Proposed Integrated Curriculum of PHYSICS for
Proficiency Certificate level of T.U., and Grades XI and XII of HSEB

P.C.L. Ist Year / Grade XI

	Theory	Practical	Total
Teaching hour/week	6	2+2	10
Examination weigtage (FM)	75	25	100
Examination duration(Hrs)	3	3	
Total teaching hours	150		

I. Introduction

The curriculum in physics is designed to provide students with sufficient understanding and knowledge of the fundamental principles of physics and their applications. As expected, this curriculum will provide an opportunity to students to see physics as a contribution to life in modern society.

The course demands emphasis on conceptual understanding of the physical phenomena. This will involve the proper utilization of suitable mathematical models and equations. The applications of the physics together with the social and environmental aspects need to be emphasized whenever possible. Students are expected to actively participate in the learning process through experimentation supplemented by demonstration, discussions and problem solving.

2. Objectives

General objectives:

The general objectives of this course are:

a. to consolidate the learning of physics achieved in the secondary school.
b. to understand physics as a coherent and developing framework of knowledge based on fundamental theories of the structure and process of the physical world.
c. to develop the skills of experimenting, observing, interpreting data, evaluating evidence and formulating generalizations and models.
d. to understand the principles and applications of physics contributing to the technology for the betterment of life.
e. to apply quantitatively and qualitatively the knowledge and understanding of physical principles.
f. to understand the social, economic, environmental and other implications of physics.
g. to sustain interest in physics and its applications related to everyday experience of life.
h. to appreciate the advancement of physics and its applications as essential for the growth of national economy.

Specific Objective

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

1. explain phenomena in terms of theories and models
2. apply laws and principles;
3. present information in the language of physics or other appropriate form; and
4. design simple experiment to develop relations among physical quantities and draw conclusions.

3. Course contents

Unit -1 Mechanics **70 teaching hours**

1. Physical Quantities- Need for measurements; System of units; S.I. unit; Precision and significant figures; Dimensions; Main uses of dimensional equations. (3 hrs)
2. Vectors- Graphical presentation of vectors; Addition and subtraction of vectors: Parallelogram, triangle and polygon laws of vectors; Resolution of vectors; Unit vectors; Scalar and vector products. (6 hrs)
3. Kinematics- Uniform and non-uniform motion; Average velocity and acceleration, Instantaneous velocity and acceleration; Equation of motion (graphical treatment); Motion of a freely falling body; Relative velocity; Projectile motion (3 hrs)
4. Laws of Motion-Newton's laws of motion: Inertia, force, linear momentum, impulse; Conservation of linear momentum; Free- body diagrams; Solid friction: Laws of solid friction and their verifications; Application of Newton's laws: Particle in equilibrium, dynamics of particle. (8 hrs)
5. Work and Energy-Work: Work done by a constant force and a variable force; Power; Energy: Kinetic energy; Work- energy theorem; Potential energy; Conservation of energy; Conservative and non-conservative forces; Elastic and inelastic collisions. (4 hrs)
6. Circular Motion- Angular displacement, velocity and acceleration; Relation between angular and linear velocity and acceleration; Centripetal acceleration; Centripetal force; Conical pendulum; Motion in a vertical circle; Motion of cars and cyclist round a banked track. (5 hrs)
7. Gravitation-Newton's law of gravitation; Acceleration due to gravity, g; Mass and weight; Gravitational field strength; Variation in value of 'g' due to altitude, depth and rotation of the earth; Weightlessness; Motion of a satellite: Orbital velocity and time period of the satellite, geostationary satellite, potential and kinetic energy of the satellite; Gravitational potential; Gravitational potential energy; Escape velocity; Black holes. (9 hrs)
8. Equilibrium – Moment of forces; Torque; Torque due to a couple; Center of mass; Center of gravity, Conditions of equilibrium. (2 hrs)
9. Rotational Dynamics- Rotation of rigid bodies; Equation of angular motion; Relation between linear and angular kinematics; Kinetic energy of rotation of rigid body; Moment of inertia; Radius of gyration; Moment of inertia of a uniform rod; Torque and angular acceleration for a rigid body; Work and power in rotational motion, Angular momentum, conservation of angular momentum. (8 hrs)
10. Elasticity - Hooke's law: Force constant, verification of Hooke's law; Stress; Strain; Elasticity and plasticity; Elastic modulus: Young modulus and its determination, bulk modulus, shear modulus, Poisson's ratio; Elastic potential energy. (6 hrs)

11. Periodic motion- Oscillatory motion; Circle of reference; Equation of simple harmonic motion (SHM); Energy in SHM; Application of SHM: Motion of a body suspended from coiled spring, angular SHM, simple pendulum; Damped oscillation; Forced oscillation and resonance. (6 hrs)
12. Fluid mechanics- Fluid statics: Density; Pressure in a fluid ;Archimedes principle; Buoyancy;
    Surface tension: Molecular theory of surface tension; Surface energy; Angle of contact and capillarity; Measurement of coefficient of surface tension by capillary tube method;
    Fluid Dynamics: Newton's formula for viscosity in a liquid; Coefficient of viscosity; Laminar and turbulent flow; Poiseuille's law(method of dimensions); Stokes law and its applications; Measurement of viscosity of viscous liquid ; Equation of continuity, Bernoulli's equation and its applications. (10 hrs)

Unit-2 Heat and Thermodynamics 40 teaching hours

1. Heat and temperature- Concept of temperature: Thermal equilibrium;
   Thermal expansion: Linear expansion, cubical expansion and their relation; Measurement of linear expansivity;
   Liquid Expansion: Absolute and apparent expansion of liquid, Measurement of absolute expansivity by Dulong and Petit method. (5 hrs)
2. Quantity of heat -Heat capacity and specific heat capacity; Newton's law of cooling; Measurement of specific heat capacity of solids by the method of mixture and of liquids by the method of cooling;
   Change of phases: Latent heat; Specific latent heat of fusion and vaporization and their measurements by the method of mixture; (5 hrs)
3. Thermal properties of matter- Equation of state: Ideal gas equation; PV- Diagram; molecular properties of matter; Kinetic – molecular model of an ideal gas: Derivation of pressure exerted by gas, average translational kinetic energy of a gas molecule, Boltzman constant, root mean square speed; Heat capacities: Heat capacities of gases and solids. (8 hrs)
4. Hygrometry – Saturated and unsaturated vapor pressure; Behavior of saturated vapor; Boiling point; Triple point and critical point; Dew point; Absolute humidity; Relative humidity and its determination. (3 hrs)
5. Transfer of heat-Conduction: Thermal conductivity and its determination by Searle method ;
   Convection: convective coefficient;
   Radiation: Ideal radiator; Black- body radiation; Stefan – Boltzmann law; (4 hrs)
6. First law of thermodynamics- Thermodynamic systems; Work done during volume change; Heat and work; Internal energy and First law of thermodynamics; Thermodynamic processes: Adiabatic, isochoric, isothermal, isobaric processes; Heat capacities of an ideal gas at constant pressure and volume and relation between them; Isothermal and Adiabatic processes for an ideal gas. (9 hrs)

7. Second law of thermodynamics- Direction of thermodynamic processes; Second law of thermodynamics; Heat engines; Internal combustion engines: Otto cycle,

diesel cycle; Carnot cycle; Kelvin temperature scale; Refrigerator; Entropy and disorder(introduction only) (6 hrs)

Unit- 3 Geometrical Optics 20 teaching hours

1. Reflection at curved mirrors: Convex and concave mirrors; Image in spherical mirrors; Mirrors formula; Real and virtual images; (2 hrs)
2. Refraction at plane surfaces: Laws of refraction; Refractive index; Relation between refractive indices; Lateral shift; Total internal reflection and its applications; critical angle; optical fiber. (3 hrs)
3. Refraction through prisms: Minimum deviation; Relation between angle of prism, minimum deviation and refractive index; Deviation in small angle prism; (3 hrs)
4. Lenses- Spherical lenses; Thin lens formula; Lens maker's formula; Power of a lens; Combination of thin lenses in contact; (4 hrs)
5. Dispersion-Spectrum; Spectrometer; Pure spectrum; Dispersive power; Achromatic lenses; Condition for achromatic lenses in contact; Chromatic aberration; Spherical aberration; Scattering of light – blue color of the sky; (3 hrs)
6. Optical instruments: Human eye; Defects of vision and their correction; Visual angle; Angular magnification; Magnifier; Camera; Compound microscope, Astronomical Telescope (reflection and refraction type). (5 hrs)

Unit-4 Electrostatics 20 teaching hours

1. Electrostatics – Electric charge: Electric charges; Conductors and insulators; Charging by induction, Coulomb's law - Force between two point charges, Force between multiple electric charges; (3 hrs)
2. Electric field: Electric fields; Calculation of electric field due to point charges; Field lines;
   Gauss law: Electric flux; Gauss law and its application: Field of a charged sphere, line charge, plane sheet of charge; (7 hrs)
3. Potential : Potential and potential difference; Potential due to a point charge; Equipotential lines and surfaces; Potential gradient; Potential energy; Electron Volt. (3 hrs)
4. Capacitance and dielectrics: Capacitance and capacitor; Charging and discharging a capacitor through a resistor, Parallel plate capacitor; Combination of capacitors; Energy of a charged capacitor; Effect of a dielectric; Molecular theory of induced charges; Polarization and displacement. (7 hrs)

List of Experiments

A student will perform 24 experiments from the given list:

Introduction

General instruction: Students are expected to learn general ideas of errors, order of accuracy and graphical analysis.

A. Mechanics

1. Use of Vernier Calipers:
   a. Determination of the length, the internal and external diameter of a given tube and calculation of its volume and density

b. Determination of the volume and density of a given rectangular block and verification of the results using a graduated cylinder
c. Determination of the internal diameter, depth and volume of a beaker or calorimeter

2. Use of Spherometer:
   a. Determination of the thickness of a given irregular thin glass plate and calculation of its area using a graduated cylinder.
   b. Determination of the radii of curvatures of a watch glass
   c. Determination of the focal length of a spherical mirror
3. Use of Screw Guage:
   a. Determination of the diameter of a tube (or of a rod) and of a small spherical bob and calculation of their densities
   b. Determination of the length, volume and density of a tangle of wire
4. Determination of the coefficient of friction for the two surfaces in contact by (i) the horizontal plane method and (ii) an inclined plane method
5. Verification of the principle of moments and the determination of a mass of a given body
6. Use of Simple pendulum:
   a. Determination of the length of seconds pendulum and the value of 'g' in the laboratory.
   b. Verification of the law of length and determination of 'g' in the laboratory by log-log plot of time period versus length of a pendulum.
7. Verification of Archimedes principle and determination of the specific gravity of a solid heavier than and insoluble in water
8. Determination of the specific gravity of
   a. a liquid
   b. a solid lighter than and insoluble in water
   c. a solid heavier than and soluble in water
9. Use of Boyle's law apparatus;
   a. Verification of Boyle's law
   b. Determination of atmospheric pressure in the laboratory without reading a barometer and verification of the result by reading a barometer
10. Use of Young's Modulus apparatus;
    a. Verification of Hooke's law
    b. Determination of Young's modulus of elasticity of the material of a given wire
11. Determination of the surface tension of water by capillary tube method
12. Determination of the coefficient of viscosity of liquid by Stoke's method

B. Heat

13. Calibration of a given thermometer and determination of the correct temperature of the tap water
14. Use of Pullinger's apparatus;
    Determination of the linear and cubical expansivity of a rod
15. Use of Regnault's apparatus:
    a. Determination of specific heat capacity of a solid by the method of mixture
    b. Determination of specific heat capacity of a liquid by the method of mixture
16. Determination of specific heat capacity of a liquid by the method of cooling

17. Determination of latent heat of fusion of ice
18. Determination of latent heat of vaporization of water
19. Determination of the melting point of a solid by (i) cooling curve method and (ii) capillary tube method
20. Determination of the coefficient of thermal conductivity of a good conductor by Searle's method

C. Geometrical Optics

21. Reflection of light:
    a. Verification of laws of reflection of light,
    b. Verification of law of rotation of light,
22. Use of rectangular glass slab:
    a. Verification of laws of refraction of light,
    b. Study of the variation of lateral shift with angle of incidence and determination of the thickness of the slab,
23. Use of traveling microscope:
    Determination of the refractive index of a glass slab
24. Determination of the refractive index of a prism by i) symmetry method and
    ii) I-D curve method
25. Determination of the focal length of (a) a concave mirror and (b) a convex mirror
26. Determination of focal length of (a) a convex lens by double pin method and (b) a convex lens by displacement method
27. Determination of the focal length of a concave lens by using convex lens,
28. Determination of the refractive index of the material of a plano- convex lens,

Laboratory manual

I. Certificate Level Physics Practical Guide, U.P. Shrestha, Ratna Pustak Bhandar, Kathmandu
II. Elementary Practical Physics, Dr. Naryan Hari Joshi, Taleju Prakasan

4. Teaching strategies;

- Lecturing
- Group interaction
- Problem solving
- Demonstration
- Evaluation

5. Instructional materials

Text book:

1. University Physics, Sears F.W, M.W. Zemansky, H.D. Young and R.A. Freedman, 11^{th} edition, Pearson Education Singapore,2004

Reference books:

2. Advanced level Physics, Nelkon and Parker, Heimesmann Education Book Ltd.,2000
3. Advanced Physics Tom Duncan, John Murray Publishers LTD, 2000

6. Evaluation Scheme

Unit	Teaching Hours	LAQ	SAQ	Numerical Problem	Mark distribution			Total
					LAQ	SAQ	Numerical Problems	
Mechanics	70	3/4	5/7	3/4	5+5+4	2 x 5=10	5+3+3	35
Heat and Thermodyna-mics	40	2/3	3/4	2/2	4+4	2 x 3 = 6	3+3	20
Geometrical Optics	20	1/2	1/2	1/1	4	2	4	10
Electrostatics	20	1/2	1/2	1/1	4	2	4	10
Total	150	7/11	10/15	7/8	30	20	25	75

Note:

LAQ: Long answer questions

SAQ: Short answer questions

a. Q.No.1,5,8,and10 the first questions of group A, B,C and D, respectively should contain 7, 4, 2, and 2 conceptual questions each carrying 2 marks, out of which students should give answers as indicated in the table.
b. In the table numerator denotes the number of questions to be attempted and denominator denotes the number of questions asked. For example, 3/4 means 3 questions are to be answered out of 4 questions.
c. Short answer questions should cover the entire course as far as possible. These questions should be of conceptual type.
d. Each of the questions numbering 2, 3, 6, 7, 9, 10 and 11 contains a long answer theory question and a numerical problem carrying marks as specified in the table.
e. There will be only one specific ‘or’ choice in one of the questions of LAQ type in each group.
f. There will be one specific ‘or’ choice for numerical problem in mechanics.

Proposed Integrated Curriculum of PHYSICS for
Proficiency Certificate level of T.U., and Grades XI and XII of H.S.E.B.

P.C.L. 2nd Year / Grade XII

	Theory	Practical	Total
Teaching hour/week	6	2+2	10
Examination weightage (FM)	75	25	100
Examination duration(Hrs)	3	3	
Total teaching hours	150		

Unit-1 Waves and Optics **40 Teaching Hours**

Waves (23 Hrs)

1. Wave motion- Wave motion; Longitudinal and transverse waves; Progressive and stationary waves; Mathematical description of a wave. (4 hrs)
2. Mechanical waves- Speed of wave motion; Velocity of sound in solid and liquid; Velocity of sound in gas; Laplace's correction; Effect of temperature, pressure and humidity on velocity of sound. (5 hrs)
3. Waves in pipes and string- Stationary waves in closed and open pipes; Harmonics and overtones in closed and open organ pipes; End correction in pipes; Resonance tube experiment;
   Velocity of transverse waves along a stretched string; Vibration of string and overtones; Laws of vibration of fixed string, (6 hrs)
4. Acoustic phenomena - Sound waves: Pressure amplitude; Characteristics of sound: Intensity, loudness, quality and pitch; Beats; Doppler's effect; Infrasonic and ultrasonic waves; Noise pollution: Sources, health hazard and control. (8 hrs)

Physical Optics (17 Hrs)

1. Nature and propagation of light : Nature and sources of light; Electromagnetic spectrum; Huygen's principle; Reflection and refraction according to wave theory; Velocity of light: Foucault's method; Michelson's method; (6 hrs)
2. Interference: Phenomenon of Interference; Coherent sources; Young's two slit experiment; Newton's ring; (4 hrs)
3. Diffraction: Diffraction from a single slit; Diffraction pattern of image; Diffraction grating; Resolving power of optical instruments; (4 hrs)
4. Polarization: Phenomenon of polarization; Brewster's law; transverse nature of light; Polaroid; (3 hrs)

Unit- 2 Electricity and magnetism **55 Teaching Hours**

Current Electricity (20 hours)

1. D.C. Circuit - Electric current; Drift velocity and its relation with current; Ohm's law; Electrical Resistance; Resistivity; Current- voltage relations; Ohmic and non Ohmic resistance; Resistances in series and parallel, Potential Divider, Conversion of galvnometer into voltmeter and ammeter, Ohmmeter; Electromotive force: Emf of a

source, internal resistance; Work and power in electrical circuits; Joule's law and its verification. (9 hrs)

2. Electrical circuits- Kirchhoffs laws; Wheatstone bridge circuit; P.O.Box, meter bridge; Potentiometer: Comparison of e.m.f., measurement of internal resistances of a cell. (7 hrs)
3. Thermoelectric effects- Seebeck effect; Thermocouples, Peltier effect: Variation of thermoelectric emf with temperature; Thermopile; Thomson effect; (2 hrs)
4. Chemical effect of current- Faraday's laws of electrolysis; Faraday's constant, Verification of Faraday laws of electrolysis. (2 hrs)

Magnetic Field of current (35 Hours)

1. Magnetic field –Magnetic field lines and magnetic flux; Oersted's experiment; Force on moving charge; Force on a conductor; Force and Torque on rectangular coil,; Moving coil galvanometer; Hall effect; Magnetic field of a moving charge; Biot and Savart law and its application to (i) a circular coil (ii) a long straight conductor (iii) a long solenoid; Ampere's law and its applications to (i) a long straight conductor (ii) a straight solenoid (ii) a toroidal solenoid; Force between two parallel conductors carrying current- definition of ampere, (14 hrs)
2. Magnetic properties of materials- Elements of earth magnetism and their variation; Dip and Dip circle; Flux density in magnetic material; Relative permeability; Susceptibility; Hysteresis; Dia,-para- and ferro-magnetic materials. (5 hrs)
3. Electromagnetic Induction- Faraday's laws; Induced electric fields, Lenz's law, Motional electromotive force; A.C. generators; Eddy currents; Self inductance and mutual inductance; Energy stored in an inductor; Transformer. (8 hrs)
4. Alternating Currents – Peak and rms value of AC current and voltage; AC through a resistor, a capacitor and an inductor; Phasor diagram, Series circuits containing combination of resistance, capacitance and inductance; Series Resonance, Quality factor ;Power in AC circuits: Power factor; Choke coil. (8 hrs)

Unit-3 Modern Physics **55 Teaching Hours**

1. Electrons and Photons- Electrons: Milikan's oil drop experiment; Gaseous discharge at various pressure; Cathode rays; Motion of electron beam in electric and magnetic fields; Thomson's experiment to determine specific charge of electron;
   Photons: Quantum nature of radiation; Einstein's photoelectric equation; Stopping potential; Measurement of Planck's constant; Milikan's experiment. (10 hrs)
2. Solids and semi- conductor devices- Structure of solids; Energy bands in solids (qualitative ideas only); Difference between metals, insulators, and semi conductors using band theory; Intrinsic and extrinsic semi- conductors; P-N junction; Semi-conductor diode: Characteristics in forward and reverse bias; Full wave rectification; Filter circuit; Zener diode; Transistor: Common emitter characteristics; Logic gates, OR, AND, NOT, NAND and NOR. (11 hrs)
3. Quantization of energy- Bohr's theory of hydrogen atom; Spectral series; Excitation and ionization potentials; Energy level, Emission and absorption spectra, de Broglie theory; Duality; Uncertainty principle;
   Lasers: He- Ne laser; Nature and production, properties and uses;

X-rays: Nature and production; Uses; X-rays diffraction; Bragg's law. (9 hrs)

4. Nuclear Physics- Nucleus: Discovery of nucleus; Nuclear density; Mass number, Atomic number; Atomic mass; Isotopes; Einstein's mass-energy relation; Mass defect; Binding energy; Fission and fusion; (6 hrs)
5. Radioactivity: Alpha-particles; Beta-particles; Gamma rays; Laws of radioactive disintegration; Half-life and decay constant; Geiger-Muller tube; Radio carbon dating; Medical use of nuclear radiation; Health hazards and safety precautions. (7 hrs)
6. Nuclear energy and other sources of energy – Sources of energy; Conservation and degradation of energy; Transformation of energy,
   Nuclear energy: Energy released from fission and fusion; Thermal and Hydroelectric power; Wind energy; Biofuels; Solar Energy: Solar constant, solar devices; Global energy consumption pattern and demands; Energy use in Nepal;
   Fuels and pollution: Global Warming; Acid rain. (9 hrs)
7. Particle physics and cosmology – particles and antiparticles, Quarks and Leptons, baryons, mesons;
   Universe - Hubble law; Big bang; Critical density; Dark matter, (3 hrs)

List of experiments

A student will perform at least 24 experiments from the given list:

Introduction

General instruction: Students are expected to learn general ideas of errors, order of accuracy and graphical analysis. Students are also expected to learn the physical principles and theory of experiments on magnetism not covered in the theory curriculum.

A. Waves and Optics

1. Determination of the wavelength of sodium light by measuring the diameter of Newton's rings,
2. Determination of the wavelength of a given monochromatic source of light by using a plane diffraction grating
3. Determination of the refractive index of a given transparent medium and calculation of the speed of light in the medium
4. Use of laser beams:
   i) Determination of the wavelength of He- Ne laser light
   ii) Determination of the diameter of a given hair
5. Use of Sonometer:
   i) Determination of the frequency of a given tuning fork
   ii) Comparison of frequencies of two tuning forks
6. Determination of the frequency of A. C. mains
7. Use of Resonance tube:
   i) Determination of the velocity of sound in air at NTP
   ii) Comparison of frequencies of two tuning forks
8. Determination of the end correction of the resonance tube apparatus,

B. Electricity

9. Verification of Ohm's Law
10. Use of P.O.Box;
    i) Determination of the resistivity of the material of a given wire
    ii) Verification of the laws of series and parallel resistances
11. Use of meter bridge:
    i) Comparison of resistances of two given wires
    ii) Determination of resistivity of the material of a given wire
    iii) Verification of the laws of series and parallel resistances
12. Determination of high resistance by substitution method.
13. Determination of the capacitance of a capacitor by charging and discharging a capacitor
14. Use of Potentiometer:
    i) Comparison of emf's of two cells
    ii) Comparison of resistances of two given wires
    iii) Determination of the internal resistance of a cell
15. Conversion of a given galvanometer into an ammeter and a voltmeter of desired range.
16. Calibration of a given ammeter and voltmeter.
17. Determination of the half-life of a circuit containing a pure capacitor in series with a resistance in a D.C. circuit
18. Use of a series LCR circuit:
    i) Determination of the resonant frequency of a series LCR circuit
    ii) Determination of the quality factor of a series LCR circuit

C. Magnetism

19. Determination of the pole strength and magnetic moment of a bar magnet by locating the neutral points keeping:
    i) North pole pointing towards the geographical south
    ii) North pole pointing towards the geographical north
20. Use of deflection magnetometer:
    i) Determination of the pole strength and magnetic moment of a bar magnet
    ii) Comparison of magnetic moments of two bar magnets
21. Use of oscillation magnetometer:
    i) Determination of the pole strength and magnetic moment of a bar magnet
    ii) Comparison of magnetic moments of two bar magnets.
22. Use of dip circle:
    Determination of the angle of dip in the laboratory,

D. Modern Physics

23. Study of the characteristics of a junction diode
24. Study of the characteristics of a transistor
25. Study the characteristics of a Zener diode
26. Study of AND, OR, and NOT gates,
27. Determination of Planck's constant using a photocell

Laboratory manual

III. Certificate Level Physics Practical Guide, U.P. Shrestha, Ratna Pustak Bhandar, Kathmandu
IV. Elementary Practical Physics, Dr. Naryan Hari Joshi, Taleju Prakasan

4. Teaching strategies;

- Lecturing
- Group interaction
- Problem solving
- Demonstration
- Evaluation

5. Instructional materials

Text book:

1. University Physics, Sears F.W, M.W. Zemansky, H.D. Young and R.A. Freedman, 11 th edition, Pearson Education Singapore, 2004

Reference books:

2. Advanced level Physics, Nelkon and Parker, Heimesmann Education Book Ltd.
3. Advanced Physics, Tom Duncan, John Murray publishers LTD, 2000

6. Evaluation Scheme

Unit	Teaching Hours	LAQ	SAQ	Numerical Problem	Mark distribution			Total
					LAQ	SAQ	Numerical Problem	
Waves and Optics	23 +17	1/2 +1/2	3/3	1/1 +1/1	4+4	6	3+3	20
Electricity and Magnetism	55	3/4	4/6	2/3	4+4+4	8	5+3	28
Modern Physics	55	3/4	4/6	2/2	4+4+4	8	4+3	27
Total	150	8/12	10/15	6/7	32	22	21	75

Note:

LAQ: Long answer questions
SAQ: Short answer questions

a. Q.No.1, 4 and 8 the first questions of group A, B and C respectively should contain 3, 6 and 6 conceptual questions each carrying 2 marks, out of which students should give answers as indicated in the table.
b. In the table numerator denotes the number of questions to be attempted and denominator denotes the number of questions asked. For example, 3/4 means 3 questions are to be answered out of 4 questions
c. Short answer questions should cover the entire course as far as possible. These questions should be of conceptual type.
d. Each of the questions numbering 2, 3, 5, 6, 9 and 10 contains a long answer theory question and a numerical problem carrying marks as specified in the table. Q.No.7 and 11 contain only a long answer theory question.
e. There should be two short answer questions from wave unit and one from optics unit
f. There will be only one specific 'or' choice in one of the questions of LAQ type in each group.
g. There will be one specific 'or' choice for numerical problem in electricity and magnetism.

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