DETAILED SYLLABUS

FOR DISTANCE EDUCATION

Bachelor of Science in Physics.

(BSC PHY)

(YEARLY SYSTEM)

COURSE TITLE: BSC PHYSICS
DURATION : 3 YEAR

FIRST YEAR

COURSE TITLE	MARKS		
	THEORY		TO-TAL
	INTER-NAL	EXTER-NAL	
Classical Mechanics and theory of relativity	40	60	100
Electricity, Magnetism and Electromagnetic Theory	40	60	100
Properties of Matter and Kinetic theory of gases	40	60	100
Semiconductor Devices	40	60	100
Practical	40	60	100

Physics

Paper – I: Classical Mechanics and Theory of Relativity

Unit 1: **Basic concepts of Classical mechanics:** Mechanics of single and system of particles, Conversion law of linear momentum, Angular momentum and mechanical energy for a particle and a system of particles, Centre of Mass and equation of motion, Constrained Motion.

Unit 2: **Generalized Notations:** Degrees of freedom and Generalized coordinates, Transformation equations, Generalized Displacement, Velocity, Acceleration, Momentum, Force and Potential, Hamilton's variational principle, Lagrange's equation of motion from Hamilton's principle, Linear Harmonic oscillator, Simple pendulum, Atwood's machine.

Unit 3: **Theory of relativity:** Reference system, Inertial and Non-inertial frames, Galilean invariance and conservation laws, Newtonian Relativity Principle, Michelson-Morley experiment: search for ether, Lorentz transformations.

Unit 4: **Applications of theory of relativity:** Length Contraction, Time Dilation, Twin Paradox, Velocity addition theorem, Variation of mass with velocity, Mass energy equivalence.

Reference:

1. Classical Mechanics by H. Goldstien (2nd Edition).
2. Berkely Physics Course. Vol. 1. Mechanics by E.M.Purcell
3. Concepts of Modern Physics by Arthur Beiser

Paper – II: Electricity, Magnetism and Electromagnetic theory

Unit I: **Vector background and Electric field:** Gradient of a scalar and its physical significance, Line, Surface and Volume integrals of a vector and their physical significance, Flux of a vector field, Divergence and curl of a vector and their physical significance, Gauss's divergence theorem, Stoke's theorem.

Derivation of electric field E from potential as gradient, Derivation of Laplace and Poisson equations, Electric flux, Gauss's Law, Mechanical force of charged surface, Energy per unit volume.

Unit 2: **Magnetism:** Magnetic induction, Magnetic flux, Solenoidal nature of vector field of induction, properties of $\vec{B}$ (i) $\vec{\nabla}.\vec{B} = 0$, (ii) $\vec{\nabla} \times \vec{B} = \mu\vec{j}$, Electronic theory of dia and paramagnetism, Domain theory of ferromagnetism (Langevin's theory), Cycle of magnetization- hystresis loop (Energy dissipation, Hystresis loss and importance of Hystresis Curve)

Unit 3: **Electromagnetism:** Maxwell equations and their derivations, Displacement current, Vector and Scalar potentials, Boundary conditions at interface between two different media, Propagation of electromagnetic wave (Basic idea, no derivation), Poynting vector and Poynting theorem.

Unit 4: **A. C. Analysis:** A.C. circuit analysis using complex variable with (a) Capacitance and Resistance (CR) (b) Resistance and Inductance (LR) (c) Capacitance and Inductance (LC) (D) Capacitance, Inductance (LR) (c) Capacitance and Inductance (LC) (d) Capacitance, Inductance and Resistance (LCR), Series and parallel resonance circuit, Quality factor (sharpness of resonance).

Reference:

1. **Electricity and Magnetism by Reitz and Milford (Prentice Hall of India).**
2. **Electricity and Magnetism by A.S. Mahajan and A.A. Rangwala (Tata McGraw Hill)**

Paper – III: Properties of Matter and Kinetic Theory of Gases

Unit I: **Moment of inertia:** Rotation of rigid body, Moment of inertial, Torque, angular momentum, Kinetic energy of rotation. Theorem of perpendicular and parallel axes (with proof), Moment of inertia of solid sphere, hollow sphere, spherical shell, solid cylinder, hollow cylinder and solid bar of rectangular cross – section, Acceleration of a body rolling down on an inclined plane.

Unit 2: **Elasticity:** Elasticity, Stress and Strain, Hook's law, Elastic constant and their relations, Poisson's ratio, Torsion of cylinder and twisting couple, Bending of beam (Bending moment and its magnitude), Cantilever and Centrally loader beam.

Unit 3: **Kinetic theory of gases -I:** Assumption of Kinetic theory of gases, pressure of an ideal gas (no derivation), Kinetic interpretation of Temperature, Ideal Gas equation, Degree of freedom, Law of equipartition of energy and is application for specific heat of gases, Real gases, Vander wall's equation, Brownian motion(Qualitative)

Unit 4: Kinetic theory of gases -II: Maxwell's distribution of speed and velocities (derivation required), Experimental verification of Maxwell's law of speed distribution: most probable speed, average and r.m.s. speed, Mean free path, Transport of energy and momentum, Diffusion of gases.

Reference:

1. **Properties of Matter by D.S. Mathur.**
2. **Heat and Thermodynamics (5th Edition) by Mark W. Zermansky.**

Paper – IV: Semiconductor Devices

Unit I: **Semiconductors:** Energy bands in solids, Intrinsic and extrinsic semiconductors, p-n junction diode and their characteristics, Zener and Avalanche breakdown, Zener diode , Light emitting diodes (LED), Photoconduction in semiconductors, Photodiode, Solar Cell, P-n junction, half wave and full wave rectifiers, Zener diode as a voltage regulator.

Unit 2: **Transistors:** Junction transistors, Working of NPN and PNP transistors, Three configurations of transistor (C-B, C-E, C-C modes), Constants of a transistor, Relation between alpha and beta, Common base, Common emitter and common collector characteristics of transistor, Advantages and disadvantages of C-E configuration.

Unit 3: **Transistor Amplifiers:** Transistor biasing, Methods a of transistor biasing and stabilization, D.C. load line , Common base and Common emitter biasing, Common base and common emitter amplifiers, Classification of amplifiers, Resistance- Capacitance (RC) coupled amplifier (two stage, concept of band width, no derivation), Feedback in amplifiers, Advantages of negative feedback, Emitter follower.

Unit 4: **Oscillators:** Oscillators, Principle of oscillation, classification of oscillators, Condition for self sustained oscillation: Barkhausen criterion for oscillation, Tuned collector common emitter oscillator, Hartley oscillator, C.R.O. (Principle and Working).

Reference:

1. Basic Electronics and Linear Circuits by N.N.Bhargava. D.C. Kulshreshtha and S.C.Gupta (TITI CHD).

2. Solid State Electronics by J.P. Agarwal, Amit Agarwal (Pragati Prakashan, Meerut).

3. Electronics Fundamentals and Applications by J.D. Ryder (Prentice Hall of India).

4. Solid State Electronics by B.L.Theraja

Paper – V: Practicals

Section: A

1. Moment of Inertia of a fly-wheel.
2. M.I. of an irregular body using a torsion pendulum.
3. Surface tension by Jeager's Method.
4. Young's Modulus by bending of beam.
5. Modulus of rigidity by Maxell's needle.
6. Elastic constant by Scarle's method.
7. Viscosity of water by its flow through a uniform capillary tube.
8. Thermal conductivity of a good conductor by Searle's method.
9. Mechanical equivalent of Heat by Callendao and Barue's method.
10. 'g' by Bar pendulum.
11. E.C.E. of hydrogen using an Ammeter.
12. Calibration of a thermocouple by Potentiometer.

Section: B

13. Low resistance by Carey Foster's bridge with calibration.
14. Determination of Impedance of an A.C. circuit and its verification.
15. Frequency of A.C. mains by Sonometer using an electromagnet.
16. Frequency of A. C. mains by Sonometer using an electromagnet.
17. Measurement of angle of dip by earth inductor.
18. High resistance by substitution method.
19. Inductance (L) by Anderson Bridge (A.C. Method).
20. To draw forward and reverse bias characteristics of a semiconductor diode.
21. Zener Diode voltage regulation characteristics.
22. Verification of inverse square law by photo-cell.
23. To study the characteristics of a solar cell.