Unit 1 Electromagnetic Theory

Coulomb law – Gauss law – Poisson's equation – Laplace equation and solution to boundry value problem – Electrostatics of dielectric media – Molecular polarisability and its application – Vector – Scalar potential – B and H in a magnetic material – Maxwell's equations and their significance – Poynting theorem.

Unit 2 Classical Mechanics

Generalised co-ordinates – D'Alembert's principle, Lagrangian equation of motion – Hamiltonian equation – Conservative and non-conservative systems–Hamilton equation, cyclic variables, principle of least action – Theory of small oscillations – Normal co-ordinates and normal modes–Linear Triatomi molecule–Rigid bodies -Moments and products of inertia-Euler's angle–Euler's equation of motion – Symmetric Properties.

Unit 3 Thermal Properties

Thermal Properties of solids Laws of Thermodynamics – Maxwell's relations and their applications – Phase transitions – Production and measurement of low temperatures –Einstein and Debye theory of specific heats of solid–Thermodynamic equations of state – closed and open systems – partial molal quantities – chemical potential with temperature and pressure – third law of thermodynamics–Fugacity – methods of determination – standard states for gases, liquids – solids and solutions – mean activity co-efficiency of electrolytes–Maxwell's distribution of molecular velocities – derivation of expression for average, most probable and root mean square velocities –– Heat capacities of solids – Einstein and Debye Models Low temperature – Negative absolute temperature.

Unit 4 Periodic properties

Atomic radius – ionic radius, ionization potential, electron affinity and electro negativity – Their significance in chemical bonding–VB theory, MO theory – applications – Comparison of VB and MO theories – VSEPR theory – Bond order – Bond energy – Bond length Bond polarity – Partial ionic character of bonds – The concept of multi-centre bond – Electron deficient compounds – Hydrogen bond – Its influences. Non aqueous solvents – A general study of typical reactions in non aqueous media – comparison with reactions in aqueous media.

Unit 5 Organic Reaction Mechanisms

General methods of investigating reaction mechanisms – Kinetic and non-kinetic methods – different types of reaction intermediates. Aliphatic nucleophilic substituion SN1, SN2 and SNi reactions – substitution at vinylic and benzylic carbon – stereo chemistry of nucleophilic reaction – solvents and substituent effects – Nucleophilicity Neighboring group participation. Addition to double and triple bonds – Mechanism Hydration – Hydroboration – Hydroxylation – epoxidation. Elimination reactions E1, E2, E1cB Mechanism – Orientation effects in elimination reactions –

stereo chemistry of elimination reactors–dehydration of alcohols – dehydro halogenation – cope elimination.

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.