

F: Momentum (One-Dimensional Momentum)

It is expected that students will demonstrate an ability to describe and apply the concepts of momentum and impulse to everyday examples of collisions or explosions.

- F1. define momentum and impulse
- F2. state that momentum and impulse are vector quantities
- F3. identify and compare momenta of common objects
- F4. solve problems involving:
 - net force •time •impulse •velocity •mass •momentum
- F5. state the law of conservation of momentum
- F6. determine whether a collision is elastic or inelastic
- F7. solve problems related to collisions or explosions involving:
 - mass •initial velocity •final velocity •momentum

G: Momentum (Two-Dimensional Momentum)

It is expected that students will use the concepts of two-dimensional momentum to analyse common situations.

- G1. analyse conservation of momentum in two dimensions
- G2. give examples of common situations involving momentum and impulse
- G3. solve problems for two objects involved in an oblique collision or for a stationary object exploding into no more than three fragments, involving:
 - mass •momentum •velocity •impulse

H: Equilibrium

It is expected that students will identify situations involving translational, rotational, and static equilibrium and apply the concepts of force, torque, and equilibrium to common situations.

- H1. define translational equilibrium
- H2. use free-body diagrams and vector analyses to determine the sum of the forces acting at a single point on an object
- H3. solve problems for common objects in translational equilibrium
- H4. define torque and identify situations involving the application of torque
- H5. solve problems involving:
 - torque •force •lever arm
- H6. define centre of gravity and determine its location for objects of uniform shape and density
- H7. define rotational equilibrium
- H8. determine the sum of the forces and the torques on an object
- H9. define static equilibrium
- H10. demonstrate that in static equilibrium, any location can be chosen as the pivot point
- H11. solve problems for common objects in static equilibrium

I: Circular Motion

It is expected that students will demonstrate an ability to describe and apply the concepts of uniform circular motion to real-world situations.

- I1. describe the velocity of an object moving in uniform circular motion at any point in that motion
- I2. demonstrate that the acceleration of an object may result in a change in direction with no change in speed
- I3. define centripetal acceleration and centripetal force
- I4. solve problems involving:

- centripetal force •speed •radius of revolution •period of revolution •object's mass
15. analyse and describe the forces acting on common objects in circular motion

J: Gravitation

It is expected that students will demonstrate an understanding of the nature of gravitational attraction between masses.

- J1. state Newton's law of universal gravitation
- J2. apply Newton's law of universal gravitation to solve problems involving:
 - force •mass •distance of separation
- J3. describe the gravitational field of a body in terms of an inverse square relationship
- J4. indicate that the work required to move an object in a gravitational field is given by the area below a graph of gravitational force versus distance of separation
- J5. define gravitational potential energy
- J6. solve problems involving:
 - gravitational potential energy relative to zero at infinity •mass •distance of separation
- J7. calculate the work required to change the separation distance between objects
- J8. analyse and describe orbiting systems in terms of universal gravitational and centripetal forces
- J9. solve problems involving orbiting systems
- J10. calculate the total energy of an orbiting object

K: Electrostatics (Electric Force and Electric Field)

It is expected that students will apply Coulomb's law to situations involving point charges and demonstrate an understanding of electric fields and their effects on charged objects.

- K1. state Coulomb's law
- K2. solve problems using Coulomb's law for two point charges, involving:
 - electric force •charge •distance of separation •Coulomb's constant
- K3. calculate the net electric force on a point charge due to two other point charges
- K4. define electric field
- K5. calculate the net electric field at any point on a line containing two point charges
- K6. describe the electric field lines for simple charge distributions
- K7. describe situations that produce uniform or non-uniform electric fields
- K8. solve problems for a charge in an electric field, involving:
 - force •charge •electric field

L: Electrostatics (Electric Potential Energy and Electric Potential)

It is expected that students will calculate electric potential and apply the concept of electric potential energy and potential difference to common situations.

- L1. define the following:
 - electric potential energy •electric potential •electric potential difference
- L2. solve problems for a charge in an electric field, involving:
 - electric potential difference •electric potential energy •charge
- L3. solve problems for a uniform electric field, involving:
 - electric potential difference •electric field •distance between two locations in a field
- L4. solve problems for two point charges, involving:
 - electric potential energy •charge •distance of separation •Coulomb's constant
- L5. calculate the work required to move a charge between two locations in an electric field
- L6. solve problems using the law of conservation of energy for a charge in an electric field, involving:
 - speed •mass •charge •distance •work •electric field •electric potential difference
- L7. apply the principles of electrostatics to qualitatively explain the operation of a cathode-ray tube (CRT)
- L8. solve problems for no more than two point charges, involving:
 - electric potential relative to zero at infinity •charge •distance

M: Electric Circuits (Ohm's Law and Kirchhoff's Laws)

It is expected that students will demonstrate an ability to use Ohm's law and Kirchhoff's laws and apply them to direct current circuits in everyday situations.

- M1. define electric current
- M2. solve problems involving:
 - current •time •charge
- M3. relate conventional current direction to the direction of electron flow in a conductor

- M4. define resistance in terms of Ohm's law
- M5. solve problems involving:
 - electric potential difference •current •resistance
- M6. calculate the total (equivalent) resistance for resistors connected in parallel, series, or a combination
- M7. state Kirchhoff's laws and apply them to circuits containing one source of electric potential difference
- M8. demonstrate the ability to construct circuits from schematic diagrams
- M9. demonstrate the correct placement and use of an ammeter and voltmeter in a circuit
- M10. define electromotive force (emf), terminal voltage, and internal resistance
- M11. solve problems using:
 - terminal voltage •electromotive force (emf) •internal resistance •current •electric potential difference

N: Electric Circuits (Power and Energy)

It is expected that students will demonstrate an understanding of electric power and how it applies to their lives.

- N1. define electric power
- N2. solve problems involving:
 - electric power •electric potential difference •current •resistance •efficiency
- N3. compare energy consumption of various household electrical appliances
- N4. explain why electric energy is transmitted through transmission lines at high potential

O: Electromagnetism (Magnetic Forces)

It is expected that students will demonstrate an understanding of the nature of magnetic fields and magnetic forces.

- O1. state the rules that explain how magnetic poles interact with each other
- O2. determine the direction of the magnetic field lines for a permanent magnet
- O3. use the right-hand rule to determine the magnetic field direction for a current-carrying wire or a solenoid
- O4. determine the direction of the force exerted on a current-carrying conductor or a moving charge that is within a magnetic field
- O5. solve problems for a current-carrying conductor placed in a magnetic field, involving:
 - magnetic force •current •length of conductor in the field •magnetic field
- O6. solve problems for a charge moving through a magnetic field, involving:
 - magnetic force •charge •speed •magnetic field •centripetal force •mass •radius
- O7. apply the principles of electromagnetism to qualitatively explain the operation of a cathode-ray tube
- O8. solve problems for a solenoid, involving:
 - current •magnetic field (in the centre of the solenoid) •number of turns per metre of solenoid
- O9. give examples of practical uses for solenoids in the home and workplace

P: Electromagnetism (Magnetic Induction)

It is expected that students will apply the concept of magnetic induction to everyday situations.

- P1. solve problems for a conductor moving perpendicularly through a uniform magnetic field, involving:
 - electromotive force (emf) between the ends of the conductor •speed of the conductor •magnetic field •length of the conductor
- P2. define magnetic flux
- P3. calculate the magnetic flux through a loop of wire placed parallel or perpendicular to a magnetic field
- P4. identify, from appropriate diagrams, situations that would produce an induced emf in a coil
- P5. apply Faraday's law to solve problems involving:
 - time •change in flux •induced emf •number of turns
- P6. apply Lenz's law to determine the direction of the induced current in a loop of wire
- P7. qualitatively describe how a generator uses induction to produce an electric current
- P8. define back emf
- P9. solve problems for DC motors involving:
 - current •back emf •armature resistance •voltage to motor
- P10. give evidence of current fluctuations due to back emf in common applications of motors
- P11. solve problems for an ideal transformer, involving:
 - primary voltage •secondary voltage •number of primary windings •number of secondary windings •primary current •secondary current
- P12. identify a transformer as step-up or step-down
- P13. give examples of the use of transformers in the home, workplace, and community