Unit – 1

Algebra Permutations, Combinations, Applications of classical number theoretic properties, Groups, Counting Principles, Polynomial Rings, Vector spaces, Inner Product Spaces, Orthonormal bases , Fields, Splitting fields, Solvable groups, Linear transformations, Determinants, Cayley Hamilton theorem and Applications, Finite fields.

Unit – 2

Real and Complex Analysis Real number system, Sequences and series, convergence, Metric spaces, Compactness, Connectedness, Continuity, Differentiability, Sequences and series of functions, Uniform convergence and continuity, Riemann–Stieltjes sums and integrals, Improper Integrals, Measure and Integration. Algebra of complex numbers, Analytic functions, Cauchy-Riemann equations, Cauchy's theorem, Cauchy's integral formula, Residues and Poles, Calculus of residues, Applications of Residues, Power series, Taylor series, Laurent series.

Unit –3

Topology and Functional Analysis Topological spaces, Basis for a Topology, Order topology, Product topology, Subspace topology, Closed sets, Limit points, Hausdorff spaces, Continuous functions, Homeomorphisms, Metric Topology, Connected spaces, Compactness, Countability axioms, Separation axioms and Normal spaces. Normed linear Spaces, Banach Spaces, Continuous linear transformations, Hahn Banach theorem, Open mapping theorem, Closed graph theorem, Conjugate of an operator, Hilbert spaces, Orthogonality, Orthonormal bases, Normal operators, Unitary operators, Projections, Banach Algebra.

Unit – 4

Ordinary and Partial 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 homogeneous linear ODEs, Variation of parameters. Lagrange and Charpit methods for solving first order PDEs, Cauchy problem for first order PDEs, Classification of second order PDEs, Method of separation of variables for Laplace, heat and wave equations.

Unit – 5

Differential Geometry and Operations Research Curves in spaces, Serret–Frenet formulas, Locus of center of curvature, Spherical curvature, Intrinsic equation, Helices, Spherical indicatrix surfaces, Envelope, Edge of regression, Developable surfaces associated to a curve, First and Second fundamental forms, Lines of curvature. Linear programming, Revised simplex method, Duality problems, Degeneracy procedure, Integer programming, Non-linear programming, Convex programming, Game theory, Queuing theory, Single server and Multi server models, Network analysis.

Unit 6

Foundations of Education Philosophical Perspectives: Idealism, Naturalism, Pragmatism, Progressivism, Existentialism, Humanism, Realism, Eclecticism – Philosophers and their contributions: Western Philosophers: Rousseau, Froebel, Maria Montessori, Pestalozzi, Bertrand Russell, John Dewey – Indian Philosophers: Mahatma Gandhi, Rabindranath Tagore, Swami Vivekananda, J.Krishnamurti, Aurobindo – Development of Indian Education during Pre-Independence, PostIndependence, Modern era–Important Education Committees – Recommendations of National Education Policies, National Curriculum Frameworks. Sociological Perspectives: Concepts of Special and Inclusive Education, Women Education, Population Education, Vocational Education, Environmental Education for sustainable development-UN SDG goals, Human Rights: UN Declaration of Human Rights, Peace and Value Education – Indian Constitution: Articles and Amendments related to Education–Culture and Communication in Education – Social issues: Measures and Reforms – Social Structure,

Socialization process – Social stratification – Indigenous Value systems – History and Culture of Tamil Nadu: Social Equality, Language, Culture and Politics.

Unit 7

Educational Psychology Educational Psychology – Cognitive, Humanistic, Behavioural and Transpersonal school of thoughts – Role of heredity and environment – Dimensions of Development: Physical, Cognitive, Psycho-Social, Moral, Behavioural, Language – Theories of Development: Piaget, Bruner, Kohlberg, Erickson, Vygotsky, Noam Chomsky, Watson–Developmental tasks – Sensation and Perception–Factors of learning: Attention, Interest, Aspiration, Motivation and its types, Motivational Theories: Maslow, McDougall's, McClelland – Learning, Factors of Learning, Theories: Trial & Error, Operant and Classical Conditioning, Insight and Gestalt – Intelligence: Theories – Single-Factor, Two-Factor, Triarchic, Group and Multi-factor theory, Guilford's Structure of Intellect, Gardner's Multiple Intelligence theory, Factor Personality: Type and Trait theories – Personality Assessment methods and techniques – Educational Implications of Learning, Intelligence and Personality theories – Mental Health, Adjustment and Defense mechanisms – Concepts of Guidance and Counselling.

Unit 8

Pedagogical approaches Nature, Scope, Aims and Objectives, Values of Teaching the subject, Inter-disciplinary aspects, Taxonomy of Educational Objectives: Bloom's, Anderson's, RCEM, NCERT –Micro-teaching: Skills and Components, Micro Cycle, Link Lesson–Planning of the lesson: Curricular Plan, Unit Plan and Lesson Plan, General and Specific Instructional objectives, Action verbs – Methods of Teaching: Traditional and Modern Methods – Techniques of Teaching: Small and Large Group Techniques – Models of Teaching: Concept attainment, Advanced Organizers, Inquiry Training, Information Processing, Personalized Model – Resources for Teaching-Learning: Text Books, Laboratory, Library, E-resources and Field-trips – Flander's Classroom Interaction Analysis – Dale's Cone of Experience – Educational

Technology and ICT Resources in Teaching-Learning: Blended Learning, Simulation, Augmented Reality, Virtual Learning – Digital Resources – Assessment and Evaluation: Types of Tests, Steps in construction of an achievement test – Continuous and Comprehensive Evaluation – Analysis and Interpretation of test scores.

Unit 9

Curriculum Components and Teacher Education Curriculum – Principles, Bases of Curriculum: Philosophical, Psychological and Sociological, Criteria of selection of content – Types: Subject, Learner, Community and Activity centred curriculum – Concepts of core and hidden curriculum – Curriculum Organization: Articulation, Balance and Continuity – Approaches: Concentric, Spiral, Topical, Logical, Vertical and Horizontal – Curricular Materials – Role of NCERT and SCERT in curriculum planning – Stakeholders contribution and participation in the curricular, co-curricular and extra-curricular activities – Curriculum Evaluation and Theories: Tyler's model, Hilda Taba model, Beauchamp's model, D.K.Wheeler's model, Virgil V. Herrick model. Teacher Education – National Council for Teacher Education: Functions–Teacher Education systems and Programmes: Pre-service and In-service – Integrated Teacher Education Programmes–Concept of Teaching Profession; Changing roles and responsibilities – Continuous Professional development and Professional ethics–National Professional Standards for Teachers – Teacher Appraisal and accountability – Significance of Teachers In-service education and training–Research and innovations in Teacher education, NAAC's Assessment and Accreditation process – Autonomy in Education: Institutional, Administrative and Teacher autonomy –Teacher Eligibility Tests –Concepts of Andragogy – Life-long and continuing education.

Unit 10

Research Methodology and Statistics Research – Types of Research: Basic, Applied and Action Research, Sources of Selecting Research Problem, Importance of Review of Literature, Hypothesis, Variables, Sampling Techniques: Probability and Non-Probability techniques, Steps in writing research proposal and research report – Academic and Research Writing – Experimental Research Designs: Pre-Experimental, True and Quasi Designs – Factors affecting internal and external validity of experimental research, Quantitative, Qualitative and Mixed Research Methods–Research Tools: Likert and Thurstone, Personality, Interest and Intelligence test, Item and Factor analysis – Characteristics of Research tools – Statistical Analysis: Descriptive and Inferential Analysis, Hypothesis testing: Type I and Type II errors, Level of Significance, Graphical Representation of Data – Issues related to plagiarism–Research Ethics and Integrity.