PHYSICS

Rationale

The two year Pre-University course of Karnataka PU Education is a very crucial and challenging stage of the education of any student in the state. It is the transition from general undifferentiated curriculum of the SSLC to specialized discipline-based, content area-oriented courses. It should also provide a strong base for the students with a purpose of pursuing their future careers in basic sciences or professional courses like engineering or medicine or studying courses in applied area of science and technology at tertiary level. In the light of the tremendous advances made in science and technology all over the world, there is an urgent need to provide the learners with sufficient conceptual as well as application oriented knowledge in physics at the PU level. This would make them competent to take the challenges of academic and professional courses.

In revising and updating the syllabus in physics, the existing syllabus for the PU course, the syllabus from other states and other streams like ICSE, CBSE have been taken into account. The suggestions made by various academia has also been thoroughly analysed. The syllabus is framed after detailed analysis of the large expansion of physics knowledge, understanding capabilities of students and the use of available information as an integral part of teaching-learning process. Further, it has to be stressed that it is essential to develop linkages between the higher secondary stage and the tertiary level curricula for better learning of physics concepts that will enhance the knowledge, understanding and application skills of the learner-

Objectives

The two year physics curriculum attempts to make the learner

- Develop competence to pursue science based professional courses like engineering and medicine and pure science courses at tertiary level.
- Strengthen the concepts developed at the school level.
- Get knowledge, understanding and application abilities about different aspects of physics.
- Get acquainted with basic scientific apparatus and learn about their usage.
- Perform basic experiments to comprehend the concepts in physics.
- Promote problem-solving abilities and creative thinking to develop interest in physics.
- Develop positive scientific attitude and appreciate the contribution of physics towards improvement of quality of life and human welfare.
- Recognize the contributions made by scientists and experience the excitement of physics

- Express ideas scientifically and arrive at judgement without any prejudice.
- Appreciate the role and impact of physics and technology and their linkages with overall national development.
- Acquire and develop scientific attitude, scientific value and scientific outlook

Salient Features

- Emphasis on conceptual understanding, acquiring skills to process, digest, vivisect problem-solving abilities and applications of physics concept.
- Emphasis on SI units, vectors, symbols, nomenclature of physical quantities and formulation as per international standards.
- Emphasis on providing vertical continuity of concepts from secondary to higher secondary stage and horizontal mobility in coverage of the concepts.
- Providing activities and projects for lucid understanding of the concepts in physics and to kindle the scientific interest and methodology in the learners.

SYLLABUS – FIRST YEAR P.U.C.

Note : SI units, symbols and abbreviations as suggested by international bureau of standards should be used. Vector treatment to be adopted.

Unit I

1.1 Introduction to Physics: Physics as study of nature - systematic observation, logical reasoning, model making, theoretical prediction with suitable examples like discovery of Neptune, Comet Haley etc. – Physics for society and technology (List of important discoveries)

1 Hr.

1.2 Scalars and Vectors : Definitions of scalars and vectors with examples, representation of a vector, unit vector, addition and subtraction of vectors, scalar and vector products with examples.

1 Hr.

1.3 Units and Dimensions : Fundamental and derived units – SI Units –dimensions – dimensional formulae – principle of homogeneity of dimensions – dimensional analysis - application to (i) Check the correctness of an equation (ii) Conversion of units (iii) Derivation of an equation - limitations

2 Hr.

Unit 2

Dynamics

2.1 Motion in one dimension: Concept of a particle – position-time graph – velocity-time and acceleration time graph – Derivation of equations of motions from graphs – mention of equations of motion under gravity - relative motion along one dimension – problems.

4 Hr.

2.2 Newton's laws of motion: First law of motion – force and inertia with examples – momentum – second law of motion, derivation of $\vec{F}=m\vec{a}$, mention of spring force $\vec{F}=-k\vec{x}$, mention of basic forces in nature - impulse and impulsive forces with examples – second law as applied to variable mass situation – third law of motion - Identifying action and reaction forces with examples – derivation of law of conservation of momentum with examples in daily life – principle of rocket propulsion – inertial and non-inertial frames – apparent weight in a lift and rocket/satellite. – problems.

4 Hr.

2.3 **Friction:** A self adjusting force – origin of frictional forces – static friction, kinetic friction – limiting friction – laws of friction – coefficient of friction – angle of friction – rolling friction – advantages and disadvantages of friction – methods of reducing friction – problems.

2 Hr.

2.4 **Motion in two and three dimensions :** Projectile motion – derivation of equation for the trajectory of a projectile – derivations of expressions for time of flight, range, maximum height. Uniform circular motion – derivation of expression for centripetal acceleration - cyclist on a curve – banking of roads, mention of expression for angle of banking– qualitative explanation of motion in three dimensions with examples – problems

4 Hr.

2.5 **Work – power – energy:** Work done by a force – $\vec{F}.\vec{S}$ – unit of work – graphical representation of work done by a constant and variable force– power – units of power – energy – derivation of expression for gravitation potential energy and kinetic energy of a moving body – statement of work – energy theorem – mention of expression for potential energy of a spring – statement and explanation of law of conservation of energy – illustration in the case of a body sliding down on an inclined plane – discussion of special case when $\theta = 90^0$ for a freely falling body – explanation of conservative and non conservative forces with examples – explanation of elastic and inelastic collisions with examples – coefficient of restitution – problems.

5 Hr.

2.6. **Rotational motion and rigid body dynamics:** Angular displacement, angular velocity and angular acceleration – mention of equations for angular motion – moment of inertia and radius of gyration – statement of parallel and perpendicular axes theorem – mention of expression of moment of inertia of a thin rod, ring, cylinder, sphere – statement of law of conservation of angular momentum with examples – ballet dancer and diver– problems.

3 Hr.

2.7 **Gravitation:** Statement and explanation of law of gravitation – definition of G – derivation of relation between g and G – mention of expression for variation of g with altitude, depth and latitude – statement and explanation of Kepler's laws of planetary motion – definition of orbital velocity and escape velocity and mention of their expressions - satellites – basic concepts of geo-stationary satellites, launching of satellites – IRS and communication satellites – brief explanation of Inertial mass and gravitational mass – weightlessness – remote sensing and essentials of space communication – problems.

3 Hr.

2.8 **Elasticity** : Stress – strain – Hooke's law – modulii of elasticity – mention of expression of Young's Modulus of elasticity in the case of a stretched string.

1 Hr.

Unit 3

Statics

3.1 **Concurrent Co-planar forces** – Definition of resultant and equilibrant – statement of law of parallelogram of forces – derivation of expression for magnitude and direction of two concurrent coplanar forces – law of triangle of forces and its converse– Lami's theorem – problems.

2 Hr.

3.2 **Moment of a force** – Definition of moment of a force – statement of law of moments and its applications to find the resultant of two like parallel forces – couple – statement of general conditions of equilibrium of forces – problems.

2 Hr.

Unit 4

Fluid Mechanics

4.1 **Fluid Thrust** :–Explanation of fluid thrust and pressure and units of pressure – derivation of $P=\rho gh$ – Pascal's law – mention of its applications –statement and explanation of Archimedes principle – concept of buoyancy – statement and explanation of laws of floatation .

1Hr.

4.2 **Fluid Dynamics** – Explanation of streamline and turbulent motion – mention of equation of continuity - mention of expressions for PE, KE and pressure energy of an element of a liquid flowing through a pipe – statement and explanation of Bernoulli's theorem and its application to uplift of an aircraft, sprayer.

1 Hr.

4.3 **Surface tension** – Concept of adhesive and cohesive forces – definition of Surface energy and surface tension and angle of contact – explanation of capillary rise and mention of its expression – mention of application of surface tension to (i) formation of drops and bubbles (ii) capillary action in wick of a lamp (iii) action of detergents .

1 Hr.

4.4 **Viscosity** – Explanation of velocity gradient – definition of coefficient of viscosity – qualitative explanation of temperature dependence of viscosity with examples – mention of Poiseuille's formula – statement and explanation of Stoke's law (qualitative)

1 Hr.

Unit 5

Heat and Thermodynamics

5.1 **Gas laws** – Statement and explanation of Boyle's law and Charle's law– definition of Pressure and Volume Coefficient of a gas - absolute zero – Kelvin scale of temperature – mention of perfect gas equation – explanation of isothermal and adiabatic changes – mention of Van-der- Waal's equation of state for real gases.

2 Hr.

5.2 **Specific heat capacities of gases** – Definition of Specific heat capacity at constant pressure and at constant volume – Derivation of Mayer's relation – explanation of ratio of specific heat capacity and its importance – explanation of degrees of freedom - law of equipartion of energy.

2 Hr.

5.3 **Mode of heat transfer** – Conduction of heat – steady state – temperature gradient– definition of coefficient of thermal conductivity - basic concepts of convection of heat – radiation – properties of thermal radiation – radiant energy – definition of emissivity and absorptivity – perfect black body –statement and explanation of Kirchhoff's law, Newton's law of cooling – Stefan's law - Wien's displacement and Planck's law – qualitative explanation of solar constant and surface temparature of sun - principle and working of total radiation pyrometer – problems

4 Hr.

5.4 **Thermodynamics:** Statement of Zeroth law and its significance – first law of thermodynamics – explanation of phase diagram – application to isothermal, adiabatic, isobaric, isochoric processes – explanation of reversible and irreversible processes – Carnot's cycle – Carnot's heat engine and mention of expression for efficiency – different statements of second law of thermodynamics – application to refrigerators – qualitative explanation of entropy – mention of Clausius Clapeyron equation and its application in the change of boiling and freezing point – problems.

4 Hr.

Unit 6

Oscillations – Waves and Sound

6.1 **Oscilalltions** – Explanation of Periodic motion with examples – Definition of period , frequency and their relation. Definition of linear displacement and angular displacement Definition and explanations of S.H.M.– mention of characteristics of S.H.M. – mention of equation of S.H.M. – $y = a \sin \omega t$ – mention of expression of velocity and acceleration of a particle executing S.H.M – definition of phase – mention of expression of K.E. and P.E in S.H.M – graphical representation of SHM - – problems.

3 Hr.

6.2 **Waves** – Waves around us - brief note on light waves, sound waves , radio waves , micro waves, seismic waves - wave as a carrier of energy –classification of waves. (i) based on medium – mechanical and electromagnetic waves (ii) based on vibration of particles in the medium – Longitudinal & transverse waves – one, two & three dimensional waves with example - definition of wave amplitude, wave frequency, wave period, wavelength and wave velocity – concept of phase of a wave - derivation $v = f\lambda$ to establish the relation between path difference and phase difference – definition of a progressive wave and its characteristics – derivation of equation of a progressive wave – different forms of a progressive wave equation - definition of wave intensity – mention of expression of wave intensity and its unit – statement and explanation of principle of superposition of waves with examples – problems.

4 Hr.

6.3 **Sound** – Properties of sound – speed of sound in a gas – explanation of Newton's formula for speed of sound - correction by Laplace – Newton - Laplace formula-discussion of factors affecting speed i.e. pressure, temperature, humidity and wind – definition of sound intensity – explanation of loudness and its unit – definition of intensity level and its unit –mention of relation between intensity and loudness – distinction between noise and musical note - characteristics of a musical note - phenomenon of beats and its theory – application of beats (i)to find the frequency of a note (ii) to tune the musical instruments– Doppler effect – derivation of expression for apparent frequency in general case and discussion to special cases – qualitative comparision of Doppler effect in sound and light – problems.

5 Hr.

6.4 **Stationary Waves** –Formation of stationary waves – its theory – characteristics - theory of different modes of vibration of air in a closed pipe and in an open pipe – end correction – Vibration in a stretched string - derivation of equation for fundamental frequency & harmonics – laws of transverse vibrations in a stretched string – explanation of forced oscillations, resonance and damped oscillations – problems.

3 Hr.

6.5 **Acoustics of Buildings** – Explanation of reverberation and reverberation time – factors affecting reverberation time – mention of Sabine's formula– mention of optimum reverberation time for speech & music – requisites for good acoustics.

1Hr.

UNIT 7

Earth's atmosphere and Astrophysics

7.1 Earth's Atmosphere: Mention of variation of earth's atmospheric pressure with height – mention of zones of the atmosphere and insolations – ozone layer and its significance – explanation of ionosphere – magnetosphere and Van-Allen Belts – explanation of Arora and its significance.

1 Hr.

7.2 Astrophysics : Mention of physical properties of stars – sun and other main sequence stars – explanation of HR diagram – qualitative explanation of internal temperature and pressure of a star – basic concept of photon diffusion time – mention of mass – luminosity relation of a star – stellar evolution in brief.

3 Hr.

Practical Work

List of experiments for Practicals

Note : 1. A minimum of twelve experiments should be performed, excluding first two. SI units are to be followed

1. Use of Logarithmic and trigonometric tables.
2. Errors and approximations – Calculation of fractional and percentage of error.
3. Vernier Calipers – To find length and radii of a hollow cylinder and calcuation of error.
4. Screw Gauge– To find diameter of a wire, sphere and thickness of a plate and calculation of error.
5. To find 'g' at a place using simple pendulum.
6. Equilibrium of concurrent coplanar forces – to verify the law of parallelogram, triangle of forces and Lami's theorem and to determine an unknown weight.
7. Moment bar –Equilibrium of parallel forces.
8. Spring constant – Load extension graph and force constant.
9. Archimedes principle – specific gravity of solids and liquids and estimation of error.
10. Surface tension of water – capillary rise.
11. Coefficient of viscosity of water by Poiseulle's formula – estimation of error.
12. Specific heat of a solid – method of mixtures.
13. To verify Newton's law of cooling.

14. Resonance air column – to determine the speed of sound in air – and hence to find speed at 0^0 C.

15. Sonometer – To find frequency of tuning fork by absolute method.

16. Meldes' experiment – to determine the frequency of an electrically maintained tuning fork by transverse mode.

Scheme for Practical Examination

The practical examination will be for a duration of two hours. The maximum marks allotted is twenty.

The scheme for allotment of marks is as follows:

1.	Relevant formula for the experiment (if there are two formulae 1 mark each)	2 marks
2.	For electrical experiments circuit diagram and for other experiments brief explanation of experimental set up	2 marks
3.	Brief procedure of the experiment	3 marks
4.	Tabular column of the experiment	1 mark
5.	Observations and entering the reading in tabular column	3 marks
6.	Substitution and calculation using log tables	3 marks
7.	Result with unit and accuracy	2 marks
8.	Record writing	04 marks
	Total	**20 marks**

SUGGESTED ACTIVITIES AND INVESTIGATORY PROJECTS

I ACTIVITIES

1. To make a paper scale of a given least count.
2. To measure the force of limiting friction for a wooden block moving on rollers on a horizontal surface.
3. To study the conservation of energy of a ball rolling down on an inclined plane (using a double inclined plane)
4. To study the variation of range of a jet of water by varying the angle of projection.

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II PROJECTS

1. To study the first law of motion by Galileo experiment using the double inclined track ie., a pair of inclined tracks each of which can be independently set at a small angle in inclination by plotting a graph between its sine (ie., perpendicular/hypotenuse) and the distance of ascent.
2. To estimate the size of a molecule of an oil.
3. To study the factors affecting the resonant length of closed pipe.
4. To determine the specific gravity of a stone using a sonometer.

NOTE: The above are only specimens of activities and investigatory projects. In order to arouse creativity/innovativeness, the students must be encouraged to take up new activities/projects (other than the ones mentioned above) in consultation with the teacher concerned. Many such activities/projects can be suggested by the teachers to encourage the students. The activities and projects do not carry any marks.

SYLLABUS – SECOND YEAR P.U.C.

Note : SI units, symbols and abbreviations as suggested by International Bureau of Standards should be used. Vector treatment to be adopted.

Unit I

Geometrical Optics

1.1 **Refraction at a plane surface** : Refraction through a parallel sided glass slab - derivation of expressions for lateral shift, and normal shift (object in a denser medium) – total internal reflection and its applications - optical fibers and its application in communication – problems

3 Hr.

1.2 **Refraction through a prism** : Derivation of expression for the refractive index in terms of A and D – dispersion through a prism – experimental arrangement for pure spectrum – deviation produced by a thin prism – dispersive power – mention of condition for dispersion without deviation – problems.

2 Hr.

1.3 **Refraction at a spherical surface** – derivation of the relation connecting n, u, v and r for refraction at a spherical surface (concave towards a point object in a denser medium) – derivation of lens maker's formula – power of a lens – magnification – derivation of expression for the equivalent focal length of combination of two thin lenses in contact – mention of expression for equivalent focal length of two thin lenses separated by a distance – problems.

3Hr.

Unit 2

Physical Optics

2.1 **Introduction to Theories of Light** – A brief explanation of Newton's corpuscular theory, Huygens' wave theory and Maxwell's electromagnetic theory – mention of expression for speed of light $C = \frac{1}{\sqrt{\mu_0 \varepsilon_0}}$, qualitative explanation of Hertz's experiment – brief explanation of Planck's quantum theory of radiation –dual nature of light.

1 Hr.

2.2 **Interference** – Explanation of the phenomenon theory of interference – derivation of conditions for constructive and destructive interference –

Young's double slit experiment, derivation of expression for fringe width – qualitative explanation of interference at thin films and Newton's rings – problems.

3 Hr.

2.3 Diffraction – Explanation of the phenomenon – distinction between Fresnel and Fraunhoffer diffraction – qualitative explanation of diffraction at single slit and analysis of diffraction pattern (Fraunhoffer type) – qualitative explanation of plane diffraction grating at normal incidence – limit of resolution – resolving power – Rayleigh's criterion – definition and mention of expression for resolving powers of microscope and telescope – problems.

3 Hr.

2.4 Polarisation – Explanation of the phenomenon - representation of polarised and unpolarised light – explanation of plane of polarisation and plane of vibration – methods of producing plane polarised light : by reflection, – Brewster's law, refraction, double refraction, selective absorption – construction and application of polaroids – optical activity – specific rotatory power – construction and working of Laurent's half shade polarimeter – mention of circularly and elliptically polarised light - problems.

4 Hr.

2.5 Speed of light – Michelson's rotating mirror experiment to determine speed of light – importance of speed of light.

1 Hr.

Unit 3

Electrostatics

3.1 Electric charges – Concept of charge – Coulomb's law, absolute and relative permitivity – SI unit of charge.

1 Hr.

3.2 Electrostatic Field – Concept of electric field – definition of field strength – derivation of expression for the field due to an isolated charge, concept of dipole – mention of expression for the field due to a dipole – definition of dipole moment – mention of expression for torque on a dipole – explanation of polarisation of a dielectric medium – dielectric strength –concept of lines of force and their characteristics – explanation of electric flux - statement and explanation of Gauss theorem and its applications to derive expressions for electric intensity (a) near the surface of a charged conductor (b) near a spherical conductor - concept of electric potential – derivation of the relation between electric field and potential – derivation of expression for

potential due to an isolated charge – explanation of potential energy of a system of charges - problems.

4 Hr.

3.3 **Capacitors** – Explanation of capacity of a conductor and factors on which it depends – definition of capacitance and its unit – derivation of expression for capacity of a spherical conductor – principle of a capacitor – derivation of expression for capacitance of parallel plate capacitor – mention of expression for capacitance of spherical and cylindrical capacitors – derivation of expression for energy stored in a capacitor – derivation of expression for equivalent capacitance of capacitors in series and parallel – mention of uses of capacitors – problems.

4 Hr.

Unit 4

Current electricity

4.1 **Electric current** : Microscopic view of current through conductors (random motion of electrons) – explanation of drift velocity and mobility – derivation of expression for current $I = neAv_d$ – deduction of Ohm's law – origin of resistance – definition of resistivity – temperature coefficient of resistance – concept of super conductivity – explanation of critical temperature , critical field and high temperature superconductors – mention of uses of superconductors – thermistors and mention of their uses – colour code for resistors – derivation of expression for effective resistance of resistances in series and parallel – derivation of expression for branch currents – definition of emf and internal resistance of a cell – Ohm's law applied to a circuit – problems.

4 Hr.

4.2 **Kirchoff's laws** – Statement and explanation of Kirchoff's laws for electrical network - explanation of Wheastone's network – derivation of the condition for its balance by applying Kirchoff's laws – principle of metre bridge – problems.

2 Hr.

4.3 **Magnetic effect of electric current** – Magnetic field produced by electric current – statement and explanation of Biot – Savart's (Laplace's) law – derivation of expression for magnetic field at any point on the axis of a circular coil carrying current and hence expression for magnetic field at the centre – current in a circular coil as a magnetic dipole – explanation of magnetic moment of the current loop – mention of expression for the magnetic field due to (i) a straight current carrying conductor (ii) at a point on the axis of a solenoid– basic concepts of terrestrial magnetism –

statement and explanation of Tangent law – construction and theory of tangent galvanometer – problems.

4 Hr.

4.4 **Mechanical effect of electric current** – Mention of expression for force on a charge moving in magnetic field – mention of expression for force on a conductor carrying current kept in a magnetic field – statement of Fleming's left hand rule – explanation of magnetic field strength in terms of flux density – derivation of expression for the force between two parallel conductors carrying currents and hence definition of ampere – mention of expression for torque on a current loop kept in an uniform magnetic field – construction and theory of moving coil galvanometer – conversion of a pointer galvanometer into an ammeter and voltmeter – problems.

3 Hr.

4.5 **Electromagnetic induction** – Statement and explanation of Faraday's laws of electromagnetic induction and Lenz's law – derivation of expression for emf induced in a rod moving in a uniform magnetic field – explanation of self induction and mutual induction – mention of expression for energy stored in a coil – explanation of eddy currents – alternating currents – derivation of expression for sinusoidal emf – definition of phase and frequency of ac – mention of the expression for instantaneous, peak, rms, and average values – derivation of expression for current in case of ac applied to a circuit containing (i) pure resistor (ii) inductor (iii) capacitor – derivation of expression for impedance and current in LCR series circuit by phasor diagram method – explanation of resonance – derivation of expression for resonant frequency – brief account of sharpness of resonance and Q – factor – mention of expression for power in ac circuits – power factor and wattless current – qualitative description of choke – basic ideas of magnetic hysteresis – construction and working of transformers – mention of sources of power loss in transformers – ac meters – principle and working of moving iron meter – qualitative explanation of transmission of electrical power – advantages of ac and dc - problems.

6 Hr.

Unit 5

Atomic Physics

5.1 **Introduction to atomic physics** – Mention of the types of electron emission – description and theory of Dunnington's method of finding e/m of an electron – explanation of types of spectra; emission and absorption spectra – brief account of Fraunhoffer lines– qualitative explanation of electromagnetic spectrum with emphasis on frequency.

2 Hr.

5.2 **Photo electric Effect:** Explanation of photo electric effect – experiment to study photo electric effect – experimental observations – Einstein's photo electric equation and its explanation – principle and uses of photo cells: (i)photo emissive (ii) photo voltaic (iii) photo conductive cells –problems.

2 Hr.

5.3 **Dual nature of matter** – Concept of matter waves – arriving at the expression for de Brogile Wave length – principle and working of G.P. Thomson's experiment – principle of Electron Microscope, Scanning Electron Microscope, Transmission Electron Microscope and Atomic Force Microscope.

2 Hr.

5.4 **Bohr's Atom model** : Bohr's atomic model for Hydrogen like atoms – Bohr's postulates – arriving at the expressions for radius, velocity, energy and wave number – explanation of spectral series of Hydrogen –energy level diagram – explanation of ionization and excitation energy – limitations of Bohr's theory – qualitative explanation of Sommerfeld & Vector atom models – problems.

3 Hr.

5.5 **Scattering of light** : Explanation of coherent and incoherent scattering – blue of the sky and sea – red at sunrise and sunset – basic concepts and applications of Raman effect.

1 Hr.

5.6 **Lasers** : Interaction between energy levels and electromagnetic radiation – laser action – population inversion – optical pumping – properties of lasers – construction and working of Ruby laser – mention of applications of lasers – brief account of photonics

2 Hr.

5.7 **Nuclear Physics** : Characteristics of nucleus – qualitative explanation of liquid drop model – qualitative explanation of nuclear magnetic resonance (NMR) and its applications in medical diagnostics as MRI – nuclear forces and their characteristics – explanation of Einsteins mass – energy relation – definition of amu and eV – arriving at 1amu=931 Mev – examples to show the conversion of mass into energy and vice- versa – mass defect – binding energy – specific binding energy - BE curve - packing fraction.

Nuclear fission with equations – nuclear chain reaction – critical mass – controlled and un-controlled chain reactions – types of nuclear reactors and mention of their principles – disposal of nuclear waste.
Nuclear fusion – stellar energy (carbon & proton cycles) – problems.

4 Hr.

5.8 **Radioactivity** : Laws of radioactivity - (i)Soddy's group displacement laws – (ii) decay law – derivation of $N = N_o.e^{-\lambda t}$ – explanation of decay constant– derivation of expression for half life– mention of expression for mean life– relation between half and mean life – units of activity ; Bequerrel and Curie – Artificial transmutation : Artificial radioactivity – radio isotopes and mention of their uses – brief account of biological effects of radiations and safety measures – problems.

3 Hr.

5.9 **Elementary particles** – Basic concepts of leptons and hadrons - qualitative explanation of β - decay – neutrino hypothesis and Quarks.

1 Hr.

5.10 **Solid state electronics** – Qualitative explanation of Band theory of solids– classification of conductors, insulators and semiconductors – intrinsic and extrinsic semiconductors – p-type and n-type semiconductors – construction and action of pn – junction – forward and reverse biasing – half wave and full wave rectification – function and application of light emitting diodes – photo diode – laser diode – transistors – npn and pnp transistors – action of transistor – npn transistor as an amplifier in CE mode.

4 Hr.

5.11 **Digital Electronics** - Logic gates – AND, OR, NOR & NAND symbols and truth table – applications of logic gates (Boolean equations) – half adder and full adder.

1 Hr.

5.12 **Soft condensed matter physics** – Liquid crystals – classification, thermotropic (nematic, cholesteric and smectic) and lyotropic liquid crystals – mention of applications of liquid crystals – basic concepts of emulsions, gels & foams

2 Hr.

Practical Physics

II PUC

Note : A minimum of fourteen experiments should be performed

1. To find f by shift method and n of a convex lens– estimation of error.
2. To find the dispersive power of a prism using spectrometer.
3. Air wedge – to determine thickness of paper from interference pattern.
4. Grating – to determine wavelength of mercury spectral lines by minimum deviation method using spectrometer.
5. Polarimeter – specific rotation of sugar solution.
6. Ohm's law – verification of laws of combination of resistances – estimation of error.
7. Meter bridge – resistivity of the material of a wire.
8. Thermistor – temperature coefficient of resistance using a meter bridge
9. Potentiometer – determination of internal resistance of cell.
10. Current sensitivity of a pointer galvanometer.
11. Conversion of a galvanometer into a voltmeter, given current sensitivity.
12. Determination of reduction factor and B_H using T.G.
13. Joule's calorimeter – specific heat of a liquid.
14. Self inductance of a coil – direct method (by measuring impedance of a R-L circuit).
15. Forward bias characteristics of a semiconductors diode – determination of knee voltage and forward bias resistance.
16. Logic gates – AND and OR gates using diodes – verification of truth table.
17. Determination of capacitance by studying variation of voltage during charging & discharging of a capacitor.

Scheme for Practical Examination

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6.	Substitution and calculation using log tables	3 marks
7.	Result with unit and accuracy	2 marks
8.	Record writing	04 marks
	Total	**20 marks**

SUGGESTED ACTIVITIES AND INVESTIGATORY PROJECTS

I ACTIVITIES

1. To observe the refraction and lateral deviation of a beam of light incident obliquely on a glass slab.
2. To find the refractive index of water forming a liquid lens.
3. To observe diffraction of light due to a thin slit between sharp edges of razor blades.
4. To study the relation between angle of incidence (i) and angle of deviation (d) in a prism and to draw the i-d curve.
5. To understand the difference between emf and pd of a cell (emf without load and pd measured when the cell is connected to the same load).
6. To use a multimeter.

II PROJECTS

1. To determine the wavelength of laser beam by diffraction.
2. To study the various factors on which the internal resistance/emf of a cell depends.
3. To study the luminosity of various electric lamps of different make and different powers.
4. To fabricate/assemble a refracting astronomical telescope and study its resolution with different apertures of objective lens.
5. To construct inductors of different dimensions and study the effect of cores.

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