6. Apparel quality testing: Quality standards and specifications; Quality parameters, defects of fabrics and garments
7. Factors affecting clothing choices, selection of clothing for different age groups, fabric selection for varied uses.
8. Role and importance of textile and garment industry in Indian economy; status of textiles and apparel industries at global scenario.

Unit-7

EXTENSION EDUCATION & COMMUNICATION

1. Extension Education: Historical perspective of Extension Education, Extension system in India. Objectives of Extension education, extension programme development; Components of extension and changing concepts of extension; Philosophy of extension education.
2. Extension methods: Steps in extension teaching methods; Teaching aids- Types, characteristics and functions; Preparation and effective use of audio-visual aids in extension work.
3. Programme management: Need, situation analysis, planning, organization, implementation, monitoring and evaluation of programmes.
4. Media in process learning: Theories and role of media; Trends in print media, electronic media, Contemporary issues in media; Human rights and media.
5. Curriculum development and planning for extension development activities, Bloom's taxonomy of educational objectives and learning.
6. Community Development: Perspectives, approaches, community organization, leadership, support structures for community development, Panchayati Raj institutions; NGOs and community based organizations.
7. Non-formal adult education- its importance, historical perspective, concept, theories, methods and materials used, challenges of implementation and evaluation. Program for life long and continuing education: local, state, national and internal agencies, policy and program of Non-formal adult education. Meaning and concept of life-long education and its definitions.
8. Developmental programmes in India for urban, rural and tribal population; Programmes for nutrition, health, education, wage, and self employment for urban, rural women's development, skill development, sanitation and infrastructure.
9. Communication systems: Concept, types, Function and significance, Elements and characteristics of mass communication.
10. Concept of leadership in communities; Role and responsibilities of leadership in community development.

Unit-8

Research Methodology

1. Research and Research Design**:** Definition and types of research; Types of Research design; Research process; Identification of research problem- Steps; Ethics in Research; Research Management techniques; PERT, CPM, SWOT analysis.
2. Sampling: Definition and types of sampling; Sampling and Non sampling error; Tools and techniques of Data collection; Measuring scales; Reliability & Validity of tools.
3. Variables**:** Definition; Classification; Types of variables.
4. Conceptual understanding of statistical measures**:** Classification and tabulation of data; Measures of Central tendency, Measures of Variation.
5. Frequency Distribution: Frequency distribution tables; Types of tables; Graphical representation of data.
6. Data Distribution: Types of distribution; Normal distribution; Use of normal probability tables
7. Hypothesis: Definitions; Classification of Hypothesis; Testing of Hypothesis; Levels of Significance.
8. Parametric and Non Parametric Tests: Application of Z test, T test; Analysis of Variance (ANOVA); Chi – square test.
9. Relational Analysis: Coefficient of Correlation; Rank Correlation; Regression Analysis.
10. Scientific Writing: Types of Reports; Steps in report writing.

11. SUBJECT : MATHEMATICS

UNIT – 1

Analysis: Elementary set theory, finite, countable and uncountable sets, Real number system as a complete ordered field, Archimedean property, supremum, infimum. Sequences and series, convergence, limsup, liminf, uniform convergence. Bolzano Weierstrass theorem, Heine Borel theorem. Metric spaces, completeness, connectedness. Riemann integration, Lebesgue measure, Lebesgue integration. Normed linear Spaces, Banach spaces, Spaces of continuous functions as example, open mapping theorem, closed graph theorem, Hahn Banach theorem, Hilbert spaces.

UNIT – 2

Calculus: Continuity, Types of discontinuity, uniform continuity, differentiability, Monotonic functions, Functions of bounded variation, Mean value theorems. Sequences and series of functions, Functions of two or more variables, directional derivative, partial derivative, total derivative, maxima and minima, saddle points, Method of Lagrange's multipliers, Double and triple integrals and their applications, Improper integrals and their convergence. Vector Calculus: Gradient, divergence and curl, Green's Theorem, Stokes Theorem, Gauss Divergence Theorem.

UNIT – 3

Algebra: Divisibility in Z, Fundamental theorem of arithmetic, Congruences and residue classes, Chinese Remainder Theorem, Euler's φ- function, Fermat's theorem, Groups, subgroups, normal subgroups, quotient groups, homomorphisms, cyclic groups, permutation groups, Cayley's theorem, Fundamental theorem of group homomorphism, group action, Class equation, Sylow's theorems. Rings, ideals, prime and maximal ideals, quotient rings, unique factorization domain, principal ideal domain, Euclidean domain, Polynomial rings and irreducibility criteria. Fields, finite fields, field extensions, Galois Theory, Modules, Submodules, Cyclic modules, free modules, Noetherian and Artinian modules, Hilbert basis theorem.

UNIT – 4

Linear Algebra: Vector spaces, subspaces, linear dependence and independence, basis, dimension, algebra of linear transformations. Rank-Nullity theorem, Matrix representation of linear transformations. Change of basis, Solution of system of linear equations, Eigenvalues and eigenvectors, Cayley Hamilton theorem, Reduction to diagonal form, triangular form, rational and Jordan canonical form. Inner product spaces, orthonormal basis. Quadratic forms, reduction and classification of quadratic forms.

UNIT – 5

Complex Analysis: Limit, continuity and differentiability of complex functions, Analytic functions, Cauchy-Riemann equations. Complex integration, Cauchy's theorem, Cauchy's integral formula, Liouville's theorem, Maximum modulus principle, Schwarz lemma, Taylor series, Laurent series, calculus of residues, Contour integral, Conformal mappings, Mobius transformations. Topology: Basic concepts of topology, basis, dense sets, topological subspaces, First countable & second countable spaces, Separation axioms, Connected spaces and their basic properties, components, locally connected, spaces, Compactness, basic properties, Sequential and countable compactness.

UNIT – 6

Differential Equations: Existence and uniqueness of solutions of initial value problems for first order ordinary differential equations, singular solutions of first order ODEs, system of first order ODEs. General theory of homogenous and non-homogeneous linear ODEs, Sturm-Liouville boundary value problem, Green's function. Linear differential equations of second order- Method of changing of dependent/independent variables, variation of parameters. Partial Differential Equations (PDEs): Linear PDE of first order, Lagrange's method, Non-linear PDE of first order-Charpit's method, General solution of higher order PDEs with constant coefficients, Classification of second order PDEs, Method of separation of variables, Laplace equation, Wave equation and Heat equation.

UNIT – 7

Numerical Analysis : Numerical solutions of algebraic equations, Method of iteration and Newton-Raphson method, Rate of convergence, Solution of systems of linear algebraic equations using Gauss elimination and GaussSeidel methods, Finite differences, Gregory-Newton, Lagrange interpolation formulae, Newton's divided difference formula, Numerical differentiation and integration, Newton Cote's formulae, Numerical solutions of ODEs using Picard, Euler, modified Euler and Runge-Kutta methods. Calculus of Variations: Variation of a functional, Euler-Lagrange equation, Fixed end-point problem, variable end-point problem, Variational problems with subsidiary conditions. Linear Integral Equations: Linear integral equation of the first and second kind of Fredholm and Volterra type, Solution by the method of successive approximation, conversion of differential equation with initial condition, separable kernels. Eigenvalues and eigenfunctions, resolvent kernel.

UNIT – 8

Geometry: Polar equation of a conic, Cartesian and polar coordinates in three dimensions, Plane, straight lines, shortest distance between two skew lines; sphere, cone, cylinder, central conicoids, paraboloid. Tensors: Contravariant and covariant tensors, transformation formulae, Tensor of (r, s)-type, symmetric and skew symmetric properties, contraction of tensors, inner product of tensors, quotiont law. Differential Geometry: Curves in space, curvature and torsion of curves, Serret-Frenet's formulae, Helix, first and second fundamental forms of a surface.

UNIT – 9

Operations Research: Linear programming problem, basic feasible solution, Graphical method, simplex method, duality, transportation problem, assignment problem, travelling salesman problem, convex optimization, gradient descent, stochastic gradient descent.
Statistics and probability: Variance and standard deviation, Curve fitting by least squares, Corelation and regression, logistic regression, support vector regression, linear discriminant analysis, Sample space, Basic laws of probability, Independent events, Expectation, Bayes theorem. Random variables, discrete and continuous probability distribution functions-Binomial, Poisson and Normal. Graph Theory: Graphs, isomorphism, subgraphs, matrix representations, operations on graphs, degree of a vertex, Connected graphs and shortest paths: Walks, trails, connected graphs, shortest path algorithms. Trees: minimum spanning trees. Bipartite graphs, Hamilton graphs, Planar graphs, Euler's formula, Eulerian directed graphs.

UNIT – 10

Mechanics: Moment of inertia, Motion of a rigid body about an axis, Twodimensional motion of rigid bodies, Generalized coordinates, generalized momentum, Lagrange's equations, Hamilton's canonical equations, Hamilton's principle of least action, Contact transformations, Possion bracket. Fluid Dynamics: Equation of continuity, Euler's equation of motion for inviscid flow, stream lines, boundary surface, Motion in two dimensions: Sources and sinks, method of images, Flow past a cylinder and sphere.

12. SUBJECT : PHYSICS

Unit-1

Mathematical Physics

Vector algebra and calculus, Gauss and Stokes theorems, orthogonal coordinates, differential vector operators, special coordinate systems, circular cylindrical coordinates, spherical polar coordinates, tensor analysis, contraction, direct product, quotient rule, pseudo-tensors, dual tensors, non-cartesian tensors, covariant differentiation, and tensors differentiation operators, elements of group theory, second order ordinary differential equations, Legendre's equation, Legendre polynomials and Bessel function with their properties, Laguerre equation and its solutions, Laguerre polynomials and their properties, Hermite equation, Hermite Polynomials and their properties, different types of matrices, orthogonal, Hermitian, unitary and normal matrices, eigenvalues and eigen functions of matrices, diagonalization of matrices, properties of analytical functions, complex variable, Cauchy's integral theorem, Cauchy integral formula, Laurent expansion, singularities, Cauchy's residue theorem, Laplace Transform (LT) and its applications in Physics, Fourier series and Fourier transform (FT), FT and LT of delta and Gaussian functions.

Unit-2

Classical Mechanics

Centre of mass, total angular momentum and total kinetic energies of a system of particles, conservation of linear momentum, energy and angular momentum, constraints and their classification, degrees of freedom, generalized coordinates, virtual displacement, D'Alembert's principle, Lagrange's equations of motion of the first and second kind, uniqueness of the Lagrangian, simple applications of the Lagrangian formulation to some physical systems, generalized momenta, canonical variables, Legendre transformations and Hamilton's equation of motion, cyclic coordinates and conservation theorems, derivation of Hamilton's equations from variational principle, generating functions and their properties, Linear harmonic oscillator and coupled oscillators, reduction of two particle equations of motion to the equivalent one-body problem, reduced mass of the system, conservation theorems, Kepler's problem, scattering cross-section, impact parameter, Rutherford scattering, center of mass and laboratory coordinate systems, motion of a particle in a general non-inertial frame of reference, equations of motion in a rotating frame of reference, the Coriolis force, degrees of freedom of a free rigid body, angular momentum and kinetic energy of a rigid body, moment of inertia tensor, moments of inertia, classification of rigid bodies as spherical, symmetric and asymmetric, Euler's equations of motion for a rigid body, torque-free motion of a rigid body, precession of earth's axis of rotation, Euler angles, angular velocity of a rigid body, notions of spin, precession of a rigid body, Special theory of relativity, Lorentz transformation, Lagrangian formulation of relativistic mechanics.

Unit-3

Quantum Mechanics

Fundamental concepts of Heisenberg Uncertainty Principle, wave equations, Schrödinger equation (time independent and dependent), eigenvalues and eigenfunctions of the linear harmonic oscillator, the periodic potential, spherically symmetric potential and the hydrogen atom, dynamical variables and operators, expectation value, expansion of eigenfunctions, completeness property, commutator algebra, commuting observables, unitary transformations, matrix representations of wave functions and operators, equations of motion in Schrödinger, Heisenberg and interaction pictures, linear harmonic oscillator by operator method, symmetric and antisymmetric wave functions, Slater's determinantal wave functions, Born-Oppenheimer approximation, partial wave analysis, phase shift, scattering from square well potential, time-independent and time-dependent perturbation, problems in relativistic quantum mechanics.

Unit-4

Electromagnetic Theory

Green's functions, boundary value problems, dielectrics, polarization of a medium and electrostatic energy, Biot-Savart law, differential equation for static magnetic field, vector potential, magnetic field from localized current distributions, examples of magnetostatic problems, Faraday's law of induction, magnetic energy of steady current distributions, displacement current, Maxwell's equations, vector and scalar potentials, gauge symmetry, Coulomb and Lorentz gauges, electromagnetic energy and momentum, conservation laws, inhomogeneous wave equation and Green's function solution, plane waves in a dielectric medium, reflection and refraction at dielectric interfaces, frequency dispersion in dielectrics and metals, dielectric constant and anomalous dispersion, wave propagation in one dimension, group velocity, metallic waveguides, boundary conditions at metallic surfaces, propagation modes in wave guides, resonant modes in cavities, field of a localized oscillating source, fields and radiation in dipole and quadrupole approximations, radiation by moving charges, Lienard-Wiechert potentials, total power radiated by an accelerated charge, Lorentz formula, formation of plasma, Debye theory of screening, plasma oscillations, motion of charges in electromagnetic fields, magneto-plasma, plasma confinement, hydromagnetic waves.

Unit-5