

Syllabus for Uchcha Madhyamic Paper II STET 2023

UNIT I Subject -----Physics 100 Marks

Unit-1

Mechanics :-

- Error Theory
- Units and dimensions, SI Units, Kinematics of Particle (projectiles and circular motion).
- Dynamics of Particles: forces in nature, Friction, Gravitation, Contact forces
- Work and energy, Momentum and Energy conservation laws, collision in one and two dimensions, Gravitational potential, Satellite, escape speed, variation of g on Earth.
- Centre of mass, moment of force, angular momentum, moment of inertia
- Analytical Mechanics: Generalised co-ordinates and velocities, Hamilton's Principle, Lagrangian and the Euler- Lagrange equation, Hamilton's equations of motion.
- High speed mechanics: Postulates of Special Theory of Relativity, Lorentz Transformations, Variation of mass with velocity, Mass-energy Equivalence.

Unit -2

General Properties of Bulk matter :-

- Elasticity: Stress, strain, Hooke's law, Moduli of elasticity, Poisson's ratio, stress in anisotropic bodies
- Viscosity: Types of fluid flow, Ideal flow and Bernoulli's Theorem, viscosity, Stokes law, Poiseuille Equation
- Surface Tension: Surface Energy, Contact angle, capillarity, Effect of temperature and contaminations

Unit -3

Heat & Thermodynamics :-

- Kinetic Theory of Gases, Distribution of Velocities, Maxwell-Boltzmann Law of Distribution of Velocities in an Ideal Gas and Experimental Verification, Mean free Path, Van der Waal's Equation of State for Real Gases.
- Zeroth and First Law of Thermodynamics: Zeroth Law of Thermodynamics & Concept of Temperature, First Law of Thermodynamics and its differential form, Internal Energy, Application of First Law: General Relation between C_p and C_v , Work Done during Isothermal and Adiabatic Processes.

- Second Law of Thermodynamics: Reversible and Irreversible process with examples, Carnot's Cycle, Carnot engine & efficiency, Refrigerator & coefficient of performance, 2nd Law of Thermodynamics: Kelvin – Planck and Clausius Statements and their Equivalence, Carnot's Theorem.
- Entropy: Concept of Entropy, Clausius Theorem, Clausius Inequality, Second Law of Thermodynamics in term of Entropy.

Unit -4

Oscillations and Waves :-

- Periodic motion, oscillation, SHM Damped oscillation, forced oscillation, Resonance.
- Wave Motion: Plane and Spherical Waves, Longitudinal and Transverse Waves. Plane Progressive (Travelling) Waves, Wave Equation, Phase and Group Velocities, Changes with respect of Position and Time.
- Wave Speed in air, Laplace's correction to Newton's formula Oscillation of air column and resonance tube, Beats, Acoustic Doppler Effect, Acoustics of Buildings.

Unit -5

Electrostatics and Magnetostatics

- Electric Field and Electric Potential: Electric field, electric field lines, electric flux Gauss' Law with applications. Conservative nature of Electrostatic Field, Electrostatic Potential, Laplace's and Poisson equations.
- Dielectric Properties of Matter: Polarization, Displacement Vector D, Relations between E, P and D
- Magnetic Field: Magnetic force between current elements and definition of Magnetic Field B, Biot-Savart's Law and its simple applications.
- Magnetic Properties of Matter: Magnetization vector (M), Magnetic Intensity (H), Magnetic Susceptibility and permeability, Relation between B, H, M. H-H curve and hysteresis, Ferromagnetism.

Unit -6

Electromagnetic Theory:-

- Electromagnetic Induction: Faraday's Law, Lenz's Law, Self Inductance and Mutual Inductance, Introduction to Maxwell's Equations : Displacement Current, Boundary Conditions at Interface between Different Media, Wave Equation, Electromagnetic Energy Density and its Physical concept.

- EM Wave in Bounded Media: Brewster's law, Total internal reflection.
- Optical Fibres: Numerical Aperture, Step and Graded Indices (Definitions Only), Single and Multiple Mode Fibres.

Unit -7

Electric circuit:-

- Charging and discharging of capacitor in RC circuit, Growth and decay of current in inductor in LR circuit, AC circuit: Kirchhoff's Law for AC circuits, impedance, Reactance, Capacitance, circuits with AC source and L, C and R. LCR-series circuit, resonance, band width, Q-factor, Parallel LCR circuit as rejecter circuit.

Unit -8

Optics :-

- Fermat Principle, reflection law and mirrors, refraction laws, refractive index, critical angle, Total Internal Reflection, Slab, Prism, refraction at spherical interface, lens, lens maker's formula, magnification, power of lens doublet,
- Dispersion, scattering, Light waves: Huygens Principle.
- Interference: Young's double slit experiment interference in Thin Film, parallel and wedge-shaped films, Fringes of equal inclination (Haidinger Fringes), Fringes of equal thickness (Fizeau Fringes), Newton's Ring, Measurement of wavelength and refractive index.
- Difference between interference and diffraction.
- Polarization and its laws.

Unit -9

Modern Physics:-

- Planck's Quantum hypothesis, Blackbody radiation, Photoelectric effect, Compton's scattering, De-Broglie's wavelength, Davission-Germer experiment, Wave description of particles by wave packets, Heisenberg Uncertainty Principle.
- Many electron atom: Bohr's Atomic model, Bohr's Sommerfeld atomic model, Fine structure of hydrogen lines, Total Angular Momentum, Vector Atom Model, Quantum numbers associated with the atom, Spin Quantization, Spin orbit coupling in atom: L-S and J-J couplings.
- Particle Accelerators: Cyclotron, Measurement of Charge and the ratio (e/m).

- Size and structure of atomic nucleus, Nature of Nuclear force, NZ curve, Binding energy Stability of the nucleus, Radioactivity, Mean life and half-life, Alpha decay, Beta decay, Gamma ray emission, Origin and types of X-ray spectra, Fission and fusion, Nuclear reactor.
- Lasers: Spontaneous and Stimulated emission, Optical Pumping and Population Inversion.
- Basic Quantum mechanics: Wave function of a free particle, Time dependent Schrodinger equation, Properties of wave function, Interpretation of Wave Function, Normalization, Eigenvalues and Eigenfunctions, Particle in a box, Simple harmonic oscillator-energy levels and energy eigenfunctions.
- Quantum Numbers of Hydrogen like atoms, Zeeman Effect.

Unit -10

Electronics and communication:-

- P and N type semiconductors, Energy band gap, conductivity and mobility, PN junction Diode, Forward and Reverse Biased Diode, Zener diode and Voltage Regulation.
- Transistor, I-V characteristics, Current gains in transistor, transistor and amplifier, Barkhausen's Criterion, Oscillator (basic).
- Digital circuit: analog and digital circuit, Decimal and Binary Numbers, Logic Gates, Universal Logic Gates, De Morgan's Theorems, Boolean Laws.
- Block diagram and communication system Bandwidth of signal, Propagation of EM waves in the atmosphere, Sky and space wave propagation, Need for modulation, Amplitude Modulation.

Syllabus for Art of Teaching and Other Skills STET 2023

Unit II Art of Teaching, Other skills	Marks 50
(A) Art of Teaching	Marks 30
(B) Other skills	Marks 20

A. Art of Teaching

1. Teaching & Learning:- Meaning, Process & Characteristics.
2. Teaching Objectives and Instructional objectives: Meaning & Types, Blooms Taxonomy.
3. Teaching Methods: - Types and its Characteristics, Merit, and demerits of Methods.
4. Lesson Plan: - Types and Format & Various Model.
5. Microteaching & Instructional analysis.
6. Effective ecosystem of Classroom.
7. Textbook and library
8. Qualities of Teacher.
9. Evaluation & Assessment for learning.

10. Curriculum.
11. Factors affecting teaching and learning.
12. Teaching Aids and Hands on learning.

B. Other skills

1. General Knowledge,
- 2.Environmental Science
3. Mathematical aptitude,
- 4.logical Reasoning