PEFA Academy

PHYSICS CURRICULUM PLAN

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1. Programme Overview

The PEFA Academy Physics programme is designed to develop students' understanding of the fundamental principles governing the physical world while equipping them with analytical, investigative, and problem-solving skills.

The curriculum combines theoretical knowledge, mathematical application, practical investigation, and scientific reasoning to prepare students for advanced studies in Physics, Engineering, Medicine, Technology, Aviation, Computer Science, and other science-related disciplines. The programme covers mechanics, waves, electricity, modern physics, thermodynamics, fields, and cosmology while emphasizing practical scientific investigation and data analysis.

Programme Duration: 36 Weeks

Learning Approach

PEFA Academy adopts a flexible and student-centred learning approach designed to help students develop a strong understanding of Physics while preparing effectively for external examinations and higher education studies.

The programme incorporates:

- Live Online Classes
- Recorded Lessons
- Interactive Discussions
- Practical Physics Experiments
- Scientific Investigations
- Cambridge-Style Examination Questions
- Weekly Assignments
- Topic-Based Assessments
- Mock Examinations
- Past Question Practice
- Tutor Support Sessions

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2. Curriculum Structure

MODULE 1: PHYSICAL QUANTITIES, MEASUREMENTS AND KINEMATICS

Duration: Weeks 1–4

Topics Covered

- Physical quantities and units
- SI units and derived units
- Errors and uncertainties
- Scalars and vectors
- Distance and displacement
- Speed and velocity
- Acceleration
- Equations of motion
- Motion graphs
- Free fall and projectile motion

Learning Objectives

Students should be able to:

- Use SI units correctly
- Estimate physical quantities
- Analyse motion using equations and graphs
- Solve kinematics problems confidently

Assessment

- Numerical exercises
- Practical measurements
- Topic quizzes

MODULE 2: DYNAMICS, FORCES AND MOMENTUM

Duration: Weeks 5–8

Topics Covered

- Newton's Laws of Motion
- Force and acceleration
- Mass and weight
- Linear momentum

- Conservation of momentum
- Friction and drag forces
- Terminal velocity
- Moments and torque
- Equilibrium of forces
- Density and pressure

Learning Objectives

Students should be able to:

- Apply Newton's laws to physical situations
- Solve momentum and collision problems
- Analyse systems in equilibrium
- Calculate pressure and density

Assessment

- Problem-solving activities
- Practical applications
- Topic assessment

MODULE 3: WORK, ENERGY AND DEFORMATION OF SOLIDS

Duration: Weeks 9–11

Topics Covered

- Work done
- Power
- Efficiency
- Conservation of energy
- Kinetic energy
- Gravitational potential energy
- Hooke's Law
- Stress and strain
- Young modulus
- Elastic and plastic deformation

Learning Objectives

Students should be able to:

- Calculate work, energy and power
- Apply conservation of energy principles

- Investigate elastic properties of materials

Assessment

- Numerical exercises
- Practical investigations

MODULE 4: WAVES AND SUPERPOSITION

Duration: Weeks 12–15

Topics Covered

- Progressive waves
- Wave properties
- Wave equation
- Transverse and longitudinal waves
- Doppler Effect
- Electromagnetic spectrum
- Polarisation
- Stationary waves
- Diffraction
- Interference
- Diffraction gratings

Learning Objectives

Students should be able to:

- Describe wave behaviour
- Analyse interference and diffraction patterns
- Solve wave calculations
- Apply wave principles to practical situations

Assessment

- Wave investigations
- Data interpretation tasks

MODULE 5: ELECTRICITY AND D.C. CIRCUITS

Duration: Weeks 16–19

Topics Covered

- Electric current
- Charge and current flow
- Potential difference
- Electrical power
- Resistance and resistivity
- Ohm's Law
- Internal resistance
- Kirchhoff's Laws
- Series and parallel circuits
- Potential dividers

Learning Objectives

Students should be able to:

- Analyse electrical circuits
- Apply circuit laws
- Solve electrical calculations accurately

Assessment

- Circuit analysis exercises
- Practical investigations

MODULE 6: PARTICLE PHYSICS, CIRCULAR MOTION AND GRAVITATIONAL FIELDS

Duration: Weeks 20–23

Topics Covered

- Atomic structure
- Nuclear structure
- Radioactivity
- Fundamental particles
- Circular motion
- Centripetal force
- Gravitational fields
- Newton's law of gravitation
- Satellites and orbits
- Gravitational potential

Learning Objectives

Students should be able to:

- Explain atomic and nuclear processes
- Solve circular motion problems
- Apply gravitational field equations

Assessment

- Topic tests
- Numerical problem-solving

MODULE 7: THERMAL PHYSICS AND THERMODYNAMICS

Duration: Weeks 24–27

Topics Covered

- Thermal equilibrium
- Temperature scales
- Specific heat capacity
- Specific latent heat
- The mole
- Ideal gases
- Kinetic theory of gases
- Internal energy
- First law of thermodynamics

Learning Objectives

Students should be able to:

- Explain thermal processes
- Apply gas laws
- Analyse thermodynamic systems

Assessment

- Calculations and investigations
- Topic-based assessment

MODULE 8: OSCILLATIONS, ELECTRIC FIELDS AND CAPACITANCE

Duration: Weeks 28–30

Topics Covered

- Simple harmonic motion
- Energy in SHM
- Damping and resonance
- Electric fields
- Coulomb's Law
- Electric potential
- Capacitors
- Energy stored in capacitors
- Capacitor discharge circuits

Learning Objectives

Students should be able to:

- Analyse oscillatory motion
- Solve electric field problems
- Explain capacitor behaviour

Assessment

- Practical exercises
- Timed assessments

MODULE 9: MAGNETIC FIELDS, ELECTROMAGNETIC INDUCTION AND ALTERNATING CURRENTS

Duration: Weeks 31–33

Topics Covered

- Magnetic fields
- Magnetic force on charges
- Magnetic force on conductors
- Hall Effect
- Electromagnetic induction
- Faraday's Law
- Lenz's Law
- Alternating currents
- Rectification and smoothing

Learning Objectives

Students should be able to:

- Explain magnetic field interactions
- Analyse induction phenomena
- Understand AC systems

Assessment

- Laboratory investigations
- Examination-style questions

MODULE 10: MODERN PHYSICS, MEDICAL PHYSICS AND COSMOLOGY

Duration: Weeks 34–36

Topics Covered

- Quantum physics
- Photons
- Photoelectric effect
- Wave-particle duality
- Atomic energy levels
- Nuclear physics
- Ultrasound imaging
- X-rays
- PET scanning
- Astronomy
- Stellar evolution
- Hubble's Law
- Big Bang Theory

Learning Objectives

Students should be able to:

- Explain modern physics concepts
- Describe medical imaging technologies
- Understand the structure and evolution of the universe

Assessment

- Mock examinations
- Comprehensive revision tests

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3. Assessment Framework

Continuous Assessment

Students will be assessed through:

- Weekly assignments
- Numerical problem-solving exercises
- Practical reports
- Topic quizzes

Topic-Based Assessments

At the end of each major topic:

- Structured tests
- Practical investigations
- Data analysis exercises

Practical Skills Assessment

Students will regularly develop skills in:

- Experimental design
- Measurement and observation
- Data presentation
- Graph plotting
- Analysis and evaluation of results

Final Examination Preparation

The final phase of the programme focuses on:

- Intensive past paper practice
- Practical skills review
- Mock examinations
- Examination technique workshops
- Individual performance reviews

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4. Teaching Methodology

PEFA Academy employs a practical and inquiry-based approach that combines:

- Scientific theory
- Mathematical application
- Laboratory investigations
- Data analysis
- Problem-solving techniques
- Real-world applications
- Examination preparation

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5. Programme Outcome

Upon completion of this programme, students should be able to:

- Demonstrate mastery of key Physics concepts
- Apply mathematical techniques to physical problems
- Conduct and evaluate scientific investigations
- Analyse experimental and theoretical data
- Explain natural phenomena using scientific principles
- Progress confidently into higher education programmes in Physics, Engineering, Medicine, Technology, Aviation, Computer Science, and other science-related fields.