

ANNEXURE-II

NOTIFICATION NO. 43/2011
SCHEME AND SYLLABUS FOR RECRUITMENT TO THE POST OF LECTURERS IN
GOVERNMENT DEGREE COLLEGES IN A.P. COLLEGIATE EDUCATION SERVICE

(P.G. Standard)

Papers	No. of Questions	Duration (Minutes)	Maximum Marks
PART-A: Written Examination (Objective Type)			
Paper-1: General Studies & Mental Ability	150	150	150
Paper-2: Concerned Subject (One only)	150	150	300
PART-B: Interview (Oral Test)			50
TOTAL			500

NB : The Candidates have to choose one of the following subjects relevant to the PG Degree for writing Paper-2:

1. English	2. Telugu	3. Hindi
4. Urdu	5. Sanskrit	6. Oriya
7. Arabic	8. Commerce	9. Public Administration
10. Economics	11. History	12. Political Science
13. Mathematics	14. Physics	15. Chemistry
16. Botany	17. Zoology	18. Statistics
19. Bio Chemistry	20. Bio Technology	21. Micro Biology
22. Computer Applications	23. Computer Science	24. Geology

SYLLABUS**PAPER-1: GENERAL STUDIES AND MENTAL ABILITY**

- General Science – Contemporary developments in Science and Technology and their implications including matters of every day observation and experience, as may be expected of a well-educated person who has not made a special study of any scientific discipline.
- Current events of national and international importance.
- History of India – emphasis will be on broad general understanding of the subject in its social, economic, cultural and political aspects with a focus on AP Indian National Movement.
- World Geography and Geography of India with a focus on AP.
- Indian polity and Economy – including the country's political system- rural development – Planning and economic reforms in India.
- Mental ability – reasoning and inferences.
- DISASTER MANAGEMENT** (Source : CBSE Publications)
 - Concepts in disaster management and vulnerability profile of India / State of A.P.
 - Earth quakes / Cyclones / Tsunami / Floods / Drought – causes and effects.
 - Man made disasters - Prevention strategies.
 - Mitigation strategies / Mitigation measures.

PAPER –2**ENGLISH**

Detailed Study of literary age (19th Century) viz.,

The period of English Literature from 1798 to 1900 with special reference to the works of the major writers including Words worth, Coleridge, Byron, Keats, Shelley, Lamb, Hazlitt, Thackeray, Dickens, Tennyson, Browning, Arnold George Eliot, Calyle and Ruskin.

Study of the following Texts:

1. William Shakespeare : 'Macbeth', 'Hamlet', 'Julius Vrsdst', 'Tempest'
2. John Milton : 'Paradise Lost', -Books I & II
3. Alexander Pope : 'The Rape of the Lock'
4. William Wordsworth : 'The Immorality Ode', 'The Tin Tern Abbey'
5. John Keats : 'Ode to a Nightingale'
6. P.B. Shelley : 'Ode to the West Wing'
7. Jane Austen : 'Pride and Prejudice'.
8. Charles Dickens : 'A Tale of Two Cities'
9. Thomas Hardy : 'The mayor of Casterbridge'
10. W.B. Yeats : "Byzantium", 'The Second Coming'.
11. T.S. Eliot : 'The Waste Land'.
12. D.H. Lawrence : 'Sons and Lovers'.
13. Mulk Raj Anand : 'The Big heart'
14. R.K. Narayan : 'The Man eater of Malgudi'

TELUGU**I.**

- a) Study of classical poets – their age and works – particular selections from Nannaya, Tikkana, Errapragada, Salva Poets i.e., (Nannechoda, Mallikarjuna Pandita, Palakuriki Soma), Nachana Somana – Bhaskara Ramayana poets and Ranganatha Ramayana Poet – Srinatha – Pothana – Pillalamarri Pinaveerabhadra – Raurana – Jakkana – Anantamatya – Koravi Goparaju – Nandi Mallaya and Ghanta Singana – Ashta Diggaja Poets – Tallapaka Poets – Krishnadeva Raya – Ponnaganti Telangana – Chemakura Venkataraju – King Poets of Tanjavore – Women Poets – Kuchimanchi Poets – (Jaggana – Timmana).
- b) Vemana, his philosophy – Observations and views on his times – his importance as commentator on contemporary times – his relevance now.

II.

- a) Study of literary trends – Sailer features of the ages, forms etc., Itihasa – Purana Prabhandha – Sataka – Folksong – Yakshagana – Samkertana Literature – Historical poem, Prose works classical and Modern – Novel-short story – Essay - One Act Play, etc.
- b) Classical and Neo-classical trends – Modern Age.

III. Study of Modern Poets – Modern Trends – their works, Gurajada – Rayaprolu – Veereshalingam – Chilakamarthi – Panuganti – Viswanatha, Devulapalli, Basavaraju, Pingali, Katuri, Duvvuri, Puttaparthi, Sri Sri and leading Modern Poets – Trends – Romantic Movement – Progressive Movement – Digambara Poets etc.

IV. Study of Telugu Grammar and General Prosody – Balavyakaranam and Praudha Vyakaranam.

V. Study of History and Evolution of Telugu language – From the early period of Modern period – The place of Telugu among the language families of India in general and the Dravidian family in particular Geographical positions and distribution – dialectal forms etc.

VI. Study of Philology – Linguistics and Semantics – Modern period: Evolution of Telugu through linguistic and literary movements (like the spoken Telugu movements, etc.)

VII. Study of Evolution of Telugu literature from the early period of Modern period covering all the ages.

VIII. Study of Aesthetics and Literary criticism (Eastern and Western outlook)

IX. Study of Sanskrit Grammar and Kavyas: Elementary knowledge of Sanskrit Grammar – Simple and standard texts for prose and poetry – Hitopadesa and Kalidasa's works.

HINDI

- I. Study of the following ten authors and poets:
 1. Kabir
 2. Tusedidas
 3. Bihari
 4. Surdas
 5. Acharya Ramachandra Shukla
 6. Premchand
 7. Prasad
 8. Pant
 9. Nirala
 10. Dinakar

- II. Appreciation of the popular couplets of Tulsī, Kabir, Rahim, Vrinda etc., and a few lines from modern poets of Prasad, Pant etc.

- III. Origin and development of prominent literary genres in modern Hindi, e.g. Novel, Short Story, Drama, Criticism.

- IV. The study of the following eight trends of the history of Hindi Literature.
 1. Gyan Margi Shakha
 2. Prem Margi Shakha
 3. Ram Bhakti Shakha
 4. Krishna Bhakti Shakha
 5. Riti kavya
 6. Chayavada
 7. Pragativada
 8. Nai Kavita

- V. History of various aspects of Hindi Language, eg:
 1. Grammatical and lexical features of Apabhraṅsa, Avahatta and early Hindi.
 2. Evolution of Khari Boli Hindi as literary language during 19th Century
 3. Development of Hindi as Rastra Bhasha during freedom struggle and as official language of Indian Union since Independence.
 4. Major Dialects of Hindi and their inter-relationship
 5. Functional and significant grammatical features of standard Hindi
 6. Origin and development of Devanagari script and its role in standardization of Hindi language.

URDU

01. The study of the following Ten Authors and Poets:

1. Mohammad Quli Qutub Shah	6. Sir Syed.
2. Wali.	7. Hali.
3. Meer.	8. Iqbal.
4. Anees.	9. Premchand.
5. Ghalib.	10. Krishna Chander.

02. Appreciation of couplets of renowned poets.

03. The Study of the following eight trends of the History of Urdu Literature.
 1. Development of Urdu under the Qutubshahis, and the Adil Shahis.
 2. Delhi School.
 3. Lucknow School.
 4. Fort William College.
 5. Aligarh movement.
 6. Iqbal and his Age.
 7. The Contribution of Jamia Osmania.
 8. Impact of progressive movement.

04. Study of various aspects of Language and Literature.

SANSKRIT

1. General introduction to Vedic literature Four Samhitas, Brahmanas, Aranyakas, Upanishads and Vedangas.
2. The Ramayana and Mahabharata - The age of their composition, Social and Political conditions revealed-Their influence on later literature.
3. Study of the following poets, their works and their age Bhasa-Kalidasa-Bharavi-Naga-Sri Harsha-Bhavabuthi-harsha Vardhana-Visakhatatta-Bhattanarayana-Dandin Banabhatta, Sudraka.
4. History of classical sanskrit literature-the origin and development of different types of literary compositions - Mahakavya - Laghukavya -Historical Kavya - Lyric Poetry - Diadactic poetry - Fable - Drama (Basic knowledge of Dasarupakas) - Gadya kavya.
5. Alankaras - Simple definitions and examples of, without varieties upama - rupaka - utpreksha - Atisayokti - Sandeha - Bhrantiman - Samaskoti - Aprastutaprasamsa - Dipaka - Tulya Yogita - Arathantharanyasa Drushtanta - Kavyalingam - Ananvyalankara - Swabhavokti.
6. Grammar - Ajanta Sadharana Sabdas in all genders - Halanta Sadharana Sabdas in all genders - Sarvanama sabdas in all genderspati - Mati - Atman - Rajan - ap.
7. Conjugations - I, IV, VI and X conjugations in (1) Lat (present tense) (2) Lit (Past perfect), (3) Lrit (Second future), Lot (imperative mood) (5) Lang (past perfect), (6) Vidhiling (potential mood).
8. Samasas - Tatpurusha - Karmadharaya - Dvandva - Ekasesh - Dvigu - Bahu vrihi - Avyavibhava.
9. Sandhi's :
 - a) Ach-sandhi-Guna-Vridhi-Savarnadirgha-Prakrutibhava-Purvarupa-Pararupa-Ayavayava-Yanadesa.
 - b) Halsandhi-Schutva-Shtutva-Jastva-Anunasiktva-Chartva-Anuswara.
 - c) Visargasandhi.
10. Philology : Origin of the language - Classification of languages into various groups - Indo European group - Satam and Kentum - languages - Phonetic changes and their causes - Samantic changes and their causes.
11. Chandas-Vrattas (I) Vamsastham (ii) Indra Vajra (iii) Upendra Vajra (iv) Bhujanga Prayatam (v) Manda Kranta (vi) Sardulavikriditam (vii) Sikharini (viii) Sragdhara (ix) Vasantatilakam (x) Anustup.

ଓଡ଼ିଆ

ଓଡ଼ିଆ ପାଠ୍ୟକ୍ରମ

‘କ’ ବିଭାଗ

(ଓଡ଼ିଆ ଭାଷା ସମ୍ବନ୍ଧୀୟ)

ପ୍ରତ୍ୟେକ ବିଭାଗରୁ ପାଞ୍ଚଗୋଟି ପ୍ରଶ୍ନ ଦିଆଯିବ ।

- * ଓଡ଼ିଆ ଭାଷାର ଉତ୍ପତ୍ତି ଓ କ୍ରମ ବିକାଶ
- * ଓଡ଼ିଆ ଭାଷାର ଉପରେ ଇଂରେଜୀ, ଯାବନିକ ଓ ଦ୍ରାବିଡ଼ ଭାଷାର ପ୍ରଭାବ
- * କୃତନ୍ତୁ ଓ ତତ୍ତ୍ୱ
- * କାରକ ଓ ବିଭକ୍ତି
- * ସମାସ ଓ ସମୋଚ୍ଚାରିତ ଶବ୍ଦ
- * ସନ୍ଧି
- * ଓଡ଼ିଆ ଶବ୍ଦ ଭଣ୍ଡାର
- * ଧ୍ୱନି ପରିଚର୍ଚ୍ଚନ କାରଣ
- * ଓଡ଼ିଆ ସ୍ୱଭାଷଣ

‘ଖ’ ବିଭାଗ

(ଓଡ଼ିଆ ସାହିତ୍ୟ ସମ୍ବନ୍ଧୀୟ)

[*]ବିହିତ ପ୍ରତ୍ୟେକ ବିଭାଗରୁ ଦଶଗୋଟି ପ୍ରଶ୍ନ ଦିଆଯିବ ।

- * ବର୍ଯ୍ୟା ଗୀତିକା
- * ସାରଳା ସାହିତ୍ୟ
- * ଓଡ଼ିଆ ପୁରାଣ ଓ ସବୁ ସାହିତ୍ୟ
- * ଓଡ଼ିଆ ରୀତି ସାହିତ୍ୟ
- * ବଉଦିଶା, କୋଇଲି ଓ ଓଡ଼ିଆ ପଦାବଳୀ ସାହିତ୍ୟ
- * ଜନବିଶ୍ୱ ଶତକ ଓଡ଼ିଆ ସାହିତ୍ୟ (ଗଦ୍ୟ ସାହିତ୍ୟ, ପଦ୍ୟ ସାହିତ୍ୟ ଓ ସାହିତ୍ୟ ପତ୍ରିକା)
- * ସତ୍ୟବାଦୀ ସାହିତ୍ୟ
- * ସବୁଜ ସାହିତ୍ୟ ଓ ପ୍ରଗତିଶୀଳ ଓଡ଼ିଆ ସାହିତ୍ୟ
- * ସ୍ୱାଧୀନତା ପରବର୍ତ୍ତୀ ଓଡ଼ିଆ ଗଦ୍ୟ ସାହିତ୍ୟ (ଗଳ୍ପ, ଉପନ୍ୟାସ, ପ୍ରବନ୍ଧ)
- * ସ୍ୱାଧୀନତା ପରବର୍ତ୍ତୀ ଓଡ଼ିଆ କବିତା

ARABIC

- I Grammar - i) Syntax –
- ii) Morphology -
- II Rhetoric - Ilm al Bayan, Ilm al Badee, Ilm-al-Maani
- III Literary History of Arabic Language - From Jahili period to Modern Period
- IV Translation - i) From English to Arabic (from unseen passages)
ii) From Arabic to English (from unseen passages)

COMMERCE

Financial Management:

Corporation Finance – Economic and Managerial Aspects – Finance Education
 Financial Plan – Operating and Financial leverage – Capital Structure determinants
 Internal Financial Control – Ratio Analysis – Break-even Analysis – Sources and uses of funds statements
 Concepts of valuation and cost of capital – Cost of Debt-Cost of preference capital – Cost of Equity Capital – Cost of retained earnings – Weighted Cost of Capital.
 Fundamentals of capital Budgeting – Evaluation of Investment opportunities – Pay back Accounting, Rate of return – Discounted cash Flow Techniques.
 Concepts of over and under capitalization – Working Capital Management – Management of Inventories – Receivables and cash
 Economics and Income retention – dividend policy - Financial aspects of expansion, reconstruction and recognition

Industrial Organisation:

Concepts of Industry, Firm and Plant
 Size of Units – Optimum firm and representation firm – Size in private and Public Sectors in India- Problems and Policy implications – Multi-plant units – Multi Plant units in private and public sectors – Economic problems and Policy size and efficiency.
 Location – Concepts of location and localization – Location criteria – Factors influencing localization – Measures of localization – Localisation pattern in Indian industry – Balanced Regional Development – Location development of managers – Performance appraisal
 State and Industry – Operational Control over Private Industry
 Labour Economics and Industrial Relations.
 Labour in Industrial Society – Man power problems of under-developed countries
 Economics of the Labour Market – factors affecting supply and demand for labour – Concepts of full employment, unemployment – different types of unemployment – Causes – Effects and remedial measures, labour mobility – Absenteeism and turnover.
 Social security and Labour welfare – Problems of Social security in a developing economy– Social Security in India; Settlement of Industrial disputes – Machinery for the same
 Collective bargaining – Objectives and methods – Issues in Bargaining
 Tripartite bodies in Industrial Relations

Management:

Organisation concept – different approaches to the study of Organisation. Constraints over organisational and managerial performance. Principles of organisation
 Planning – Business Objectives – Social responsibilities of business
 Authority, Power, Influence and the art of delegation, Span of Supervision
 Line and Staff relationships
 Bases and problems of departmentation
 Centralisation and Decentralisation
 Bureaucracy-Committee management
 Top management functions and the role of the Board
 Control functions in organisations
 Group dynamics
 Communication -Leadership – Motivation – Morale – Training and Development of managers – Performance appraisal.

PUBLIC ADMINISTRATION

1. Meaning and scope of Public Administration – Its relations with other Social Sciences – The Art and Science of Public Administration
2. Theories of Administration – Classical, Human Relations, Ecological, Systems approach – Decision-making
3. Concept of Development - Administration and Comparative Administration
4. Concept of Administration: Hierarchy, Span of Control, Co-ordination, Unity of Command, Centralisation and Decentralisation, Authority and responsibility, Formal and Informal Organisation, Decision making, Leadership, Administrative Planning, Communication, Work motivation, Management Information system.
5. Types of Organisation: Departments, Corporations, Independent Regulatory Commissions.
6. Administrative adjudications, Delegated Legislation
7. Controls over Administration – Legislative, Executive, Judicial
8. Personnel Administration – Recruitment, Promotion, All India Services, Political Rights of Civil Servants – Right to strike – Negotiating Machinery – Generalist versus Specialists – Controversy, Citizens Grievances – Lok Ayukta and Lokpal; the A.P. Administrative Tribunal.
9. Financial Administration – Principles of Budgeting, Performance Budgeting, PPBS, Budgeting in India, Organisation and Role of Finance Ministry
10. Centre- State and State-Local Relations in India
11. Planning in India – Planning Commission, Planning Process at National and State levels – Concept of Block Planning
12. State Administration – Organisation, Secretariat, Minister – Civil Servant relations – Directorates – Boards of Revenue, Functional Commissioners, Regional Administration, Divisional Commissioners, District Administration
13. Local Government; Theories of Local Government – Organisation, Process, Functions and working of Panchayat Raj Institutions in Andhra Pradesh, Municipal Administration in Andhra Pradesh; Urban Development Authorities; Official – Non-Official relations in local Government relations.

ECONOMICS

- I
 - 1.. National Economic Accounting, National Income Analysis Generation and Distribution of Income and related aggregates: Gross National Product, Net National Product, Gross Domestic Product & Net Domestic Product (at market prices and factor costs): at constant and current prices.
 2. Price Theory: Law of Demand: Utility analysis and Indifference Curve techniques, Consumer equilibrium, Cost curves and their relationships; equilibrium of a firm under different market structures; pricing of factors of Production.
 3. Money and Banking: Definitions and functions of money (M1, M2 M3): Credit creation; Credit; Sources, Costs and availability; theories of the Demand for money.
 4. International Trade: The theory of comparative costs; Recardian Hockseher Ohlin; the balance of payments and the adjustment mechanism. Trade theory and economic growth and development.
 5. Economic growth and development; Meaning and measurement; characteristics of under development; rate and pattern, Modern Growth; Sources of growth distribution and growth-problems of growth of developing economics.
- II. Indian Economy-India's economy since Independence; trends in population growth since 1951, Population and poverty; general trends in National Income and related aggregates; Planning in India Objectives, Strategy and rate and pattern of growth; problems of Industrialization strategy; Agricultural growth since Independence with special reference to food-grains; unemployment; nature of the problem and possible solution, Public Finance and Economic Policy.
- III. Identification of backward regions and the problems of regional development with special reference to Andhra Pradesh.

HISTORY

Ancient India:

1. Harappan Civilisation -- Extent, major cities, Characteristic features, social and economic conditions, script, religious practices, causes for the decline.
2. Vedic Age: Importance of Vedic literature, political, social and economic conditions in the early and later Vedic age.
3. India in the 6th Century B.C.: Social and economic conditions, Rise and spread of Jainism and Buddhism.
4. Mauryan Age: political history of the Mauryans, Ashoka, Mauryan Administration, Social and economic conditions, decline of the Mauryan empire.
5. The Satavahanas: political history, administration, contribution to the culture.
6. Gupta period: Political history, administration, social and economic conditions, growth of culture, decline of the empire.
7. India in the 7th Century A.D.: Harsha Vardhana, Pallavas and Chalukyas, their political history and their contribution to culture.

Medieval India:

8. India between 650 and 1200 A.D. -- political, Social and economic conditions, Chola administration and culture, Sankaracharya.
9. Age of the Delhi Sultanate: (1206-1526), Military and Administrative organisation. Changes in Society and economy, Bhakti movement.
10. The Vijayanagar Empire: Origin, History, Krishnadevaraya, Social and economic conditions, growth of culture, decline.
11. Mughal Age (1556-1707): political history, Akbar, Administration, Social and Economic conditions, culture, decline of the Mughal empire, Maharattas and Shivaji.

Modern India (1757-1947):

12. Historical forces and factors which led to the establishment of the British power in India - Early resistance to the British power in India - Hyder Ali, Tipu Sultan, causes for their failure.
13. Evolution of British paramountcy in India: Policies of Wellesley and Dalhousie.
14. Socio-religious reform movements Rajaram Mohan Roy, Dayananda Saraswathi and others.
15. Revolt of 1857: Causes, results, significance.
16. Rise and growth of the Indian National Movement: Birth of the Indian National Congress, the national movement from 1885 to 1905; movement from 1905 to 1920. Role of Tilak and Annie Besant; The movement from 1920 to 1947; Emergence of Gandhi; Non-cooperation movement, Salt Satyagraha and the Quit India Movement.
Freedom movement in Andhra Pradesh with special reference to the role of Alluri Sitharama Raju and Tanguturi Prakasam, Revolt against the Nizam's rule in Telengana.

Modern world:

17. Industrial Revolution - Significance and results.
18. American war of Independence courses, significance and results.
19. French Revolution - Courses, significance and effects.
20. National Liberation movements in Italy and Germany in the 19th Century - Mazzini, Cavour, Garibaldi, Bismark.
21. I World War - Causes and effects.
22. The Russian Revolution of 1917 - Causes, importance and results.
23. The World between the two world wars - Nazism in Germany, Fascism in Italy. Turkey under Mustafa Kamal Pasha
24. Developments in China 1911-1949 – Nationalist Revolution of 1911 – Communist Revolution of 1948
25. II World War -- Causes and effects.

POLITICAL SCIENCE

1. State: Theories of origin of State. Rights and Duties, Law, Liberty and Equality. Nation & Nationality – Forms of Government – Pressure Groups and parties
2. Ideologies: Utilitarianism – Individualism – Idealism. Theories of Socialism – Gandhian philosophy
3. Theories of Decision making – Behaviouralism – System Theory, Elite Theory – Structural functional decision-making and Game Theory.
4. Nature of Indian Constitution – Fundamental Rights – Directive Principles of state policy legislature – Executive and Judiciary – Judicial Review – Centre-State relations – Problems of National Integration.
5. United Nations and Collective Security – Concept of power in International Relations – Balance of Power, Cold-war détente. Arms Control and Disarmament.
6. Problems of Third World. New Colonialism – Non-alignment India's role in world affairs.

MATHEMATICS

Real Analysis: Continuity and differentiability of real functions.; Uniform continuity, Sequences and series of functions. Uniform convergence. Functions of bounded variation. Riemann integration.

Complex Analysis: Analytic functions. Cauchy's theorem Cauchy's integral formula. Laurent's series. Singularities. Theory of residues – Conformal mapping.

Abstract Algebra: Groups – Sub-groups – normal subgroups Quotient group Homomorphism – Fundamental theorem of Homomorphism, Permutation groups: Cayley's theorem – Rings – Subrings – Ideals – Fields – Polynomial rings.

Linear Algebra: Vector spaces – Basis and dimension – Linear transformations – Matrices – Characteristic roots and characteristic vectors – systems of linear equations – Canonical forms – Cayley – Hamilton theorem.

Differential Equations: First order ordinary differential equations (O.D.E) and their solutions – Singular solutions. Initial value problems for first order O.D.E. General theory of homogeneous and non-homogeneous linear differential equations, variation of parameters. Elements of first order partial differential equations (PDE).

Co-ordinate Geometry of Three Dimensions: The Plane – The straight-line – Sphere and cone.

PHYSICS

I. Mathematical Physics:

Vectors: Vector operators like DCI & grad, div. & curl. Surface and volume integrals – Theorems of Gauss, Stokes, & Green.

Matrices: Quality, addition and subtraction, multiplication of matrices, inverse of a matrices, similarity and unitary transformation Characteristic equation of a matrix Eigen values – Eigen vectors Square, diagonal, unit, symmetric, and skewmatrix-Hermitian and unitary matrix.

Tensors: Tensors of any order –Transformation relation Covariant & Contra-variant tensors-Christoffel symbols.

Fourier Analysis: Trigonometric Fourier series – Evaluation of coefficients – Exponential Fourier series.

II. Classical Mechanics:

General Theorems of mechanics of mass points – Principales of Virtual work – De-Alembert's principle – Lagrange's equation of motion – Hamilton's principle – Hamilton's Equation of motion – Principle of least action – Canonical transformations = Poisson bracket. Rigid body motion – Euler's theorem on rigid body motion – moment of inertia-tensor – heavy Symmetrical top.

III. Electromagnetic Theory:

Generalisation of Ampere's Law – Derivation of Maxwells equation – Pointing theorem – Transverse nature of Electromagnetic waves – propagation & Conducting and non-conducting media – metallic reflection – Propagation of light in crystalline media – Fresnel's Theory of double refraction.

IV. Special Theory of Relativity:

Galilean Transformation – Newtonians Relativity – Michelson's Morley Experiment – Postulates of special theory of relativity Lorentz's transformation – Relativistic particle mechanics Equivalence of mass & energy – Covariance of Maxwell's equation.

V. Statistical Mechanics:

Generalised coordinates & momenta-phase space, Liowellies Theorems – Maxwell Boltzman statistics – Distribution of velocities and energy in ideal gas – Equipartition of energy – Vibrational, rotational, and electronic partition functions for diatomic gas – specific heats of gas – Ortho and para hydrogen's – Bose Einstein & Fermi Dirac statistics – Bose Einstein gas and application to radiation – liquid helium – Free electrons in metals.

VI. Quantum Mechanics:

Schrodinger's wave equation – Born interpretation of wave functions – Expectations values of dynamical variables – Ehrenfest's Theorem - Uncertainty Principle – Application of Schrodinger's equation to (a) One dimensional squarewell potential (b) Simple harmonic Oscillator (c) Hydrogen atom.

Perturbation theory – First order and second order theories for non degenerate & degenerate systems – Application to normal helium atom – Time dependent & time independent perturbation theory – Application for each. Relativistic quantum mechanics – Klein Gornian equation Dirac's equation Solution for a free particle meaning of negative energy states – Quantum theory of scattering – Born approximation.

VII. Electronics:

Vacuum: Tubes and semiconductor diodes – Principle and working of rectifier and power supply – Ripple factor L and T section filters voltage stabilisation in power supplies characteristics of triode and pentode and junction transistors their static characteristics – Voltage amplifiers – R.C. coupled amplifiers – and its frequency response Negative feed back in amplifiers – Advantages of – Ve feed back – condition for sinusoidal oscillations in transistor circuits Hartley and Colpitts oscillators – multi vibrators A stable – Monostable and bi-stable type – Pulse generator – Saw tooth voltage generator Cathode – ray oscilloscope (C.R.O).

VIII. Solid State Physics:

Crystallography – Classification of solids – Point group and space group – Crystal systems – Specification of planes and directions – Elements of X-ray diffraction – Various crystal bindings – Metallic, ionic, co-valent molecular and hydrogen bonded crystals – Band theory of solids – motion of electrons in periodic potential Bloch's theorem Kronig's penny model – energy bands – Brillouin zones – distinction between insulators – Metals and Semi-conductors on band theory.

IX. Nuclear Physics:

Radioactivity, Chain dis-integration, transient and secular equilibrium – Age of rocks and Radio carbon dating – alpha decay or Gamow's theory – Beta decay and neutrino Interaction of gamma rays with matter – Selection rules – nuclear models – Liquid drop model – semi empirical mass formula – criteria for stability against spontaneous decay – Shell model – nuclear detectors – Ionisation – Chambers – G.M. counters – Proportional counters – bubble and spark chambers – Semi-conductor detectors.

X. Spectroscopy:

Bohr – Sommerfield theory of Hydrogen atoms – Space quantisation – fine structure of spectral lines – Alkali spectra – Zeeman effect Vector atom model of one electron system – Paschen – Back effect – Stark effect in Hydrogen atoms – Band spectra – Types of band spectra-I.R. and Raman effect. Isotope effect – Franck – Condon Principle.

CHEMISTRY**Inorganic Chemistry:**

1. Atomic structure & Chemical Bonding – Quantum theory Schrodinger – wave equation – Hydrogen atom, Hydrogen molecule – Elements on valence bond – molecular orbital theories.
2. Determination of molecular structure – X – ray and electron diffraction methods.
3. Periodic classification (Classical and modern) periodic functions of elements – atomic volume – atomic radius electronegativity-oxidation states – lattice energy and their applications.
4. Chemistry of d-block elements – Physical and chemical characteristics of the transition elements – Characteristics related to electronic arrangements oxidation states – color magnetic properties – Complex formation – interstitial L-S coupling – Hund's rule. A General study of the first transition series.
5. Chemistry of f-block elements – Lanthanons and Actinons – electronic configurations – oxidation's states – Separation of Lanthanons and Actinons.
6. Chemistry of complex compounds: Jorgenson and werner's views – effective atomic number – valence bond theory – Introductory treatment of crystalfield theory applied to complexes with co-ordination number 6.
7. Isomerism in complexes: Geometrical and optical isomerism of four and six co-ordinated complexes. Pearson's theory of hard and soft acids and bases.
8. Study of the following elements and their modern Chemistry Be, Ti, Zr, Hf, V, Mo, W, U, and Th.
9. Alloys: Intermettallic compounds.

Physical Chemistry:

10. Radio activity: Elementary account of nuclear structure natural and artificial radio activity – characterisation of relations – decay chains-half-life-decay constant and average life. Radio-active series, atomic transmutation – atomic fission and fusion reactions and their applications – nuclear isomers and their separations.
11. Kinetic theory of gases: Equations of state – critical constants – States of aggregation – liquid states – viscosity – physical properties and chemical constitution – collision theory of derivation of the collision – number from Kinetic theory of gases.
12. Chemical Kinetics: order and molecularity of reaction first order and second order reactions – law of mass action – influence of temperature and pressure – thermo-dynamic derivation of Law of mass action – unimolecular reactions Lindemann's theory.
13. Thermodynamics: First law of thermodynamics and its applications to ideal gases, energy and enthalpy changes in gases, heat capacities of gases and their inter-relation. Isothermal and adiabatic processes – Kirchoff's equation and its applications – Vant Hoff's isotherm isochore equilibria in heterogeneous system. Second Law of thermo dynamics (Joules and Joule Thomson experiments). Entropy change in an isolated system for

reversible and irreversible processes – Variation on entropy of a system with temperature and pressure.

Organic Chemistry:

14. Heterocyclic compounds and chemistry of neutral products – Importance of heterocyclic compounds – classification based on the nature of heteroatom, size of the ring and its excessive and its deficient nature of the ring.
A general and comparative study of Furan, pyrrole and thiophene Ring transformations. General comparison with benzenoid compounds, pyridine, quinoline, Isoquinoline and acridine – deficient nature of heterocyclic rings – case of nucleophilic substitution.
15. Methods of synthesis, reactivity and properties of the following polynuclear aromatic compounds: anthracene, Benzanthracene, Phenanthrene, Chrysenes and picene.
16. Benzopyrones: Coumarins and Chromones.
17. Alkaloids: General occurrence, reactions and degradations. Chemical and Physico-Chemical methods for the elucidation of structures – synthesis and structural elucidation of the following alkaloids – atropine – cocaine – quinine – Narcotine – papaverine.
18. Organic reaction mechanism: Structure and reactivity of organic molecules – Factors affecting Electron density in a bond – inductive, inductive, mesomeric, (resonance) and electromeric effects, hyperconjugation – Dipole moments – acidic and basic strength of organic Compounds.
Modern concepts of organic reaction mechanisms – Addition, substitution and elimination reactions – simple examples and their mechanism. The intermediate carbonium ion formation and its participation in organic reactions. Addition C-C, system-pinacol-pinacolene rearrange rearrangements. Automatic substitution – Formation and hydrolysis of esters.
19. Some name reactions: Wurtz-Friedel-Crafts, Fries-Gattermann – Perin – Beckmann's rearrangements and Grignard reactions.
20. Carbohydrates: General reactions of monosaccharides – configurational studies on glucose, fructose, sucrose, Recent advances in the Chemistry of cellulose and starch.
21. Proteins – Introduction to proteins – their classification – Nomenclature and distribution in nature simple, amino acids – Isolation and their synthesis.
22. General Ideas regarding the chemistry of vitamins & Hormones nicotine, B-Carotene and Vitamin C.
23. Alicyclic compounds: Synthesis and reactions Bayers strain theory – Factors affecting stability of conformation – terpenes – citral – geraniol – limonene – terpinol – pinene and camphor.
24. Stereo Chemistry: Optical and geometric isomerism configuration of saturated molecules – DL and RS configuration of optically active compound – racemic – mixtures – racemisation and resolution.
25. Molecular spectra: NMR, Chemical shift – Spin – Spin coupling – ESR of simple radicals – Rotational Spectra, diatomic molecules, linear triatomic molecules, isotopic substitution – Vibrational and Raman Spectra.

Physical Chemistry:

26. Electro-Chemistry: Equivalent conductance and its measurement. The independent migration of ions – Kohlrausch's Law. Transport number and their determination. Ionic mobilities. Equivalent conductance of weak and strong electrolytes. Inter-ionic attraction theory treated quantitatively – Debye-Huckel-Onsager equation. Determination of solubilities from conductance measurements – Conductometric titration's.
Ionic product of water and its determination from conductance and EMF methods – theories of acids and bases – Hydrogen ion concentration and its measurements from E.M.F. measurements using Hydrogen quin – hydrogen and glass electrodes – Buffer solutions – Henderson's equation potentiometric titration's – Determinations of equilibrium constant and solubilities from E.M.F. measurements – Gibbs – Helmholtz equation and its application to chemical cells.
27. Photo – Chemistry: Laws on absorption of light – Griess – Draper Laws – Einstein's Law in Chain reactions – Hydrogen chlorine reactions – absorption – Laws of absorption.
28. Surface Chemistry and catalysis – Absorption isotherms, surface area determination, heterogeneous catalysis, acid-base and enzyme catalysis.

BOTANY

I. Bacteria and Viruses:

1. General Account of viruses. Definition, Characterisation, Chemistry, Ultrastructure, Composition, replication, Bacteriophages, transmission of plant viruses, Importance.
2. General account of bacteria – Characteristics, shape, ultrastructure of the cell, nutrition, reproduction, classification and importance.

II. Plant Pathology:

1. Disease symptoms produced by Bacteria, Fungi, and Viruses.

2. A general account of important diseases of crop plants and their control:
 - a) Late blight of potato
 - b) Smuts (Wheat, Jowar)
 - c) Rust of wheat
 - d) Leaf spot of groundnut.
 - e) Paddy blast.
 - f) Leaf spot of rice.
 - g) Citrus cancer
 - h) Bacterial blight of paddy.
 - i) Angular leaf spot of cotton.
 - j) Mosaic of Tobacco.
3. Mycoplasma.
4. Control of plant diseases (A general account)

III. Algae (Phycology)

1. Introduction and general classification of Algae.
2. Criteria for the classification.
3. Thallus organization in Algae.
4. Economic importance of Algae.
5. General characters, structure, Reproduction, pigments, phylogeny, life cycles etc., of main groups in Algae with reference to Genera Given:
 - (a) Cyanophyceae (Nostoc, Scytonema, Oscillatoria).
 - (b) Chlorophyceae (Chlamydomonas, Volvox, Cladeopora, Oedogonium, Coleochaete, Chara).
 - (c) Bacillariophyceae – General Account.
 - (d) Xanthophyceae – Vautheria]
 - (e) Phaeophyceae (Ectocarpus, Laminaria)
 - (f) Rhedophyceae (Polysiphonia, Gracillaria)

IV. Fungi (Mycology):

1. General Characters of fungi. Occurrence and thallus structure of fungi. Nutritional aspects of Fungi (Saprophytism, parasitism, Symbiosis). Modes of reproduction (Sexual and Asexual). Life cycle in fungi. Criteria for classification of fungi. Classificatory systems.
2. General characters, morphology, reproduction, phylogeny, affinities etc., of the following : main groups with special reference to Genera given below:
 - a) Mytomycetes (stemonites).
 - b) Plasmodiophoromycetes (Plasmodiphora).
 - c) Mastigormycotina (Saprolegnia, Phytopthera).
 - d) Zygomycotina (Mucor).
 - e) Ascomycotina (Taphnina Eurotium, Erysiphe, Pleospora Neuropora).
 - f) Basidiomycotina (Puccinia, Agaricus).
 - g) Deuteromycotina (Cercospora, Colletotrichum, Phoma).
3. Economic importance of Fungi.

V. Bryophyta:

1. General characters of Bryophyta.
2. Sporophyte evolution in Bryophytes.
3. Classification of Bryophytes.
4. General account of the following main groups.
 - a) Hepaticopsida, (b) Anthocerotopsida, (c) Bryopsida.
5. Structure, reproduction and systematics of the following genera:
 - a) Marchantia, (b) Anthoceros, (c) Sphagnum (d) Funaria.

VI. Pteridophyta:

1. General characters of pteridophytes.
2. Classification of pteridophytes.
3. General characters of the following main groups:
 - a) Psilopsida; b) Lycopsida; c) Sphenopsida (Eusporangiate and Leptosporangiates):
4. Morphology, anatomy, reproduction and affinities of the following genera:
 - a) Psilotum; b) Lycopodium; c) Selaginella; d) Ophioglostum; e) Marsilea; f) Pteris.

VII. Palaeobotany:

1. Fossil pteridophytes .
2. Origin and evolution of land plants.
3. Homospory, Heterospory and Origin of Seed.
4. Telome theory and origin of sporophyte.
5. General account of the following fossil Gymnosperms.
 - a) Pteridosperms; b) Bennittitales; c) Cordaitales; d) Pentoxylales.

VIII. Gymnosperms:

1. Gymnosperms.
2. Comparative account of morphology, life history, Affinities etc. of the following:
 - a) Cycadophyta – Cycas, Zarnia,
 - b) Coniferophyta – Pinus.
 - c) Ginkgophyta – Gintgo.
 - d) Chlamydospermatophyta : Ephedra, Welwetschia, Gnetum.
3. Classification of Gymnosperms.

IX. Taxonomy of Angiosperms:

1. Systems of classification: - Hutchinson, Takhtajan, Bessey, Engler and Prantl, Bentham and Hooker.
2. Principles of taxonomy:- Criteria of classification, categories of classification, Diversity of Phyletic concepts.
3. International code of Botanical nomenclature, principles, Typification, Citation and authority.
4. Recent trends in Taxonomy:
 - a) Biosystematics; b) Chemataxonomy; c) Serodiagnostic test and classification,
 - d) Numerical taxonomy.
5. Study of the following families with reference to their characteristics, economic importance, attributes etc.,

a) Ranunculaceae,	e) Malvaceae,	i) Apocynaceae,	m) Solanaceae,
b) Caryophyllaceae,	f) Tiliaceae,	j) Asclepiadaceae,	n) Euphorbiaceae,
c) Sterculiaceae,	g) Rubiaceae,	k) Boraginaceae,	o) Poaceae.
d) Sapotaceae,	h) Compositae,	l) Convolvulaceae,	

X. Anatomy and Cell Biology:

1. Ultra structure of the cell and cell organelles along with their functions.
2. Cell wall structure.
3. Tissue and Tissue systems.
4. Meristems – Shoot and root apices.
5. Normal and anomolom Secondary growth.

XI. Embryology:

1. Concept of primitive flower.
2. Development of anther and ovule.
3. General account of Embryosac and types of Embryo.
4. Fertilization.
5. Endosperm morphology and types.
6. Polyembryony and apomixis.

XII. Cytology, Genetics and Evolution:

1. Mitosis and Meiosis.
2. Chromosome (Morphology, Structures importance etc.).
3. Concept of gene, laws of inheritance gene action.
4. Genetic code.
5. Linkage and crossing over.
6. Parasexuality.
7. General account of Mutations
8. Polyploidy and its role in crop improvement.
9. Origin of life.

XIII. Ecology and Phytogeography :

1. Ecosystem: - Concept, boitic and abiotic components, ecological pyramids, productivity.
2. Geo-chemical cycles.
(Carbon, Nitrogen, Sulphur, Phosphorous cycles).
3. Plant succession – Xerosere and Hydrosere.
4. Floristic regions of the world.
5. Floristic zones of India.

XIV. Physiology:

1. Absorption and translocation of water.
2. Transpiration and stomatal behaviour.
3. Absorption and uptake of Ions, Donnan's equilibrium.
4. Role of micronutrients in plant growth.
5. Translocation of solutes.

6. Respiration (Glycolysis, pentose phosphate shunt, structure and role of mitochondria, Krebs cycle, Oxidative phosphorylation, Photorespiration, Respiratory quotient, Fermentation, Pasteur effect Factors affecting).
7. Photosynthesis: - light and dark reaction, Red drop, Emerson effect, Two pigment systems, Mechanism of Hydrogen transfer, Calvin cycle, Enzymes of CO₂ reduction, Hatch a slack cycle C₄ cycle, CAM Pathway, Factors affecting photosynthesis, Pigments.
8. The enzymes: Nomenclature and classification, structure and composition, Mode of enzyme action, Factors affecting.
9. Nitroge, Metabolism and bio, synthesis of proteins Nitrogen fixation, Nitrogen cycle, (Physical and biological) Nitrogen assimilation Amino acid, metabolism, Biosynthesis of proteins.
10. Plant hormones Auxins, Gibberellins, Cytokinins, Abscissic acid (General account).

XV. Economic Botany:

1. Cultivation, economic importance, systematic position and morphology of the following plants.

(a) Rice	(e) Sugarcane	(l) Coffee	(m) Rauwolfia
(b) Wheat	(f) Groundnut	(j) Tea	(n) Pigeon pea
(c) Jowar	(g) Sun flower	(k) Jute	(o) Pearl millet.
(d) Cotton	(h) Castor	(l) Cardamom	

XVI. Recent Aspects of Botany:

1. Modern techniques

a) Electron microscopy,	e) Electrophoresis
b) Phase contrast microscopy	f) The tracer technique
c) Spectro photometry	g) Auto radiography
d) Chromatography	h) Sero-diagnostic methods.
2. Genetic engineering.
3. Plant tissue culture.
4. Alternative sources of Energy.
5. Social forestry.
6. Microorganisms as tools in understanding biological systems.
7. Environmental pollution (Water, soil, air) health hazards and control.

ZOOLOGY

Non-chordata and Chordata:

Non-Chordata:

1. Protozoa-Classification of protozoa (Honigberg), Locomotion in Protozoa, Nutrition in protozoa, Reproduction in protozoa, Diseases of Protozoa, Economic importance of Protozoa.
2. Porifera: Canal system in porifera, skeleton in porifera, Reproduction in sponges.
3. Coelenterata : Polymorphism in coelenteratas, Metagenesis coral formation, etenophora.
4. Hemlinths: Common Helminthic parasites of Man – Taenia solium, Schistosoma sp., Ascaris, Ancylostoma, Oxyuris Loa, Trichinella, Strongyloides – their life cycles, Parasitism.
5. Annelida: Excretory system in Annelida, Coelome formation.
6. Arthropoda: Mouthparts of Insects, crustacean larvae, parasitism in crustacea, useful and harmful insects, Metamorphosis in insects. Apiculture and sericulture in India.
7. Mollusca: Respiration in Mollusca, Torsion and Detorsion, pearl formation and Pearl industry.
8. Echinodermata: Echinoderm larvae.

CHORDATA:

Origin of Chordata, phylogeny and affinities of Hemichordata Retrogressive metamorphosis, Comparative account of Respiratory, Circulatory, Excretory and Reproductive systems of Vertebrates. Pisciculture in India, Common edible fishes of A.P., Origin and classification of Amphibia, Paedogenesis.

Temporal fossae in Reptilia, Important snakes of India, Dinosaurs.

Adaptations of flight in birds, Migration of birds. Poultry in India.

Adaptive radiation in Mammals, Aquatic Mammals, useful Mammals, Dentition in Mammals.

Evolution of placentalia.

Cell Biology Genetics, Physiology, Evolution, Embryology, Histology, Ecology.

Cell Biology: Ultra structure of the Cell-Plasma membrane – Mitochondria, Golgibodies, Nucleus, Endoplasmic reticulum, ribosomes. Chromosomes and their fine structure. Mitosis and meiosis-D.N.A. & R.N.A. and geneic code, Protein synthesis.

Genetics: Mendel's law of inheritance – Critical review. Linkage, crossing over, Sex linked inheritance, Mutations, Inborn errors of Metabolism, Human genetics.

Physiology: Vitamins; Enzymes; Carbohydrate, protein and lipid metabolism; Osmoregulation, Thermoregulation; Excretion in Vertebrates; Muscle contraction; Nerve Impulse; vertebrate harmones and Mammalian reproduction.

Evolution: Origin of life – Modern concepts, theories of Evolution, Isolation, Speciation, Natural Selection, Hardy weinberg" Law, Population genetics and evolution, Adaptations, Evolution of Man. Zoogeographical realms of the world.

Embryology: Cleavage patterns; Gastrulation and its significance in development of vertebrates; Formation and functions of Foetal membranes, Types of placenta, organisers, Regeneration, genetic control of development organogenesis of central nervous system, sense organs, heart and kidney of vertebrate embryos.

Histology: Histology of Mammalian tissues and organs – Epithelial, connective, blood, bone, cartilage, skin, stomach, intestine, liver, pancreas, kidney, Testis and ovary.

Ecology: Concept of Ecosystem, Biogeochemical cycles, influence of environmental factors on animals, energy flow in Ecosystem, food chains & Tropic levels, community ecology. Ecological Succession, Environmental Pollution – Air, water, land, Noise, Radioactive, thermal and Visual, Effects of Pollution on ecosystem, Prevention of Pollution.

Wild life in India – Conservation.

Man & Biosphere Programme – Chipko movement.

STATISTICS

01. PROBABILITY AND STATISTICS:

Sample space, events: Classical, Axiomatic and statistical definition of probability of an event. Addition and multiplication theorems of probability; conditional probability and Bayes theorem.

Random variables: Distribution function and its properties marginal and conditional distributions. Mathematical expectations, mathematical expectation of sum and product of random variables, Moments, variance and covariance. Characteristic function and its simple properties.

Bionomial, Poisson, Geometric and Negative binomial distributions and their simple properties (such as mean, variance, characteristic function inter-relationship if any)

Normal, exponential, gamma and beta distributions and sampling distributions, Chi-square, T & F distributions; their inter-relationships and their simple properties.

Collection, classification and analysis of statistical data. Measures of location and dispersion, moments-raw and central. Correlation and regression; regression lines.

Curve fitting by the method of least squares, for the types:

(i) $Y=a+bx^2$; (ii) $Y = a+bx+cx^2$; (iii) $Yx=ab$; and (iv) $Yb=axb$

02. INFERENCE:

Conceptual introduction to sufficient statistics unbiased estimators and consistent estimators, Maximum likelihood estimators. Estimatio of parameters in Binomial, Poisson normal distributions.

Test of significance, statistical hypohthesis, types of errors, level of significance, power of a test, large sample tests for means and proportions (one sample and two sample case). Small sample tests (t-test for one and two sample case). Chi-square tests-testing of goodness of fit, testing independence of attributes.

Run test for randomness, Sign test for location, Wilcoxin-Mamn Whitney test and Kolmogorov-Smirnov test.

References: 1) Hogg & Graig: (1972) Introduction to Mathematical statistics 3rd edition, Amerind Publishing Co. Pvt. Ltd., New Delhi, Bombay, Calcutta,; 2) Saxena and Surendran (1973) Statistical Inference, S. Chand & Company, New Delhi; 3) Fisz M. Probability theory and Mathematical Statistics (3rd edition) John Wiley; 4) Kendall and

Stuart. The advanced theory of Statistics (Vol. I Charles Griffin & Co., Ltd., London); 5)
Gupta and Kapur Fundamental of Mathematical Statistics (1971) S. Chand & Sons.

03. SAMPLING TECHNIQUES:

Simple Random Sampling: Estimates of population mean and population total; Variance of the estimates; estimation of standard error, confidence limits. Sampling for proportions and percentages variances of estimates. Estimation of sample size.

Stratified Random Sampling: Estimates of population mean and population total. Variations of the estimates. Confidence limits. Optimum allocation. Relative precision of stratified Random sampling and Simple Random Sampling. Estimation of sample size. Stratified, sampling for proportion.

Regression Estimators: Regression estimates with preassigned value of b. estimates when b. is computed from sample estimate of variance. Linear regression estimator under a linear regression model.

Regression estimates in stratified sampling Regression coefficient estimated from sample.

Text: William G. Cochran. Sampling Techniques (3rd edition) Willey Estern Ltd., New Delhi, Bombay, Calcutta (1977)

Sections: Ch. 2:2.1 to 2.8
Ch. 3:3.1 to 3.2
Ch. 4:4.4 to 4.6
Ch. 5:5.1 to 5.12
Ch. 7:7.1 to 7.4
Ch. 7:8 to 7.10

04. EXPERIMENTAL DESIGNS:

Advantages, disadvantage; layout of the design analysis of the design and missing experimental unit analysis (where applicable) in case of the following design:

Completely Randomised design, Randomised Block design, Latin square design and the Factorial design (22 and 23 factorial designs only)

Text: Walter T. Federer (1974) Experimental Design Theory and Application, Oxford & IBH publishing Co., New Delhi, Bombay, Calcutta.

Chapter IV : IV-1-1 to IV-1-5
Chapter V : V-1-1 to V-1-4, V-1-6-1
Chapter VI : VI-1-1 to VI-6, VI-1-9-1
Chapter VII : 4-1, VII-1-2

BIO-CHEMISTRY

1. CHEMISTRY, METABOLISM OF PROTEINS AND LIPIDS

Chemistry of Amino Acids, Peptides and Proteins. Metabolism of Amino Acids, Peptides and Proteins. Chemistry of Lipids and Porphyrins. Metabolism of Lipids and Porphyrins.

2. CHEMISTRY, METABOLISM OF CARBOHYDRATES AND NUCLEIC ACIDS

Chemistry of Carbohydrates. Metabolism of Carbohydrates. Chemistry and Metabolism of Nucleic Acids. Chemistry and Metabolism of Vitamins.

3. BIOANALYTICAL TECHNIQUES

Spectroscopy, Chromatography, Centrifugation and Electrophoresis, Microscopy and Tracer Techniques

4. BIOENERGETICS AND CELL BIOLOGY

Bioenergetics, Cell Structure of Prokaryotes, Cell Structure of Eukaryotes, Methods of Cell Study

5. ENZYMOLOGY

Enzymes and coenzymes, Enzyme Kinetics, Catalytic mechanisms, Enzyme regulation

6. MOLECULAR BIOLOGY

DNA replication, DNA repair, Transcription and Translation, Protein sorting, targeting and degradation

7. BIOCHEMICAL GENETICS & MODEL ORGANISMS

Mendelian Genetics, Linkage and Mapping, Bacterial Genetics, Model Organisms

8. CELL – CELL COMMUNICATION

Extracellular matrix and cell surface, Cell signaling, Signal transduction and cancer, Signal transduction in bacteria and plants

9. REGULATION OF GENE EXPRESSION & RECOMBINANT DNA TECHNOLOGY

Gene Regulation in prokaryotes and viruses, Gene Regulation in eukaryotes, Recombinant DNA technology, Genetic engineering

10. IMMUNOLOGY

Basic immunology, Immune response, Transplantation & Applied immunology, Disorders of the immune system

11. VIROLOGY AND CLINICAL BIOCHEMISTRY

Prokaryotic viruses, Eukaryotic viruses, Clinical diagnosis, Pathophysiology & Clinical enzymology

12. ENDOCRINOLOGY, PHYSIOLOGY AND NUTRITION

Endocrine systems, Hormones, Body fluids & clinical testing, Physiology of body fluids and Nutrition

13. BIOTECHNOLOGY

Microbial biotechnology, Plant biotechnology, Animal biotechnology, Protein engineering

14. BIostatistics, COMPUTERS AND BIOINFORMATICS

Biostatistics, Computers and Bioinformatics, Genomics, Transcriptome and Proteomics

BIOTECHNOLOGY

CELL BIOLOGY: Diversity of cell size and shape. Cell theory, microscopic techniques for study of cells. Sub-cellular fractionation and criteria of functional integrity. Cellular organelles – Plasma membrane, cell wall, Mitochondria, Chloroplast, Nucleus and other organelles and their organization, structure and functions. Cell motility – cilia, flagella of eukaryotes. Transport of nutrients, ions and macromolecules across membranes. Cellular energy transactions – role of mitochondria and chloroplast. Cell cycle – molecular events and model systems. Cellular responses to environmental signals in plants and animals – mechanisms of signal transduction. Cellular basis of differentiation and development – meiosis, gametogenesis and fertilization, Development in *Drosophila* and *Arabidopsis*.

BIOMOLECULES AND ANALYTICAL TECHNIQUES: Chemical foundations of Biology pH, pK, acids, bases, buffers, weak bonds, covalent bonds. Principles of thermodynamics. Classes of organic compounds and functional groups – atomic and molecular dimensions, space filling and ball and stick models. Classification, structure and functions of carbohydrates, amino acids, proteins and lipids. Molecular assemblies like membranes. Ribosome's, extra cellular matrix. Heterocyclic compounds and secondary metabolites in living systems – nucleotides, pigments, isoprenoids. Separation and purification criteria for homogeneity, end group analysis, hierarchy in structure and Sequencing of proteins and nucleic acids, Ramachandran map. Conformational properties of polynucleotide and polysaccharides – secondary and tertiary

structural features and their analysis – theoretical and experimental; protein folding – biophysical and cellular aspects. Nucleic acid hybridization Structural analysis and biological studies. Analytical techniques in biochemistry and biophysics for small molecules and macro – molecules for quantization. Structural analysis of carbohydrates, proteins, nucleic acids and lipids by UV, IR, NMR, LASER Raman Spectroscopy MASS Spectroscopy, Florescence Spectroscopy, Differential colorimetry, X-ray Crystallography, Ultra centrifugation, Electron Cryomicroscopy and Scanning Tunneling microcopy. Radiochemical methods and measurement of radioactivity, photographic emulsion, ionization chamber, Geiger Muller counter, auto radiography.

MOLECULAR BIOLOGY: DNA Structure, replication, repair and recombination, Transcription, regulation and post transcriptional modifications in Prokaryotes and Eukaryotes. Transcriptional and post-transcriptional gene silencing. Translation and regulation in Prokaryotes and eukaryotes, translation, co-and post-translational modifications of proteins. Protein Localization – Synthesis of secretary and membrane proteins, import into nucleus, mitochondria, chloroplast and peroxisomes, Receptor mediated endocytosis. Biology of cancer – Oncogenes and Tumor Suppressor genes, Structure, function and mechanism of action of pRB and p53 tumor suppressor proteins. Antisense and Ribizyme Technology. Homologous Recombination – Holliday junction, gene targeting, gene disruption, FLP/FRT and Cre/Lox recombination RecA and other recombinases. Molecular Mapping of Genome, Genes, mutation and mutagenesis and bacterial Genetic systems.

BIOSTATISTICS: Frequency distribution, Measures of central tendency – mean, median, mode and standard deviation – probability distribution – regression – correlation – Analysis of variance – tests of significance – T-test, F-test, Chi-square test.

MICROBIOLOGY: Discovery of the microbial world; Distinguishing features of prokaryotes and eukaryotes; General role of microorganisms in transformation of organic matter and in the causation of diseases; Microbial taxonomy, classification, nomenclature and new approaches to microbial taxonomy; Pure culture techniques; sterilization methods; Principles of microbial nutrition and construction of culture media; Enrichment culture techniques; Growth and its mathematical expression; Culture collection and maintenance of cultures; Purple and green bacterial; Rickettsias; Chlamydia and Mycoplasma. Archea; Viruses: structure and replication of viruses; DNA viruses and RNA viruses; Viroids and Prions; Virus and their Genetic System; Bacteriophages; RNA phages; Retroviruses.

IMMUNOLOGY: Phylogeny of Immune System; Innate and acquired immunity; Hematopoiesis and differentiation, Cells and organs of the immune system; Lymphocyte trafficking; Antigenicity and super antigens; Antibody structure and function, Antigen – antibody interactions; Major histocompatibility complex, BCR & TCR and generation of diversity; Complement system, Antigen processing and presentation, generation of humoral and cell mediated immune responses: Activation of B-and T-lymphocytes, Cytokines and their role in immune regulation; Cell mediated cytotoxicity, Hypersensitivity, Autoimmunity, Transplantation, Tumor Immunology, AIDS and other Immunodeficiencies; Hybridoma Technology.

BIOPROCESS ENGINEERING: Engineering calculations, SIT units, Dimensional analysis, presentation and analysis of data, fermenters and bioreactors, Friction factor, pressure drop, Fluid flow and mixing, Material balances, Energy Balances and heat transfer, calculation of heat transfer coefficients, cell concentration and stirring. Boiling and evaporation, Mass transfer, unit operations: Filtration, centrifugation, cell disruption. Downstream processing, industrial applications of bioprocessing.

ENZYME TECHNOLOGY: Discovery, classifications and nomenclature of enzymes. Techniques of enzyme isolation and assay, Intracellular localization of enzymes, Isoenzymes Multienzyme complexes and multifunctional enzymes Physico-chemical characterization of enzymes, Enzyme kinetics, kinetics of enzyme inhibition, Allosterism, Enzyme memory and pmonical enzymes, Various techniques used for the immobilization of enzymes and their applications in Biotechnology.

ENVIRONMENTAL BIOTECHNOLOGY: Ecological balance, resiliency of ecosystem and sustainable development, environmental pollution and global problems, water, air, soil pollution and their impacts on environment and biotechnological approaches for management, waste water treatment: aerobic and anaerobic processes, bioremediation of contaminated soils and waste land, biotechnological treatment for industrial effluents and solid wastes.

GENETIC ENGINEERING: Restriction enzymes, Gene Cloning Vectors, Nucleic Acid Purification and Amplification, Restriction Mapping and Map Construction. Nucleic Acid sequencing methods. cDNA Synthesis, Library construction and screening of recombinants by

hybridization methods, Reporter assays; Site-directed Mutagenesis, protein engineering, Nucleic acid micro array, Vector engineering and codon optimization, Recombinant Protein Purification and refolding, characterization of recombinant proteins and stabilization of proteins. Phage Display; T-DNA and Transposon Tagging, Role of gene tagging in gene analysis; Gene Therapy, Gene silencing methods.

BIOINFORMATICS: Biological databases, ORF finding, EST analysis, gene identification, micro satellite repeat patterns, Blast all flavors, mutation matrix, global Vs local alignments, Dot plots, PAM and BLOSUM matrices, Multiple sequence alignments, dendrograms, phylograms, protein structure prediction methods, molecular modeling, Primer design, QSAR, Drug desing.

PLANT BIOTECHNOLOGY: Propagation techniques in plant tissue culture suspension culture, single cell. Anther, pollen and ovary culture for production of haploid plants. Cryopreservation for germplasm conservation. Plant Transformation technology, Transgene stability and gene silencing. Application of Plant Transformation for productivity and performance. Metabolic Engineering and Industrial Products: plant secondary metabolites, industrial enzymes, biodegradable plastics, therapeutic proteins, antibodies, edible vaccines. Molecular Marker assisted selection and Breeding: RFLP maps, RAPD markers, STS, microsatellites, SCAR (sequence characterized amplified regions), SSCP (single stand conformational polymorphism), AFLP.

ANIMAL BIOTECHNOLOGY: Equipments and materials for animal cell culture technology, simple and complex growth media, cell culture techniques, Primary and established cell line cultures. Biology and characterization of the cultured cells, measuring growth parameters, maintenance of cell culture, Measurement of viability and cytotoxicity, cell separation. Scaling-up of animal cell culture. Cell synchronization. Cell cloning and micromanipulation. Cell transformation. Stem cell cultures, embryonic stem cells and their applications Cell culture based vaccines. Organ and histotypic cultures. Apoptosis, measurement of cell death.

MICROBIOLOGY

MICROBIOLOGY

General Microbiology: History of Microbiology, Microscopy, Structure of microbial cells, Spontaneous generation and germ theory of diseases, Prokaryotic cell, Eukaryotic cell, Organization and function of cellular organelles, Methods of sterilization, Isolation methods (Methods of pure culture isolation, Enrichment culturing techniques, single cell isolation, and pure culture development). Microbiological media and its types, culturing and cultivation of microorganisms. Preservation and Maintenance of Microbial cultures. Identification methods and classification of principles of bacterial taxonomy and classification, Importance of Algae and Fungi, Applications of microbiology in Industry, Agriculture and medicine.

Virology: Structure and Classification of bacterial, plant and animal viruses, Methods of cultivation, detection, Propagation and maintenance of viruses. Some important viruses: TMV, HBV, HIV, T2 phase. Replication of viruses, Tumor viruses, Interferon.

Microbial Physiology: Microbial nutrition, Respiration and fermentation, Bacterial growth and growth curve.

Immunology: T cell, B cell, Immune response, Types of immunity, prophylaxis, vaccines. Major histocompatibility, complex and immunoglobulins. Immunological methods, Antigen-Antibody reactions, Adjuvants, Tumors, Hybridoma technology.

Chemotherapy: Types of antimicrobial agents and mode of action. Therapeutic agents, Chemical, non-medicinal antimicrobials- sanitizers, disinfectants, antiseptics. Antibiotics.

Biochemical Techniques: Enzymes, Enzymes nomenclature, Enzyme kinetics, Regulation of enzyme activity, Optical methods, Separation methods.

Microbial genetics: Nucleic acids Structure and Replication. Transcription. Translation. Mutations, Benzer's fine structure. Bacterial Transformation, transduction and conjugation Plasmids, PCR, Cloning, Recombinants. Molecular markers. Gene chip and microarrays.

Industrial microbiology: Exploitation of microbes in industry. Screening, Fermentation, fermenters. Types of fermentations processes Scale-up of fermentations. Up and Down stream process. Strain development. Fermentation productions-Ethanol, Beer, Wine and other alcoholic drinks, aminoacids, antibiotics, organic acids, vitamins, enzymes, biotransformations, probiotics,

and solvents. Principles of vaccine production and types of vaccines. Industrial Quality control and assurance.

Agricultural and veterinary microbiology: Ecological significance. Soil Microorganisms, Mineralization, Soil humus formation, Nitrogen metabolism, Phosphate solubilization. Bio-fertilizers, Biopesticides, Rumen microbiology, termite microbial communities, Microbes in the production of energy from agricultural and domestic wastes. Rhizosphere, Mycorrhizae, Phyllosphere.

Medical Microbiology: Normal flora, Bacterial and viral infections (Air born, water born, food born, insect born and zoonotic), Mycosis, Medical diagnostics and Toxins.

Microbiology of Food and Environment: Fermented foods, Spoilage of foods, Food preservation methods, Food poisoning, Mycotoxins. Microbial degradation, pollution, sewage treatment. Bioremediation.

COMPUTER APPLICATIONS

Mathematical Foundations: Mathematical Logic, Set Theory, Elementary Combinatorics, Probability, Random Variables, Binomial and Poisson Distributions, Curve Fitting, Number Systems and Computer Arithmetic.

Computer Organization: Memory Organizations, CPU Organization, Assembly Language, Microprogramming, Input-Output Organization, Intel 8086 Computer.

Programming: Programming in C, Object oriented programming concepts including classes, Polymorphism, Inheritance, and Programming in C++ and Java.

Data Structures: Arrays, Records, Searching and Sorting Techniques, Linked Lists, Trees, Binary Tree Traversal, Binary Search Trees, and Graphs.

Operating Systems: Introduction, Process and CPU Scheduling, Process Synchronization, Deadlocks, Disk and Memory Management, Virtual Memory, File System Interface and Implementation, Protection and Security.

Database Management Systems: Introduction, Relational Model and Languages, Data Modeling, Database Design Theory and Methodology, SQL, Transaction Processing & Concurrency control and Database Recovery & Security.

Computer Graphics: Line Drawing, Graphic Primitives and Polygons, 2D Transformations, Windows and Clipping, 3-D Graphics, Curves and Surfaces.

Computer Networks: Introduction, Seven Layers in OSI Model, Internetworking, and TCP/IP Model.

Software Engineering: Software Characteristics, Software Process Models, Analysis, Design, Coding, Testing, and Software Quality Assurance.

Object oriented Analysis and Design: Introduction to UML, Basic Structural Modeling, Classes and Object Diagrams, Behaviour Modeling and Architecture Modeling.

COMPUTER SCIENCE

Computer Organization: Memory Organizations, CPU Organisation, Assembly Language, Microprogramming, Input-Output Organization, Intel 8086 Computer.

Programming: Programming in C, Object oriented programming concepts including classes, Polymorphism, Inheritance, and Programming in C++ and Java.

Data Structures: Arrays, Records, Linked Lists, Trees, Binary Tree Traversal, Binary Search Trees, and Graphs.

Design and Analysis of Algorithms: Algorithm complexity, Algorithms Design Techniques – Divide and Conquer, Greedy Method, Dynamic Programming, Backtracking, Branch and Bound, NP-Hard and NP-Complete Problems.

Principles of Programming Languages: BNF, Variables, Data Types, Control Structures, Scope and Extent, Data Abstraction, Concurrency concepts, Exception Handling, Functional Programming, and Logic Programming.

Compiler Design: Types of grammar, Phases of compiler, Lexical Analysis, Parsing Techniques, Code generation and Optimization.

Operating Systems: Introduction, Process and CPU Scheduling, Process Synchronization, Deadlocks, Disk and Memory Management, Virtual Memory, File System Interface and Implementation, Protection and Security.

Database Management Systems: Introduction, Relational Model and Languages, Data Modeling, Database Design Theory and Methodology, SQL, Transaction Processing & Concurrency control and Database Recovery & Security.

Computer Graphics: Line Drawing, Graphic Primitives and Polygons, 2D Transformations, Windows and Clipping, 3-D Graphics, Curves and Surfaces.

Computer Networks: Introduction, Seven Layers in OSI Model, Internetworking, and TCP/IP Model.

Distributed Operating Systems: Goals, Client-Server Model, Synchronization in distributed systems, Distributed Process Management and File Systems, Distributed Shared Memory.

Software Engineering: Software Characteristics, Software Process Models, Analysis, Design, Coding, Testing, and Software Quality Assurance.

Object oriented Analysis and Design: Introduction to UML, Basic Structural Modeling, Classes and Object Diagrams, Behaviour Modeling and Architecture Modeling.

Network Security: Data Encryption and Decryption, Symmetric Key algorithms like DES, IDEA and AES, Public Key Cryptography, RSA algorithm, Digital Signatures & Authentication, Firewalls and VPN.

GEOLOGY

CRYSTALLOGRAPHY

Definition, classification and morphology of crystals. Symmetry elements, 32 classes of symmetry. Plane lattice, space lattice, unit cell, 14 Bravais lattices, glide planes, screw axes and space groups.

MINERALOGY

Introduction to Mineralogy, definition and classification of minerals. Structural and chemical principles of crystals/minerals. Chemical bonds, Ionic radii, Coordination number (CN), Polyhedron and Pauling's rules. Silicate structures.

Structure, Chemistry, Physical and Optical characters and paragenesis of the following mineral groups – Olivine, Pyroxene, Amphibole, Mica, Spinels
Feldspars, Quartz, Feldspathoids, Aluminum silicates, Epidote, Garnet.

OPTICAL MINERALOGY

Nature of polarized light. Behavior of Isotropic & Anisotropic Minerals in Polarized Light. Refractive Index – Double Refraction – Birefringence – Dispersion – Sign of Elongation – Interference figures – optic sign and accessory plates.

IGNEOUS PETROLOGY

Classification of Igneous rocks. Structure and textures of Igneous rocks. Phase Equilibrium in igneous systems. Magmatic processes.

Petrography and petrogenesis of the following rock types:

Granite – Granodiorite – Tonalite suite. Alkaline rocks, Anorthosites and layered complexes. Kimberlite provinces in Andhra Pradesh.

GEOCHEMISTRY

Classification, Mineralogy and chemical composition, origin and age of meteorites. Composition of crust, primary differentiation of earth.

Geochemical classification of elements, periodic table, petrogenetic significance of transition and rare earth elements. Goldschmidt's rules governing distribution of elements during magmatic crystallization.

Introduction to Isotopic geochemistry.

METAMORPHIC PETROLOGY AND THERMODYNAMICS

Definition, scope and historical background of Metamorphism and Metamorphic processes. Classification, Nomenclature, Structures and Textures of metamorphic rocks. Zones, Grades, and Facies of metamorphism. ACF – AFM – AKF phase diagrams.

Contact metamorphic facies: Hornfels and Sandinite. Regional metamorphic facies: Zeolite Greenschist, Blueschist, Amphibolite, Granulite, and Eclogite. Goldschmidt's Mineralogical Phase rule and Metamorphic reactions. Petrogenetic grids. Geothermobarometry and Pressure (P); Temperature (T); and Time (T) paths. Paired metamorphic belts.

Internal energy of a system and First law of thermodynamics. Entropy and Second law of thermodynamics. Reversible and irreversible processes. Enthalpy and Gibb's free energy. Chemical potential, fugacity, activity and activity coefficient.

SEDIMENTOLOGY AND PETROLEUM GEOLOGY

Nature and classification of sedimentary rocks. Classification of Sedimentary Environments. Evolution of Sedimentary basins and geosynclinal concept.

Nature and origin of Petroleum hydrocarbons. and Gas Hydrates. Reservoir rocks. Migration and accumulation.

STRUCTURAL GEOLOGY AND GEOTECTONICS

Stress-strain relationships of elastic, plastic and viscous materials. Measurement of strain in deformed rocks. Behaviour of minerals and rocks under deformation conditions. Folds: classification and causes of folding. Diapirs and salt domes.

Shear Zones & Recognition of faults & shear zones in the field. Mechanics of shearing & faulting. Geometry of thrust sheets. Block faulted and rifted regions. Wrench faults and associated structures. Foliations and Lineations: classification, origin and significance.

Tectonic framework of Earth's crust. Interior of earth. Isostasy.

Convection currents. Wilson Cycle. Continental Drift. Sea-floor spreading

Nature of Convergent, Divergent and Conservative plate margins. Transpression & Transtension. Plate tectonics: Concept of plate and plate movements. Plate model of Morgan. Plate tectonics in relation to igneous, sedimentary and metamorphic processes and mineralisation. Triple junctions. Aulocogens. Plume Theory. Island arcs. Nature and origin of Earth's magnetic field.

PALAEONTOLOGY AND STRATIGRAPHY

Morphology, classification and geological history of the Invertebrate fossil phyla—Foraminifera, Radiolaria, coelenterata, Brachiopoda, Trilobita, Mollusca, Echinodermata, General characters of amphibians, reptiles and mammals. Classification, evolution and extinction of Dinosaurs. Classification and evolution of horse, elephant and man. Classification and distribution of microfossils. Gondwana flora and their significance.

Nomenclature and the modern stratigraphic code. Litho, bio and chrono stratigraphic units and their inter relationships. Geological time scale. Magneto-stratigraphy. Dating of rocks. Modern methods of stratigraphic correlation. Precambrian stratigraphy-- a) Achaean stratigraphy - tectonic frame-work, geological history & evolution of Dharwar, and their equivalents; Easterghats mobile belt. (b) Proterozoic stratigraphy - tectonic framework, geological history, and evolution of Cuddapah, and their equivalents.

Stratigraphy of the Palaeozoic and Mesozoic formations of India with special reference to type localities. Palaeozoic and Mesozoic formations of India with special reference to their history of sedimentation, fossil content and palaeogeography. Gondwana System. Cenozoic formations of India Rise of the Himalayas and evolution of Siwalik basin and Deccan volcanics. Boundary problems in Indian stratigraphy

GEOMORPHOLOGY AND FIELD GEOLOGY

Definition and fundamental concepts of geomorphology. Geomorphic processes: Gradation, degradation, aggradation. Endogenetic process: Diastrophism, Vulcanism. Weathering processes and Mass wasting: Physical weathering, chemical weathering, soil profile, formation of soil, processes of mass wasting.

The fluvial cycle: streams and valleys, drainage patterns and their significance, stream deposition. The peneplain concept, topography on domal folded and faulted structures. The arid cycle: origin of deserts and its landforms, topographic effects of wind erosion. Karst topography: landforms of Karst regions.

Glaciers: features resulting from glaciers, development of landforms, effects of glaciation beyond ice caps, Interglacial deposits. Geomorphology of coasts: topographic features resulting from marine deposition. Topography of Ocean floors:- landforms related to shelves, slopes and deep sea. Landforms resulting from Vulcanism.

Principle of map reading. Toposheets; Geological Mapping. Geological mapping; Clinometer Compass; Brunton Compass; Strike & Dip measurements; Details of field geological mapping of Igneous, sedimentary and metamorphic terrains.

ORE GENESIS AND MINERAL DEPOSITS

Processes of formation of ore deposits. Metallogeny through geological time. Advanced study of ore textures. Scientific application of ore textures and ore genesis. Paragenesis, paragenetic sequences and zoning in metallic ore deposits.

Orthomagmatic ores of mafic-ultramafic association--- Chromite deposits and PGE. Diamonds in kimberlite, REE in Carbonatites. Cyprus type Cu-Zn, Ores of Silicic igneous rocks – Kiruna type Fe-P, Kuroko type Zn-Pb-Cu.

Stratiform and stratabound ore deposits (Mn, Fe, non-ferrous ores). Placers concentrations. Ores of metamorphic affiliations. Ores related to weathering and weathered surfaces – laterite, bauxite and Manganese nodules..

Study of the case studies of the following Indian ores :

1. Iron ore formations and deposits. 2. Chromite deposits. 3. Manganese deposits. 4. Copper deposits. 5. Lead and Zinc deposits. 6. Bauxite deposits. 7. Magnesite deposits. 8. Barite deposits. 9. Mica deposits. 10. Asbestos deposits. 11. Dimension and decorative stones. Mineral based Industries – Iron & Steel; Refractories; Ceramic; Electrical & Insulators; Paper; Glass etc.

MINERAL EXPLORATION

Geological exploration. Ore search--physiographic, lithologic, stratigraphic, structural and mineralogical guides.

Geophysical Exploration. Simple types of measuring instruments, field procedures and interpretation of data from various methods of geophysical prospecting viz. Gravimetric, Magnetic, Electrical and Radiometric methods. Well logging and interpretation.

Geochemical Exploration - Geochemical environments-Dispersion and mobility, Geochemical associations and pathfinders and their application. Primary environment. Primary dispersions and halos. Secondary environment: Chemical weathering: Significance of Eh & pH, Absorption. Mobility of elements in secondary environment. Sampling and interpretation of data. Geochemical anomalies-Significant, non-significant and displaced anomalies.

HYDROGEOLOGY, REMOTE SENSING AND GIS

Hydrological cycle. Hydrographs, water table contour maps. Rock properties affecting groundwater. Porosity, permeability, specific yield, specific retention, hydraulic conductivity, transmissivity, storage coefficient.

Well hydraulics- General flow equations, Steady unidirectional flow, Steady radial flow to a well, Unsteady radial flow in a confined and unconfined aquifer.

Water level fluctuation, causative factors. Methods of pumping tests and analysis of test data, evaluation of aquifer parameters. Artificial recharge of Groundwater. Groundwater legislation.

Ground Water quality-sources of salinity, estimation of major elements, reporting of chemical analysis. Groundwater Pollution-problems of Arsenic and Fluoride. Groundwater quality map of India. Quality criteria for groundwater use. Salt water intrusion in coastal aquifers and remedial measures.

Importance of Remote sensing and GIS in geological applications.