# ADIKAVI NANNAYA UNIVERSITY

# RAJAHMUNDRY

### B.Sc.  II Year Syllabus
### Effective for 2013 Admitted Batch only.

*Part  I: Languages*

**Paper-2:  English (At the end of the Second Year)**

I. Prose:
| | | | |
|---|---|---|---|
| 1. | Mother Theressa | : | John Frazer |
| 2. | Forgetting | : | Robert Lynd |
| 3. | Seeing People Off | : | Sir Max Beerbohm |
| 4. | The Power of Prayer | : | A.P.J. Abdul Kalam |
| 5. | On Saying 'Please' | : | A.G.Gardiner |
| 6. | The Eyes are Not Here | : | Ruskin Bond |

II. Poetry:
| | | | |
|---|---|---|---|
| 1. | The Human Seasons | : | John Keats |
| 2. | The Solitary Reaper | : | William Wordsworth |
| 3. | The Quality of Mercy | : | William Shakespeare |
| 4. | The Night of the Scorpion: | | Nissim Ezekiel |
| 5. | Ode on Solitude | : | Alexander Pope |
| 6. | Stopping By Woods on a Snowy Evening | : | Robert Frost |

III. Non-detailed:
1. The Importance of Being "Earnest"      : Oscar Wilde
   Published by Orient Black Swan
   Edited by Dr.K.S.Ramesh

IV. Composition and communication:
1. Resume Writing (or)  e – correspondence
2. Note Making (or) Mind Mapping
3. Proverb (or) Information Transfer (Tree diagram (or) Pie-chart)
4. Personal Letter (or) Official Letter

English Language Through Literature - Textbook for II year Undergraduate Courses
Published by Orient Black Swan.

## ii) TELUGU

## Paper-2: General Telugu (At the end of the Second Year) (వశిష్ట సౌరభాలు)

1. ప్రాచీన కవిత్వం
   1. పోతన - వామనావతారం.
      శ్రీ మదాంధ్రభాగవతము, అష్టమస్కంధము. 585 నుండి 621 వరకు.
      " కులమున్ రాజ్యము " నుండి " రవివింబంబువవింత " వరకు.
   2. అనంతామాత్యుడు - సత్యవిష్ట
      భోజరాజీయములోని షష్ఠాశ్వాసమునందలి గోవ్యాఘ్ర సంవాదమునుండి.
      27 నుండి 74 వరకు.
      " విన్నుగని యుస్పిదినములు " నుండి " ఈగోవ్యాఘ్ర సంవాదంబు "విష్ణ" వరకు.
   3. సుభాషితాలు - వేమన (5), సుమతి (5) భాస్కరశతకం (3) సుభాషితరత్నావళి (3)

      వేమనపద్యాలు :-    1. ఆత్మశుద్ధి లేని ఆచారమదియేల
      (వేమన)    2. భూమినాదియన్న భూమి నక్కున నవ్వు
          3. తల్లిదండ్రి మీద దయలేని పుత్రుండు
          4. ఇనుమువిరిగేవేని ఇనుమారుముమ్మారు.
          5. చంపదగినయట్టి శత్రువు తనచేత.

      సుమతిశతక పద్యాలు :-    1. ఉపకారికి నుపకారము
      ( బద్దెన)    2. పుత్రోత్సాహము తండ్రికి
          3. వినదగునెవ్వరుసెప్పిన
          4. కులకాంతలోడనెప్పుడు
          5. బలనంతుడ నాకేమని.

      భాస్కరశతక పద్యాలు :-    1. చదువది యొంతగల్గిన
          2. దక్షుడు లేనియింటికి
          3. పండితులైనవారు

      సుభాషితరత్నావళి :-    1. ఆరంభింపరు నీచమానవులు.
      (ఏనుగు లక్ష్మణకవి)    2. ఒకటోనేలను బవ్యకించు
          3. మకరముఖాంతరస్థమగుసూనికసుమ్.

2. ఆధునిక కవిత్వం
   4. బోయిభీమన్న - గుడిపెలు కాలిపోతున్నె.
   5. విశ్వనాథసత్యనారాయణ - నాథభవర్మ ( ఆంధ్రపశస్తినుండి 1 నుండి 16 )
      " ఇతడు పల్లవరాజు " నుండి "చటివసాయంసంధ్యా "వరకు.
   6. దేవరకొండ బాలగంగాధర తిలక్ - ఆర్ద్రగీతం ( అమృతంకురిసినరాత్రి నుండి)

3. గద్యభాగం
   7. వరవస్తు చిన్నయసూరి - మిత్రభేదం (నీతిచంద్రికనుండి)
      "యమునాతీరమందలి" నుండి "లొట్టియనుచంప భక్షించెను" వరకు.
   8. సాగంటి లక్ష్మీనరసింహారావు - "స్వభాష" (సాక్షి మూడవ సంపుటి లోనిది)
   9. ఆర్.వి.ఎస్.సుందరం - జానపదవిజ్ఞానం-సామెతలు.
      (ఆంధ్రుల జానపదవిజ్ఞానం అనేగ్రంథంలోనిది).

4. ఉపవాచకం
   తిరుపతి వేంకటకవులు - పాండవోద్యోగం (నాటకం)

5.     సాధారణవ్యాసాలు.

6.     ఆ) అలంకారములు :-

1. శబ్దాలంకారములు :- 1. వృత్యనుప్రాస 2. ఛేకానుప్రాస 3. లాటానుప్రాస
   4. అంత్యానుప్రాస 5. ముక్తపదగ్రస్తము 6. యమకము

2. అర్థాలంకారములు :- 1. ఉపమ 2. ఉత్ప్రేక్ష 3. రూపక 4.అర్థాంతరన్యాస
   5. అతిశయోక్తి 6. శ్లేష.

ఆ) ఛందస్సు :-

1. వృత్తములు :- 1. ఉత్పలమాల 2. చంపకమాల 3.శార్దూలము 4.మత్తేభము
   5. మత్తకోకిల.

2. జాతిపద్యము :- కందము

3. ఉపజాతులు :- 1.తేటగీతి 2. ఆటవెలది 3. సీసము.

### పరీక్షావిధానం

| మొత్తం | 100 | మార్కులు |
|---|---|---|
| ఇంటర్నల్ | 20 | మార్కులు |
| వార్షిక పరీక్ష | 80 | మార్కులు |

ఇంటర్నల్ విధానం  : -

విద్యాసంవత్సరంలో 2 ఇంటర్నల్ పరీక్షలు (రూల్ పేపర్ మీద) నిర్వహించాలి. ఒక్కొక్క పరీక్షకు 20 మార్కులు చొప్పున 2 పరీక్షలు 40 మార్కులకు నిర్వహించినాటిని 20 మార్కులకు ఎవరేజ్ చేసి మార్కులజాబితాను ఆదికవి నన్నయ విశ్వవిద్యాలయానికి సమర్పించాలి.

సమాధాన పత్రాలు, మార్కులజాబితా, రికార్డు చేసి భద్రపరచాలి.

### iii) HINDI

**Paper-2: Hindi (At the end of the Second Year)**

A.     Poetry Text – Kavya Deep

        Editor :  Sri B. Radha Krishna Murthy

        Maruthi Publications,  Guntur.

        *In Poetry text ` Kavya Deep` only these lessons are kept in syllabus:*

**Old Poetry:**

1.   कबीर दास : दोहे --- **2,3,4,7,16,19.**

2.   सूर दास :    विनय पद

3.   तुलसी दासः   दोहे --- 1,**3,4,** 5, 6, 10.

4.   रहीमः   दोहे --- 1,**2,5,6,7,9.**

**Modern Poetry:**

5. मातृभाषा के प्रति -- भारतेंदु हरिशंद्र

6. मातृभूमि -- मैथलीशरण गुप्त

7. तोड़ती पत्थर – सूर्यकांत त्रिपाठी निराला

8.ठूँठ -- अलूरी बैरागी

9. मादा भ्रूण – रजनी तिलक

**B. History of Hindi Literature:**

1. आदिकाल   2. भक्ति काल

*निम्न कवियों का आध्यान करना हैः*

**[1]** कबीर दास    **[2]** तुलसी दास   **[3]** मैथलीशरण गुप्त **[4]** जयशंकर प्रसाद **[5]**  सूर्यकांत त्रिपाठी निराला **[6]** प्रेमचंद

**C. General Essay:**

1.पर्यावरण प्रदूषण   2.समाज और नारी   3.पुस्तकालय  4.बेरोजगारी समस्या    5. राष्ट्रभाषा हिन्दी  6. विद्यार्थी और राजनीति

**D. Prayojan moolak  Hindi (Functional Hindi):**

    [1]  Prayojanmoolak Hindi :  Arth Evam Swarop

    [2]  Raj Bhasha, Rastra Bhasha aur Sampark Bhasha.

### iv) SANSKRIT

**Paper-2:** "दैवीवाक्-2" (Daivi Vak-2) Drama, Upanishad, Prose, Poets, Alankaras and Grammar. (At the end of the Second Year)

**I. Drama:**

| | | |
|---|---|---|
| Lesson No. 1 | : | "PratimaGruham" |
| | | From III act of PratimaNataka by Bhasa |
| Lesson No. 2 | : | "BharataSamskrutehMulam" |
| | | From VI act of SusamhataBharatam by |
| | | P. Sreeramachandrudu |

**II. Upanisadadesah:**

| | | |
|---|---|---|
| Lesson No. 3 | : | 1. Dakara Katha |
| | | From Bruhadaranyaka |
| | | 2. Sikshanusasanam |
| | | From SikshaValli of Taitriya |

**III. Prose:**

| | | |
|---|---|---|
| Lesson No. 4 | : | "Sukanasopadesah" |
| | | From KadambariSangraha |
| Lesson No. 5 | : | "BhojasyaSaraswathiSushama" |
| | | From Bhojaprabandha (Abridged form) |

**IV. Poets and Books from History of Literature:**

| | | | |
|---|---|---|---|
| 1. Panini | 2. Kaulilya | 3.Bharatamuni | |
| 4.Bharavi | 5. Magha | 6. Sriharsha | |
| 7.Bhavabhuti | 8. Sankaracharya | 9. Dandin | 10.Jagannath |

**V. Alankaras from Kuvalayananda:**

| | | |
|---|---|---|
| i) Upama | ii) Ananvaya | iii) Utpreksha |
| iv) Deepaka | v) Aprastutaprasamsa | vi) Drstanta |
| vii) Arthantaranyasa | viii) Virodhabhasa | ix) Ullekha |
| x) Vyajasthuti | | |

**VI. Grammar:**

(a) Declensions :

अ) Halanta Nouns:

| | | |
|---|---|---|
| i) Jalamuc | ii) Vac | iii) Marut |
| iv) Bhagavat | v)  Pachat | vi) Rajan |
| vii) Gunin | viii) Naman | ix) Vidwas |
| x) Manas | | |

आ) Pronouns:

| | | |
|---|---|---|
| i)Asmad | ii) Ushmad | iii) Idam |
| iv) Tad | v) Etad | vi) Yad |
| vii) Kim | | |

(b) Participles:

| | | |
|---|---|---|
| i) Ktwa | ii) Lyap | iii) Tumun |
| iv) Kta | v) Kthavat | vi) Sathr |
| vii) Sanach | viii) Tavya | |

Text Book:

1. Prof. G.A. Sarma, *दैवीवाक्-2(Daivi Vak-2)*, Maruthi Publishing House, Hyderabad.

*Part II: Foundation courses*

**Paper-2: Contemporary India:  Economy, Polity and Society**
   **(at the end of Second Year)**

Unit-I:   Basic features of  Indian Economy – Trends in National Income – Role of Agriculture Sector – Problems, Remedial Measures; Industry – Large scale, Small scale – problems and remedial measures; a brief review of Industrial policies in India.

Unit-II:  Population, Poverty, Unemployment and Income Inequalities – Causes and Consequences – Remedies – Inflation – Causes and Remedies – Indian Tax Structure Globalization, Economic Reforms and their impact on Indian Economy.

Unit-III:  Indian National movement – various Stages – Its legacy, Integration of Native States and Formation of Modern India.  Formation of Andhra Pradesh.

Unit-IV: Basic Characteristics of Indian Constitution – Indian Political System, Emergence of All India Parties – Regional Parties – Coalition Politics. Centre – State relations – Emerging trends – Various Commissions – Rajamannar Committee, Anandpur Sahib resolutions, Sarcaria Commission.  Indian Foreign Policy – Non –Aligned Movement – Local Self governments in the light of 73$^{rd}$, 74$^{th}$ constitutional amendments.  Right to Information Act – Civil Society.

Unit-V:   Salient features of Indian Social Structure, Social Groups:  Primary and Secondary, Association – Institution.  Status and Role – Norms, values and Customs Concept of Socialization -   Agencies of Socialization. Gender Issues – Women Liberation Movements In India – Domestic Violence, Women Empowerment – Entrepreneurship Programmes – Child Labour.

Unit-VI: Human Rights – Importance and violation of Human rights.

**Books for Reference**:
   1. Dutt and Sundaram, *Indian Economy*, S. Chand Publications, New Delhi.
   2. Mishra and Puri, *Indian Economy*, Himalaya Publications, New Delhi.
   3. *Indian Government and Politics,* Telugu Academy
   4. K. Jagannadha Sarma, *Indian Society*
   5. *Indian History,* Telugu Academy

*Part III: Basic Subjetcs*

**BIO-CHEMISTRY**

**Paper-2: Enzymology and Intermediary Metabolism**

Unit-I: Enzymes:Introduction to biocatalysis, differences between chemical and biological catalysis. Nomenclature and classification of enzymes. Enzyme specificity. Active site. Principles of energy of activation, transition state. Interaction between enzyme and substrate- lock and key, induced fit models. Definition of holo-enzyme, apo-enzyme , coenzyme, cofactor. Fundamentals of enzyme assay, enzyme Units.

Factors affecting the catalysis- substrate concentration, $p$H, temperature. Michaelis - Menten equation for uni-substrate reaction (derivation not necessary), significance of $K_M$ and $V_{max}$. Enzyme inhibition- irreversible and reversible, types of reversible inhibitions- competitive and non-competitive.

Outline of mechanism of enzyme action- acid-base catalysis, covalent catalysis, electrostatic catalysis, and metal ion catalysis. Regulation of enzyme activity- allosterism and cooperatitvity, ATCase as an allosteric enzyme, covalent modulation- covalent phosphorylation of phosphorylase, zymogen activation- activation of trypsinogen and chymotrypsinogen. Isoenzymes (LDH). Multienzyme complexes (PDH). Ribozyme.

Unit-II : Carbohydrate and Lipid Metabolism: Concept of anabolism and catabolism. Glycolytic pathway, energy yield. Fate of pyruvate- formation of lactate and ethanol, Pasteur effect. Citric acid cycle, regulation, energy yield, amphipathic role. Anaplerotic reactions. Glycogenolysis and glycogenesis. Pentose phosphate pathway. Gluconeogenesis. Photosytnthesis- Dark reactions, Calvin cycle, $C_4$ Pathway.

Catabolism of fatty acids ( - oxidation) with even and odd number of carbon atoms, Ketogenesis, *de novo* synthesis of fatty acids, elongation of fatty acids in mitochondria and microsomes, Biosynthesis and degradation of triacylglycerol and lecithin. Biosynthesis of cholesterol.

Unit-III : Metabolism of Nitrogen Compounds: General reactions of amino acid metabolism- transamination, decarboxylation and deamination, Urea cycle and regulation, Catabolism of carbon skeleton of amino acids- glycogenic and ketogenic amino acids. Metabolism of glycine, serine, aspartic acid, methionine, phenylalanine and leucine. Biosynthesis of creatine. Inborn errors of aromatic and branched chain amino acid metabolism.

Biosynthesis and regulation of purine and pyrimidine nucleotides, *de novo* and salvage pathways. Catabolism of purines and pyrimidines. Biosynthesis of deoxyribonucleotides- ribonucleotide reductase and thymidylate synthase and their significance. Disorders of nucleotide metabolism- Gout, Lesch- Nyhan syndrome. Biosynthesis and degradation of heme.

Unit –IV: Bioenergetics and Biological Oxidations: Energy transformations in the living system, Free energy concept. Exergonic and endergonic reactions. High energy compounds. Phosphate group transfer potential. Substrate level phosphorylation.

Biological oxidations: Definition, enzymes involved- oxidases, dehydrogenases and oxygenases. Redox reactions. Redox couplers. Reduction potential ($v$, $v_o$, $v'_o$). Standard reduction potential ($v'_o$) of some biochemically important half reactions.

Ultra structure of mitochondria. Electron transport chain and carriers involved. Oxidative phosphorylation, theories of oxidative phosphorylation- Mitchell's chemiosmotic theory.

$F_o$ $F_1$- ATPase. Inhibitors of respiratory chain and oxidative phosphorylation, uncouplers. Formation of reactive oxygen species and their disposal through enzymatic reactions.

Ultra structure of chloroplast, Cyclic and non-cyclic photophosphorylation.

**Books for Reference:**
1. Nelson.D.L. and Cox.M.M, *Lehninger's Principles of Biochemistry* , Freeman & Co.
2. Voet.D and Voet., J.G., *Biochemistry*, John Wiley & Sons .
3. Murray, R.K., Granner.D.K. & Rodwell,V.W., *Harper's Illustrated Biochemistry*, McGraw-Hill
4. Champe, P.C. and Harvey, R. A. Lippincott
5. Price.N.C.and Stevens.L., *Fundamentals of Enzymology* ,Oxford University Press.
6. McKee. T and McKee, J. R, *Biochemistry- The Molecular Basis of Life,* Mc Graw-Hill.
7. Palmer.T, *Understanding Enzymes ,* Ellis Harwood.

**Practicals - 2: Quantitative Analysis and Enzymology**
List of Experiments:
1. Estimation of amino acid by Ninhydrin method.
2. Estimation of protein by Biuret method.
3. Estimation of protein by Lowry method.
4. Estimation of glucose by DNS method.
5. Estimation of glucose by Benedict's titrimetric method.
6. Estimation of total carbohydrates by anthrone method (Demo with Record).
7. Titration curve of glycine and determination of $p$K and $p$I values.
8. Assay of amylase.
9. Assay of protease.
10. Effect of pH, temperature, and Substrate concentrations on amylase activity (Demo with Record).

**Books for Reference:**
1. Plummer, D. T, *An Introduction to Practical Biochemistry*, Tata McGraw-Hill.
2. Sawhney, S. K. Randhir Singh, *Introductory Practical Biochemistry*, Narosa Publications House osa Publications House.
3. Eisenthal,.R and Dawson, M.J., *Enzyme Assays , A Practical Approach* , IRL Press
4. Rameshwar. A *, Practical Biochemistry* , Kalyani Publisher.
5. Jayaraman, J. *Laboratory Manual in Biochemistry,* Wiley-Eastern.
6. Sheel Sharma, *Experiments and Techniques in Biochemistry* Galgotia Publications.

**BIOTECHNOLOGY**

**Paper -2 : Biological Chemistry, Biostatistics and Bioinformatics:**
Unit- I: Biomolecules:
1. Carbohydrates : Importance, classification and properties.
2. Structure, configuration and biochemical importance of monosaccharides (glucose and fructose).
3. Dissacharides – Structures and biochemical importance of sucrose and Trehalose.
4. Structure and function of homo polysaccharides – starch, inulin, cellulose and glycogen.
5. Structure and function of heteropolysaccharides – Hyaluronic acid
   Proteins : Classification, structure and properties.
   Amino acids, Peptide bond.
6. Primary, secondary, tertiary and quaternary structures of proteins.
7. Lipids :: Saturated and unsaturated Fatty acids.
8. Triacylglycerols, Sphingolipids, Sterol Phospholipids (phosphatidic acid, phosphatidylcholine).
9. Enzymes: Classification and nomenclature of enzymes, Kinetics of enzyme catalyzed reactions.(Michaeli's-Menton equation only)
10. Factors influencing enzymatic reactions.
    (a) pH  (b) Temperature (c) Substrate concentration (d) Enzyme concentration
11. Enzyme Inhibition – Competitive and non-competitive .

Unit- II: Intermediary Metabolism:
1. Glycolysis.
2. Citric acid cycle.
3. Mitochondrial electron transport.
4. Deamination, decarboxylation and transamination reactions of amino acids.
5. Catabolism of amino acids – phenyl alanine and tyrosine (Phenylketonuria and albinism)
6. Photosynthesis – Light reaction and photophosphorylation.

. Unit III: Concepts of Biostatistics and Bioinformatics:
1. Concept of Mean, Median, Mode, Range, Standard deviation and Coefficient of Variation.
2. Concept of probability, basic laws and its application to Mendelian segregation.
3. Concept of sampling and sampling distribution. Concept of test of hypothesis. Applications of t-test statistics to biological problems/data: Chi-square, statistic applications in biology.
4. Simple Regression and Correlation.
5. Introduction to Bioinformatics  Biological Databases – Nucleotide sequence and Protein databases, their  utilization in Biotechnology.

Unit-IV:   Principles and Applications of Biophysical Techniques:
1. Microscopy – Light, Inverted, Fluorescent and Electron microscopy.
2. Colorimetry – Beer – Lambert's Law.
3. UV-VIS Spectrophotometry.
4. Chromatography.
   (a) Paper (b) Thin Layer (c) Ion-exchange (d) Gel-filtration.
5. Electrophoresis – Native gels and SDS-PAGE, Agarose.
6. Centrifugation and filtration – Basic Principles.

7. Dialysis and lyopholization.
8. Radio isotopes and their uses in biology.

Note: From statistics unit equal weight-age is given to theory of the topics.

**Books for Reference:**

1. Dr. U. Satyanarayana, U. Chakrapani. *Biochemistry.*
2. Lehninger,*Biochemistry*
3. S. Sadasivam and A. Manickam, *Biochemical Methods*
4. V. Deshpande and . B.SasidharRao *Experimental Biochemistry, A Student Companion*
5. Khan and Khanum, *Fundamentals of Biostatistics,* Ukaaz Publications.
6. S.Irfan Ali Khan and Atiya Khanum, *Basic Concepts of Bioinformatics,* Ukaaz publications.

**Practicals -2: Quantitative Analysis, Biostatistics and Bioinformatics**:

1. Preparation of Normal, Molar and Molal solutions.
2. Preparation of Buffers (Acidic, Neutral and Alkaline Buffers).
3. Qualitative tests of sugars, amino acids and lipids.
4. Estimations of protein by Biuret method.
5. Estimation of total sugars by anthrone method.
6. Separation of amino acids by paper chromatography.
7. Electrophoretic separation of proteins (SDS-PAGE) (Demo only).
8. Enzyme assay – Catalase/ Invertase (or any other enzyme).
9. Finding statistical significance of a given data using 't' test .
10. Graphical representation of data (Histograms, frequency polygon, Pie diagram).
11. Fitting of binomial and Poisson distributions.
12. Acquaintance with the Biological databases through Internet .

**BOTANY**

**Paper - 2: Gymnosperms, Cell Biology Anatomy, and Embryology**
Unit -I:Gymnosperms**:**
    1. General Characters, Structure, Reproduction and Classification.
    2. Morphology of vegetative and reproductive parts, systemic position, life history of *Pinus* and *Gnetum.*
    3. Palaeobotany: Introduction, Fossils and fossilization; Geological time scale; Importance of fossils.
    4. Bennettitales: General account.
Unit - II: Cell Biology:
    1. Plant cell envelops: Ultra structure of cell wall, molecular organisation of cell membranes.
    2. Nucleus: Ultrastructure,  Nucleic acids - Structure and replication of DNA; types and  functions of  RNA.
    3. Chromosomes: Morphology, organisation of  DNA in a chromosome, Euchromatin and Heterochromatin,  Karyotype.
    4. Cell division: Cell cycle and its regulation; mitosis, meiosis and their significance.
Unit - III: Anatomy:
    1. Meristems: Types, histological organisation of shoot and root apices and theories.
    2. Tissues: Simple and complex. and Special.
    3. Tissue Systems: Epidermal , Ground and Vascular.
    4. Leaf: Internal Structure of Xerophytic (Nerium) and Hydrophyti (NymphaeaPetiole)  Stem and root: Vascular Cambium-Formation and function. Anamalous secondary growth General account. *stem-Achyranthes, Boerhaavia, Bignonia, Dracaena; and Beet root.*
    5. Wood structure*:* General account. Study of local timbers – Teak (*Tectona grandis*), Rosewood, (*Albeggia latefolia*), Red sanders, (*Pterocarpus santalinus*) Yegisa (*Pterocarpus marsupium*  and  Neem (*Azadirachta indica*).
Unit - IV: Embryology:
    1. Introduction, Anther structure, Microsporogenesis and development of male gametophyte.
    2. Ovule structure and types; Megasporogenesis; Types and development of female gametophyte.
    3. Pollination-Types;Pollen-pistil interaction. Fertilization.
    4. Endosperm - Development and types. Embryo-development and types; Polyembryony and Apomixis - an outline. Palynology:  Principles and applications.

**Books for Reference:**
    1. Bhojwani, S.S. and S.P.Bhatnagar, *The Embryology of Angiosperms* (4th Ed.) , Vikas Publishing House,  Delhi, 2000.
    2. Esau, K, *Anatomy of Seed Plants,* John Wiley & Son, USA, 1971.
    3. Harris,N and K.J.Oparka, *Plant Cell Biology*: A Practical approach, IRL Press at University Press, Oxford, UK, 1994.
    4. Maheswari, P. *An Introduction to Embryology of Angiosperms*, McGraw Hill Book Co., London, 1971.
    5. Pandey, B. P, *College Botany*, Vol. II: *Pteridophyta, Gymnosperms and Paleobotany*, S. Chand & Company Ltd, New Delhi, 2006.  .
    6. Sporne, K. R., *Morphology of  Gymnosperms,* Hutchinson Co., Ltd., London, 1965.

**Practicals - 2: Gymnosperms, Cellbiology, Anatomy & Embryology**
**Suggested Laboratory Exercises:**

1.  Morprology (vegetative and reproductive structures) and anatomy of the following taxa. Gymnosperms: Pinus  and Gnetum.
2.  Fossil forms using permanent  slide  / Photographs  Rhynia and cycadeoidea.
3.  Demonstration of chemical Methods, Fixation of plant material and nuclear staining for mitotic and meiotic studies.
4.  Study of various stages of mitosis using cytological preparation of onion root tips.
5.  Study of various stages of meiosis using cytological preparation of onion  flower buds.
6.  Karyotype study using cytochemical preparation of dividing root tip cells of onion / photographs / permanent slides.
7.  Study of polytene chromosomes using cytological preparation of salivary glands from chironomus (photographs / permanent slide).
8.   Demonstration of double staining technique.
9.   Tissue organization in root and shoot apices using permanent slides.
10.  Preparation of  double staining slides. Primary structure : Root – *Cicer*, *Canna*; stem: *Tridax, Sorghum*; Secondary Structure: root – *Tridax* stem: *Pongamia*, Anomalous secondary structure: Examples as given in Theory syllabus.
11.  Stomatal types using epidermal peels.
12.  Microscopic study of wood in T.S., T.L.S and R.L.S.
13. Structure of anther and microsporogenesis using permanent slides.
14.  Structure of pollen grains using whole mounts (*Hibiscus ,Acasia* and grass).
15.  Study of ovule types and developmental stages of embryo sac.
16. Structure  of endosperm ( nuclear or cellular).
17.  Development stages  of dicot and monocot  embryos using permanent slides.

**CHEMISTRY**

**Paper- 2: Inorganic, Organic and Physical Chemistry**

Unit- I:Inorganic Chemistry – 1

1. Chemistry of d-block elements: Characteristics of d-block elements with special reference to electronic configuration, variable valence, magnetic properties, catalytic properties, color and ability to form complexes. Stability of various oxidation states and e.m.f. Comparative treatment of second and third transition series with their 3d analogues. Study of Ti, Cr and Cu traids in respect of electronic configuration and reactivity of different oxidation states.

2. Chemistry of f-block elements: Chemistry of lanthanides – electronic structure, oxidation states, lanthanide contraction, consequences of lanthanide contraction, magnetic properties, spectral properties and separation of lanthanides by ion exchange and solvent extraction methods. Chemistry of actinides – electronic configuration, oxidation states, actinide contraction, position of actinides in the periodic table, comparison with lanthanides in terms of magnetic properties, spectral properties and complex formation.

3. Theories of bonding in metals: Valence bond theory, Explanation of metallic properties and its limitations, Free electron theory, thermal and electrical conductivity of metals, limitations, Band theory, formation of bands, explanation of conductors, semiconductors and insulators.

4. Metal carbonyls and related compounds – EAN rule, classification of metal carbonyls, structures and shapes of metal carbonyls of Fe, Co and Ni. Metal nitrosyls and metallocenes (only ferrocene).

Unit-II: Organic Chemistry – 2

1. Halogen compounds
   Nomenclature and classification of alkyl (into primary, secondary, tertiary), aryl, aralkyl, allyl, vinyl, benzyl halides.
   Chemical Reactivity, formation of RMgX
   Nucleophilic aliphatic substitution reaction- classification into $S_N1$ and $S_N2$.

2. Hydroxy compounds.
   Nomenclature and classification of hydroxy compounds.
   Alcohols: Preparation with hydroboration reaction, Grignard synthesis of alcohols.
   Phenols: Preparation i) from diazonium salt, ii) from aryl sulphonates, iii) from cumene.
   Physical properties- Hydrogen bonding (intermolecular and intramolecular). Effect of hydrogen bonding on boiling point and solubility in water.
   Chemical properties:
   a. Acidic nature of phenols.
   b.Formation of alkoxides/phenoxides and their reaction with RX.
   c. Replacement of OH by X using $PCl_5$, $PCl_3$, $PBr_3$, $SOCl_2$ and with $HX/ZnCl_2$.
   d. Esterification by acids ( mechanism).
   e. Dehydration of alcohols.
   f. oxidation of alcohols by $CrO_3$, $KMnO_4$.
   g. Special reaction of phenols: Bromination, Kolb-Schmidt reaction, Riemer-Tiemann reaction, Fries rearrangement, azocoupling.
      Identification of alcohols by oxidation with $KMnO_4$, ceric ammonium nitrate, lucas reagent and phenols by reaction with $FeCl_3$.
      Polyhydroxy compounds: Pinacol-Pinacolone rearrangement.

3. Carbonyl compounds:

Nomenclature of aliphatic and aromatic carbonyl compounds, structure of the carbonyl group. Synthesis of aldehydes from acid chlorides, synthesis of aldehydes and ketones using 1,3-dithianes, synthesis of ketones from nitriles and from carboxylic acids.

Physical properties: absence of hydrogen bonding, keto-enol tautomerism, reactivity of carbonyl group in aldehydes and ketones.

Nucleophilic addition reaction with a) $NaHSO_3$, b) HCN, c) RMgX, d) $NH_2OH$, e)$PhNHNH_2$, f) 2,4 DNPH, g) Alcohols-formation of hemiacetal and acetal.

Halogenation using $PCl_5$ with mechanism.

Base catalysed reactions: a) Aldol, b) Cannizzaro reaction, c) Perkin reaction, d) Benzoin condensation, e) Haloform reaction, f) Knoevenagel reaction.

Oxidation of aldehydes- Baeyer-Villiger oxidation of ketones.

Reduction: Clemmensen reduction, Wolf-Kishner reduction, MPV reduction, reduction with $LiAlH_4$ and $NaBH_4$.

Analysis of aldehydes and ketones with a) 2,4-DNP test, b) Tollen's test, c) Fehling test, d) Schiff test, e) Haloform test (with equation).

4. Carboxylic acids and derivatives:
   Nomenclature, classification and structure of carboxylic acids.
   Methods of preparation by
   a) hydrolysis of nitriles, amides and esters.
   b) carbonation of Grignard reagents.
      Special methods of preparation of aromatic acids by
      a) oxidation of side chain.
      b) hydrolysis by benzotrichlorides.
      c) Kolbe reaction.

   Physical properties: Hydrogen bonding, dimeric association, acidity- strength of acids with examples of trimethyl acetic acid and trichloroacetic acid. Relative differences in the acidities of aromatic and aliphatic acids.

   Chemical properties: Reactions involving H, OH and COOH groups- salt formation, anhydride formation, acid chloride formation, amide formation and esterification (mechanism). Degradation of carboxylic acids by Huns-Diecker reaction, decarboxylation by Schimdt reaction, Arndt-Eistert synthesis, halogenation by Hell-Volhard- Zelinsky reaction.

   Derivatives of carboxylic acids: Reaction of acid chlorides, acid anhydrides, acid amides, esters (mechanism of the hydrolysis of esters by acids and bases).

5. Active methylene compounds:
   Acetoacetic esters: preparation by Claisen condensation, keto-enol tautomerism.
   Acid hydrolysis and ketonic hydrolysis.
   Preparation of a) monocarboxylic acids. b) dicarboxylic acids.
   Reaction with urea:
   Malonic ester: preparation from acetic acid.
   Synthetic applications: Preparation of
   a) Monocarboxylic acids (propionic acid and n-butyric acid).
   b) Dicarboxylic acids (succinic acid and adipic acid).
      c) , ß-unsaturated carboxylic acids (crotonic acid).

Unit-III: Physical chemistry – 2
   1. Phase rule:
      Concept of phase, components, degree of freedom. Derivation of Gibbs phase rule.
      Phase equilibrium of one component – water system. Phase equilibrium of two-component system, solid-liquid equilibrium. Simple eutectic diagram of Pb-Ag

system, desilverisation of lead. Solid solutions- compound with congruent melting point- (Mg-Zn) system, compound with incongruent melting point – NaCl- water system. Freezing mixtures.

2. Dilute solutions:

Colligative properties. Raoult's law, relative lowering of vapour pressure, its relation to molecular weight of non-volatile solute. Elevation of boiling point and depression of freezing point. Derivation of relation between molecular weight and elevation in boiling point and depression in freezing point. Experimental methods of determination. Osmosis, osmotic pressure, experimental determination. Theory of dilute solutions. Determination of molecular weight of non-volatile solute from osmotic pressure. Abnormal Colligative properties. Van't Hoff factor, degree of dissociation and association.

3. Electrochemistry: Specific conductance, equivalent conductance, measurement of equivalent conductance. Variation of equivalent conductance with dilution. Migration of ions, Kohlrausch's law. Arrhenius theory of electrolyte dissociation and its limitations. Ostwald's dilution law. Debye-Huckel-Onsagar's equation for strong electrolytes (elementary treatment only). Definition of transport number, determination by Hittorf's method. Application of conductivity measurements- determination of dissociation constant ($K_a$) of an acid, determination of solubility product of sparingly soluble salt, conductometric titrations.

Types of reversible electrodes- the gas electrode, metal-metal ion, metal-insoluble salt and redox electrodes. Electrode reactions, Nernst equation, single electrode potential, standard Hydrogen electrode, reference electrodes, standard electrode potential, sign convention, electrochemical series and its significance. Reversible and irreversible cells, conventional representation of electrochemical cells. EMF of a cell and its measurements. Computation of cell EMF Potentiometric titrations.

Unit –IV: General chemistry-2

1. Molecular symmetry: Concept of symmetry in chemistry-symmetry operations, symmetry elements. Rotational axis of symmetry and types of rotational axes. Planes of symmetry and types of planes. Improper rotational axis of symmetry. Inversion centre. Identity element. The symmetry operations of a molecule form a group. Flow chart for the identification of molecular point group.

2. Stereochemistry of carbon compounds: Molecular representations- Wedge, Fischer, Newman and Saw-Horse formulae. Stereoisomerism, Stereoisomers: enantiomers, diastereomers- definition and examples.Conformational and configurational isomerism- definition. Conformational isomerism of ethane and n-butane.

Enantiomers: Optical activity- wave nature of light, plane polarised light, interaction with molecules, optical rotation and specific rotation. Chiral molecules-definition and criteria- absence of plane, center, and Sn axis of symmetry-asymmetric and disymmetric molecules. Examples of asymmetric molecules (Glyceraldehyde, Lactic acid, Alanine) and disymmetric molecules (trans -1,2-dichloro cyclopropane).

Chiral centers: definition- molecules with similar chiral carbon (Tartaric acid), definition of mesomers- molecules with dissimilar chiral carbons (2,3-dibromopentane). Number of enantiomers and mesomers- calculation.

D, L and R, S configuration for asymmetric and disymmetric molecules. Cahn-Ingold-Prelog rules. Racemic mixture- racemisation and resolution techniques.

Diastereomers: definition- geometrical isomerism with reference to alkenes- cis, trans and E,Z- configuration.

3. Introductory treatment to:

a) Pericyclic Reactions:   Concerted reactions, Molecular orbitals, Symmetry properties HOMO, LUMO, Thermal and photochemical pericyclic reactions. Types of pericyclic reactions – electrocyclic, cycloaddition and sigmatropic reactions – one example each.

b) Synthetic strategies:  Terminology – Disconnection (dix), Symbol (    ), synthon, synthetic equivalent (SE), Functional group interconversion (FGI), Target molecule (TM). Retrosynthesis of the following molecules 1) acetophenone 2) cyclohexene

c) Asymmetric (Chiral) synthesis: Definitions-Asymmetric synthesis, enantiomeric excess, diastereomeric excess. stereospecific reaction, definition,     example, dehalogenation of 1,2-dibromides by $\Gamma$. stereoselective reaction, definition, example, acid catalysed dehydration of 1-phenylproponol.

**Practicals – 2: Inorganic Chemistry**

Qualitative Analysis and Inorganic preparations:

Analysis of mixtures containing two anions (one simple and one interfering) and two cations (of different groups) from the following:

Anions: Sulphate, chloride, bromide, iodide, acetate, nitrate, oxalate, tartrate, borate, phosphate, arsenate* and chromate*.

Cations: Lead, copper, bismuth, cadmium, tin, antimony, iron, aluminum, zinc, manganese,   nickel, cobalt, calcium, strontium, barium, potassium and ammonium.

*not to be given for examination.

Preparations: Any three of the following inorganic preparations:

1) Ferrous ammonium sulphate
2) Tetrammine copper (II) sulphate
3) Potassium trisoxalato chromate
4) Potash alum $KAl(SO_4)_2. 12H_2O$
5) Hexammine cobalt (III) chloride.

**COMPUTER SCIENCE**

**Paper-2: Java and Data Structures.**
Unit-I: Java Fundamentals & Oops Concepts in Java*:*

*Fundamentals of Object Oriented programming : Object Oriented paradigm – Basic concepts of Object Oriented Programming – Benefits of OOP – Applications of OOP.*

Java Evolution : Java Features – How Java differs from C and C++ - Java and Internet – Java and World Wide Web – Web Browsers – Hardware and Software Requirements – Java Environment.  Overview of Java Language: Simple Java Program – Java Program Structure – Java Tokens- Java Statements – Implementing a Java Program – Java Virtual Machine – Command Line Arguments.

Constants, Variables and Data types: Constants – Variables – Data types – Declaration of Variables-Giving Values to variables- Scope of Variables-Symbolic Constants-Type Casting. Operators and Expressions: Arithmetic Operators – Relational Operators- Logical Operators – Assignment Operators–Precedence of Arithmetic Operators – Operator Precedence and Associativity. Decision Making and Branching -  Decision Making and Looping.

Unit-II:   Classes and Objects:

Class, Objects and Methods: Defining a Class – Fields Declaration – Methods Declaration – Creating Objects – Accessing class members – Constructors – Methods Overloading – Static Members – Nesting of Methods – Inheritance – Overriding Methods – Final Variables and Methods – Final Classes – Abstract Methods and Classes – Visibility Control.

Arrays, Strings and Vectors: One-dimensional Arrays-creating an Array – Two dimensional Arrays – Strings – Vectors – Wrapper Classes – Enumerated Types.

Interfaces: Multiple Inheritance : Defining Interfaces – Extending Interfaces – Implementing Interfaces – Accessing Interface Variables.

Unit-III**:**  Packages and Interfaces in Java:

Packages: Java API Packages – Using system Packages – Naming Conventions – Creating Packages – Accessing a Package – Using a Package – Adding a Class to a Package – Hiding Classes – Static Import.

Multithreaded Programming: Creating Threads – Extending the Thread Class – Stopping and Blocking a Thread – Life Cycle of a Thread – Using Thread Methods – Thread Exceptions – Thread Priority – Synchronization.

Managing Errors and Exceptions: Types of Errors – Exceptions – Syntax of Exception Handling Code – Multiple Catch Statements – Using Finally Statement – Throwing our own Exceptions – Using Exceptions for debugging.

Applet Programming: How Applets differ from Applications – Preparing to write Applets – Building Applet Code – Applet Life Cycle – Creating an executable Applet – Designing a WebPage – Applet Tag – Adding Applet to HTML file – Running the Applet – More about Applet Tag – Passing parameters to Applets – Aligning the display – More about HTML tags – Displaying Numerical Values – Getting Input from the user.

Unit-IV**:**   Data Structures:

Sorting and Searching Techniques: Bubble Sort – Selection Sort – Insertion Sort – Quick Sort- Merge Sort – Linear Search – Binary Search

Abstract Data types  - Stacks and Queues: Stacks – Queues –Linked List:  Simple Linked List –Doubly Linked Lists.

Trees: Introduction to Trees – Binary Search Tree – Tree Traversing Techniques.

Graphs: Introduction to Graphs – Types of Graphs – Graph Traversing

Techniques.

**Text Books**:
1. E.Balaguruswamy, *Programming with Java, A primer*, 3e, TATA McGraw-Hill Company, 2008.(Chapters : 1 to 14 )
2. Robert Lafore, *Data Structures & Algorithms in Java,* Second Edition, Pearson Education, 2008. (Chapters: 3,4,5,7 (Only Quick Sort),8,13 )

**Books for Reference:**
1. John R. Hubbard, *Programming with Java*, Second Edition, Schaum's outline Series, Tata McGrawhill, 2007.
2. Timothy Budd, *Understanding Object Oriented Programming with Java,* Pearson Education 2007.
3. Adam Drozdek, *Data Structures and Algorithms in Java*, Second Edition, Cengage Learning, 2008.
4. John R. Hubbard, Anita Hurry, *Data Structures with Java*, Pearson Education, 2008.
5. Jana, *Java and Object Oriented Programming Paradigm*, PHI, 2007.
6. Deitel & Deitel. *Java TM: How to Program*, 7th Edition, PHI, 2008.
7. Samatha*, Classic Data Structures*, PHI, 2005.

**Practicals - 2:  Java and Data structures Lab**

Java Lab Cycle:
1. Write a java program to determine the sum of the following harmonic series for a given  value of 'n'.  1+1/2+1/3+. . . _1/n
2. Write a program to perform the following operations on strings through interactive input.
    a)     Sort given strings in alphabetical order.
    b)     Check whether one string is sub string of another string or not.
    c)     Convert the strings to uppercase.
3. Write a program to simulate on-line shopping.
4. Write a program to identify a duplicate value in a vector.
5. Create two threads such that one of the thread print even no's and another prints odd no's up to a given range.
6. Define an exception called "Marks Out Of Bound" Exception, that is thrown if the entered marks are greater than 100.
7. Write a JAVA program to shuffle the list elements using all the possible permutations.
8. Create a package called "Arithmetic" that contains methods to deal with all arithmetic operations. Also, write a program to use the package.
9. Write an Applet program to design a simple calculator.
10. Write a program to read a text and count all the occurrences of a given word. Also, display their positions.
11. Write an applet illustrating sequence of events in an applet.
12. Illustrate the method overriding in JAVA.
13. Write a program to fill elements into a list. Also, copy them in reverse order into another list.
14. Write an interactive program to accept name of a person and validate it. If the name contains any numeric value throw an exception "InvalidName".
15. Write an applet program to insert the text at the specified position.
16. Prompt for the cost price and selling price of an article and display the profit (or) loss percentage.
17. Create an anonymous array in JAVA.
18. Create a font animation application that changes the colors of text as and when prompted.

19. Write an interactive program to wish the user at different hours of the day.
20. Simulate the library information system i.e. maintain the list of books and borrower's details.

Data Structures Lab Cycle:

1. Program to create, insert, delete and display operations on single linked list?
2. Program to create , insert, delete and display operations on double linked list ?
3. Program to split a single linked list.
4. Program to reverse a single linked list.
5. Program to implement Insertion Sort.
6. Program to implement PUSH and POP operations on Stack using array method.
7. Program to implement PUSH and POP operations on Stack using Linked list method.
8. Program to implement  insert and delete operations on Queue using array method.
9. Program to implement  insert and delete operations on Queue using linked list method.
10. Program to evaluate postfix expression by using Stack?
11. Program to construct Binary Search Tree and implement tree traversing Techniques.
12. Program to delete a leaf node from binary search tree.
13. Program to implement Selection Sort.
14. Program to implement Bubble Sort.
15. Program to implement Quick Sort.
16. Program to Find number of Leaf nodes and Non-Leaf nodes in a Binary Search Tree.
17. Program for Insertion Sort.

## ECONOMICS

**Paper - 2: Macro Economics**

Unit-I: National Income: Meaning, Definition and importance of Macro Economics – National Income: Meaning, Definitions: National Income, GNP & NNP, GDP & NDP, Personal Income (PI), Disposable Income (DI), Per Capita Income (PCI), Real National Income (RNI) – Methods of Estimation of National Income (NI) – Measurement of National Income in India.

Unit-II: Theories Of Employment: Classical theory of employment – Say's law of markers – Keynesian theory of employment – Consumption function – APC, MPC, factors influencing consumption function – Investment function – MEC and Rate of Interest. The concepts of Multiplier and Accelerator – Applicability of the Keynesian theory to the developing countries.

Unit-III: Money And Theories Of Money: Meaning, functions and classification of Money– Gresham's law – R.B.I. Classification of Money – M1, M2, M3, M4 Theories of Money – Fisher's quantity theory of Money, Cambridge approach (Marshall, Pigou, Robertson and Keynes).

Unit-IV: Trade Cycle and Inflation: Trade cycles – Meaning and definition – Phases of a trade cycle – Inflation – Definition – Types of Inflation – Causes and effects of inflation – Measures to control inflation.

Unit-V: Banking, Stock Market And Insurance: Functions of Commercial banks – The process of credit creation – Concept of Non Banking Finance Companies (NBFCs) – Concept of SEBI Stock Market – Meaning, functions and importance of Stock Market–Primary and Secondary Markets, Concepts of (a) Shares (b) Debentures. Insurance – Types of Insurance – Life Insurance and General Insurance – Functions of the Reserve bank of India – Methods of credit control – Quantitative and Qualitative.

**Books for Reference:**
1. G Ackley, *Macro Economics Theory and Policy*, Collier Macmillan,1978.
2. M L Seth, *Macro Economics*, Lakshmi Narayana Agarwal, 2006.
3. K P M Sundaram, *Money banking & International Trade*, Sultan Chand, 2006.
4. Telugu Academy Publications.
5. M N Mishra & S B Mishra, *Insurance Principles & Practice* S Chand  2007.
6.  Dr. N Koti Reddy, *Dictionary of  Economics,* Samatha Publications, 2011.

**ELECTRONICS**

**Paper–2: Analog Circuits and Communications**

Unit-I: Rectifiers– Half wave, full wave and bridge rectifiers- Efficiency- Ripple factor- Regulation –Types of filters- Shunt capacitor filter- L section Choke input (inductor) filter- section filter.

Unit-II: Block diagram of regulated power supply - Series and shunt regulated power supplies Three terminal regulators (78XX and 79XX) – Principle and working of switch mode power supply (SMPS) and UPS.

Unit-III: Amplifiers: Circuit,Working and frequency response of RC coupled CE amplifier. Positive and negative feedback- Effect of Negative feedback on gain, band width, noise, input and output impedances.

Unit-IV: Oscillators: Barkhusen criterion, RC-phase shift oscillator, Weins bridge oscillator, LC oscillators- Hartly and Colpitts oscillators, Crystal oscillator (No Need to derive expression for frequency of oscillation for all oscillators).

Unit-V: Operational Amplifiers: Block diagramme of Op-amp,Ideal characteristics of Op-Amp, op-Amp parameters, Virtual ground, Inverting Op-Amp, inverting Op-Amp.

Unit-VI: Applications of Op-Amps: Summing amplifier, Voltage follower- Integrator- Differentiator – Comparator, square wave [Astable] generators, solving simple second order differential equation.

Unit-VII: Communications: Need for modulation-Types of modulation- Amplitude, Frequency and Phase modulation. Amplitude modulation-side bands- modulation index- AM modulator- Demodulation- diode detector.

Unit-VIII: Frequency modulation working of simple frequency modulator- detection of FM waves- Advantages of frequency modulation over AM.

(Note: Solving related problems in all the Units)

**Books for Reference:**
1. Millman and Halkias, *Electronic Devices and Circuits*, Tata Mc Graw Hill (TMH)
2. Ramakant A. Gayakwad, *Operational Amplifiers and Linear Integrated Circuits*, Prentice Hall of India (PHI).
3. R.S.Sedha, *Applied Electronics*, S Chand &Co
4. V.K. Mehta and Rohit Mehta, *Principles of Electronics*, S Chand &Co
5. Unified Electronics, *Volume-II*
6. George Kennedy & Bernard Davis, *Electronic Communication Systems,* TMH.

**Practicals - 2: Analog Circuits and Communications Lab**
1. D.C Power supply and filters.
2. Single stage RC – coupled amplifier – frequency response.
3. OP-Amp (IC 741) as
   a) Inverting amplifier.
   b) Non- inverting amplifier.
   c) Comparator.
4. OP-Amp (IC 741) as
   a) Integrator.
   b) Differentiator.
5. OP-Amp as Wien bridge oscillator.
6. Astable multivibrator – Determination of frequency (using IC741 Op-Amp).
7. Voltage regulator using IC- 7805and IC-7905.
8. AM modulator and Demodulator.
9. FM modulator.
10. Simulation experiments using appropriate electronic circuit simulation software.

a) RC coupled amplifier.
b) Wien bridge oscillator.
c) Astable multivibrator.
d) Amplitude Modulation.
e) Frequency Modulation.

Note: Student has to perform the following experiments
(1) Any 7 experiments among the experiment numbers 1 to 9.
(2) Experiment Number 10 (a,b,c,d and e) is compulsory
    Students are encouraged to do a small project work during second year

# FORESTRY

**Paper-2: Silviculture and Social Forestry**
1. General Silvicultural principles: Growth form and reproduction of trees and crops.
2. The Stem: Bole form; Natural pruning, taper, buttressing, fluting and size of trees.
3. Stem structure: Bark, Cambium and wood.
4. Root: Forms of roots, adaptability, mycorrhiza, root nodules, parasitic roots and biofertilizers.
5. Silvicultural practices of Cedrus deodara, Pinus roxburghii, Acacia catechu, Acacia auriculiformis, Acacia nilotica, Albizzia sps, Artocarpus sps, Anogeissus sps, Bambusa sps, Casuarina equisetifolia, Dalbergia sps, Eucalyptus sps, Gmelina arborea, Lagerstroemia sps, Shorea robusta, Tectona grandis, Terminalia sps, Jatropa curcas, Pedilanthus sps, Pongamia sps.
6. Social forestry: Objectives, Scope and Necessity, Agro-Forestry, Objectives, Scope and Necessity.

**Practicals - 2: Silviculture and Social Forestry**
1. Designing a forest farm: Nursery and nursery techniques: Rearing of saplings for social forestry.
2. Study of natural regeneration with reference to local vegetation.
3. Plantation with reference to local species and plantation programme.
4. Study of Primary and Secondary structures of Stem and Root .
5. Visit to a afforestation programmes of local areas.
6. Study and identification of fodder plants.
7. Isolation of *Rhizobium* bacteria from root nodules.
8. Observation of Mycorrhizal studies of forest plants.
9. Microscopic observation and identification of Bluegreen algae such as Anabaena and Nostoc , Bacteria such as Rhizobium, Azospirillum which are used as Biofertilizers.
10. Identification of manures such as oil seed cakes, green leaf manures and agro industrial wastes.

**Books for Reference**:
1. Theodore W. Daniel, *Principles of Silviculture.*
2. Philip R. Larson, *Stem form development of Forestries.*

# GEOGRAPHY

**Paper - 2: Human and Economic Geography**

Unit-I: Perspectives**:** Nature and Objectives of Human and Economic Geography - Man and Environment: Physical and Cultural environment - Human activities – Primary – Secondary – Tertiary – Quaternary - Resources: Classification, Conservation and Management, Sustainability.

Unit-II: Population and Settlement**:** World population – growth and distribution – Demographic Transition - Human Migration: Types, Causes and Consequences of Migration, - Human Settlements: Forms, Structure, Functions and Patterns – Rural and Urban settlements – Urbanization – Impacts of Urbanization.

Unit-III: Agriculture:  Crop Pattern and Production - Livestock: Development and Distribution – Dairying, Meat and Woolen- Fisheries: Major Fishing grounds of the World – Production and Trade - Forest: Types, Distribution and Forest Products – Wild Life - Minerals: Metallic (Iron Ore, Copper) – Non-metallic (Limestone and Mica) – Fuels - (Coal and Petroleum) – Locations and Potentials – Mining and Trade

Unit-IV: Industry: Locational Factors, Industrial  location theory of Weber – Major industries (Iron and Steel, Cotton and Textile,) - Transport: Roadways, Railways, Waterways and Airways - Trade: International Trade, Major Exports and Imports, – WTO and Developing Countries.

**Text Books:**
1. Majid Hussain,  *Human Geography*, Rawat, Jaipur, 1999.
2. Ghosh,B.N., *Fundamentals of Population Geography*, Sterling Publishers, Bangalore, 1995.
3. Chandana,R.C. *A Geography of Population*, Kalyani Publishers, New Delhi, 1986.
4. Guha,J.L. and Chatoraj,P.R*Economic Geography*, World Press, Kolkatta, 1978.
5. Bhende,A.A. and Kanitkar T, *Principles of Population Studies*, Himalaya Publishing House, Hyderabad, 2006.

**Books for Reference:**
1. Leong,G.C. and Morgan,C.C.,  *Human and Economic Geography*, Oxford University Press, London, 1975.
2. Alexander,J.W. *Economic Geography*, Prentice Hall, New Delhi, 1963.
3. Hartshorn,T.A. and Alexander *Economic Geography*, Prentice Hall, New Delhi, 1988.

**Practicals -2: Human and Economic Geography**
1. Data: Primary and Secondary – Classification.
2. Diagrams:
    (i) One Dimensional: Line Graph – Poly Graph – Bar Graph – Pyramid Graph – Simple and Compound Diagram, Pie Diagram.
    (ii) Two Dimensional: Squares and Rectangles.
    (iii)Three dimensional: Spheres and Blocks.
    (iv)Climatic Diagrams: Climo Graph, Hyther Graph, Wind Rose.
3. Maps: i) Thematic Maps: Class intervals – Choropleth – Isopleth – Choroschematic Dot Maps – Flow Maps(ii) Flow Chart.
4. Field  trip.

**Books for Reference:**
1. Monkhouse,F.J. and Wilkinson,H.R. *Maps and Diagrams*, Methuen, London, 1968.
2. Robinson,A.H. et al. *Elements of Cartography*, John Wiley, New York, 1995.

# GEOLOGY

**Paper-2: Petrology and structural geology**

Petrology:

Unit-I: Nature and scope of Petrology – definition of rock, Classification of rocks into igneous, sedimentary and metamorphic; distinguishing features of three types of rocks.

Igneous Rocks: Classification into Plutonic, Hypabyssal, and Volcanic rocks; forms of igneous rocks– lava flows, intrusions, sills, laccolith, bismalith, lopilith, dykes, ring dykes, cone sheets, volcanic necks, phacolith, batholith, Structures of igneous rocks – Vescicular, amygdaloidal, block lava, ropy lava, pillow structure, flow, sheeting, plates, columnar jointing, prismatic.

Unit-II:Textures of igneous rocks – definition of structure, microstructure,

Textures based on Crystallinity – Holocrystalline, hemicrystalline, Holohyaline

Textures based on granularity – Phaneric, Aphanetic textures

Textures based on mutual relationship – Equigranular, inequigranular textures- Panadiomorphi, hypidiomorphic, allotriomorphic; porphyritic, poikilitic, ophitic; intergranular, intersertal, trachytic, graphic and micrographic.

Devitrification.

Reaction structures – corona, myrmekite, orbicular, spherulitic, perilitic

Classification of igneous rock – CIPW and Tyrrel Tabular Classification

Unit-III: Composition and Constitution of magma – crystallisation of magma – unicomponent, binary system with Eutectic and solid solution.

Origin of igneous rocks – Bowen's reaction principle, differentiation and assimilation.

Descriptive study of the following igneous rocks:

granite, granodiorite syenite, Nepheline syenite, diorite porphry, pegmatite, aplite, gabbro, anorthosite, peridotite, pyroxenite, dunite, dolerite, rhyolite, obsidian, pumice, trachyte, andesite, basalt.

Unit-IV: Sedimentary Rocks: Sources of sediments – mechanical and chemical weathering, modes of transportation, sedimentary environments.

Definition of diagenesis – lithification and cementation, stratification,

Structures of sedimentary rocks: Types of bedding, surface marks, deformed bedding, solution Structures. Classification of sedimentary rocks

Clastic: rudaceous, arenaceous, argillaceous,

Non-clastic: calcareous, carbonaceous, ferruginous, phosphatic, evaporites.

Descriptive study of the following sedimentary rocks

Conglomerate, breccia, sandstone, grit, arkose, graywacke, shale, limestone and shelly limestone.

Unit-V: Metamorphic Rocks: Definition of metamorphism, agents of metamorphism, types of metamorphism, grades and zones of metamorphism.

Metamorphic minerals – stress and anti-stress minerals.

Structures of metamorphic rocks – cataclastic, maculose, schistose, granulose and gneissose.

Textures of Metamorphic rocks – crystalloblastic, palimpsest, xenoblastic, idioblastic.

Classification of metamorphic rocks

Concept of metamorphic facies.

Cataclastic metamorphism of argillaceous, arenaceous rocks.

Unit-VI: Thermal metamorphism of argillaceous, arenaceous and calcareous rocks.

Dynamothermal metamorphism of argillaceous, arenaceous and basic igneous

rocks.
Plutonic  metamorphism, metasomatism and additive processes.
Definition of anatexis and palingenesis.
Descriptive study of the following metamorphic rocks
Gneiss, schist, slate, phyllite,  quartzite, marble, granulite, eclogite,  amphibolite,
migmatite, Indian rocks – khondalite, charnockite, gondite.

**Structural Geology:**
Unit-VII: Definition of Structural Geology; Aims and Objectives of structural
geology, importance of study of geological structures. Primary and Secondary
structures, outcrop, attitude of beds, Strike, dip and apparent dip, use of clinometer,
Primary structures as markers.
Folds – description, geometric classification of folds, recognition of folds in the
field.
Unit-VIII: Joints – geometrical and genetic classification of joints.
Faults – Geometrical and genetic classification of faults, recognition of faults in the
field, effects of faults on the outcrops.
Unconformities – definition of Unconformity – types of unconformities,
recognition of unconformities in the field; distinguishing the faults from
unconformities.
Definition of overlap, offlap, outlier, cleavage, schistosity, foliation and lineation.

**Text Books:**
**Petrology:**
1. Dr.N.Ramana Rao and others , *Sila Sastram*, Telugu Akademi , 1997.
2. G.W.Tyrrell, *The Principles of Petrology*,  B.I.Publications Pvt Ltd.
3. Eulers & Blatt, *Igneous and Metamorphic Petrology*,  C.B.S Publishers
.   4.  K.M. Bangar, *Principles of Engineering Geology,*  Standard Publishers, 2009
5.  N. Chennakesavulu, *Engineering Geology,* McMillan Publishers, 1999
**Books for Reference:**
1. A.Miyashiro, *Metamorphic Petrology*,  U.C.L.
2. M.G.Best, *Igneous and Metamorphic Petrology*,  CBS Publishers, 2002
3. J.D. Winter, *Principles of Igneous & Metamorphic Petrology*
4. E.J.Pettijohn, *Sedimentary  Rocks,*  C.B.S Publishers
**Structural Geology:**
**Text Books**
1. Dr.C.V.R.K.Prasad et al , *Nirmitiya Bhuvignana Sastramu* , , Telugu Akademi.
2. M.P.Billings,  *Structural Geology*,  Prentice Hall.
3. B.E.Hobbs, W.D.Means,  P.F.Williams, *An Outline of Structural Geology*, John Wiley
& Sons
**Books for Reference:**
1. S.Marshak and Gautam Mitra, *Basic methods of  Structural Geology,* Prentice Hall,
1988
2.  Haakon Fosssen, *Fundamentals and Modern Developments: Structural Geology*,
Cambridge University Press, 2010
3. S.K.Ghosh , *Structural Geology,*  Pergamon Press, 1993

**Practicals - 2: Petrology and structural geology**
1. Megascopic and Microscopic study of the following rocks.
   Granite, syenite, diorite, gabbro, dolerite, rhyolite, trachyte, basalt, pegmatite, conglomerate, breccia, sandstone, arkose, and limestone, Fossiliferous limestone, schist, gneiss, quartzite, marble, charnockite.
2. Interpretation of simple geological maps with horizontal and inclined beds, unconformities, Folds, faults with reference to topography, structure, geological successsion &  history and section drawing (at least 8 maps).
3.  Problems dealing with true dip and apparent dip, bore hole data, thickness and width of   Outcrop and dip of the beds (at least 8 problems).

## HUMAN GENETICS

**Paper-2: Basics of Human Biology**

Unit-I:
1. Man's place in Animal Kingdom - order primates
2. Theories of Evolution: Lamarckism, Darwinism, Neo - Darwinism.

Unit-II:
3. Fossil evidence for Human Evolution. Australopithecines, Pithecanthro pithecines, Neanderthals and Cro - Magnon.
4. Theories regarding the origin of Man

Unit-III:
5. Human Variation - Physical Variation - Somatic characterers.
6. Genetic Variation - Blood group polymorphism. Enzyme polymorphism. DNA polymorphism
7. Genetic demography - mortality rates - crude mortality rate, age and sex specific mortality rate - Fertility rates. Crude fertility rate. Age and sex specific fertility rates. crude fertility rate, Age and sex specific fertility rate and general fertility rate.

Unit-IV:
8. Introduction to Anatomy and Physiology
9. Body fluids
10. Articulations and skeletal system
11. Muscular and circulatory system
12. Digestive and Respiratory system
13. Reproductive and Urinary system
14. Endocrine and Nervous system

**Books for Reference:**
1. Betneur Janusch J, *Origins of Man.*
2. Legros Clarks, W.K, *The Fossil Evidence of Human Evolution*.
3. Legros Clark, *The Antecadants of Man.*
4. Das, B.M, *Outlines of Physical Anthropology.*
5. Dash Sharma, *Human Evolution- An Introduction to Physical Anthropology.*

**Practicals - 2: Human Biology**
1. Osteology : Human skeleton - Axial and appendicualr skeleton, Descriptive terminology used in osteology, Different classes of bones and their functions. Features of bones, Age and sex determination of Human skeleton
2. Osteometry : Scapula : Measurements. angles, indices Humerus - measurements, Angles and indices Humerus and femur - Torsion angles
3. Craniometry : Measurements on cranium and face
4. Somatometry : Landmarks on Body, Projective height measurements of of the body in standing position, measurements in sitting position length and breadth measurements of upper and lower extremities.
5. Somatoscopy: Morphological observation of different body characters

**Book for Reference:**
1. Singh. I.P and Bhasin M.K, *Anthropometry*

# MATHEMATICS

**Paper-2: Real Analysis, Abstract Algebra &Solid Geometry**
Unit –I:  Rings:
1. Rings and Elementary Properties- Definition and Examples, Divisors of Zero and Cancelation Laws, Integral Domains and Fields, TheCharacteristic of a Ring.
2. Non-commutative Rings- Matrices over a field.
3. Ideals and Homomorphisms- Ideals, Factor Rings, Maximal and Prime Ideals, Homomorphisms of Rings, Prime Fields.
(Chapter-5 Section 5.1 to 5.4, Chapter-6: Section 6.1 & Chapter 7: Sections 7.1 to 7.5 from the Prescribed Book)
(One 15 mark question and two 5 marks questions are to be set from this portion)

Unit –II: Real Analysis:
1. Real Functions, Limits and Continuity- Algebraic operations on Functions, Bounded and Unbounded functions, Limit of a Function, Algebra of Limits, One-sided Limits- Right hand and Left Hand Limits, Limits at Infinity and Infinite Limits, Continuous Functions, Discontinuity of a Function, Algebra of Continuous Functions, Criteria for Continuity, Some Properties of Continuity of a function at a point, Properties of Functions continuous in Closed finite intervals, Uniform Continuity(Chapter-8: Section 8.2 to 8.7, 8.11,8.12, 8.15 to 8.17, 8.19  from the Prescribed Book).
2. Real functions, The Derivative- Derivability of a Function, A necessary condition for the existence of a finite derivative, Algebra of Derivatives, Geometrical meaning of the Derivative, Meaning of the sign of derivative at a point, Darboux's Theorem.
(Chapter-9: Section 9.1 to 9.6 from the Prescribed book)
3. Mean Value Theorems- Rolle's theorem, Geometrical Interpretation of Rolle's theorem, Lagrange's mean value theorem, Increasing and Decreasing functions, Monotonic functions, Cauchy's mean value theorem, Genaralised mean value theorem, Taylor's theorem with Schlomitch and Roche, Cauchy's, Lagrange's form of remainders, Maclaurin's Infinite series, Power series expansions of some standard functions.
(Chapter-10: Section 10.1 to 10.5, 10.7,10.8,10.9,10.11, 10.13,10.15 from the prescribed book))
(One 15 mark question and two 5 marks questions are to be set from  this portion)

Unit -III: Riemann Integrability:
Introduction, Partitions and Riemann sums , Some properties of Darboux sums (without proofs), Upper and Lower Riemann integrals, Riemann integral, Another equivalent definition of Integrability and Integral, Second definition of Riemann Integrability (Only definitions and problems), Necessary and sufficient conditions for integrability, Particular classes of bounded integrable functions, Integrability of the modulus of a bounded integrable function, Definition of $\int_a^b f(x)dx, if\ b \leq a,$ Inequalities for an integral, Functions defined by definite integrals, Fundamental theorem of integral calculus, Genaralised mean value theorem, Abel's Lemma(without proof), second mean value theorem,  change of variable in an integral, integration by parts
(Chapter-13: section 13.1 to 13.8, 13.11 to 13.20 from the prescribed book)
(One 15 marks question and One 5 mark questions are to be set from this portion)

Unit -IV: Solid Geometry:
1.  The Plane- Equation of a plane, Shortest distance from a point to a plane and related

results, Angle between two planes, Planes bisecting the Angles between two planes, Joint equation of two planes, Projections on a plane.

2. The Straight Line-Symmetric form of equations of a line, Changing the equations of a line into symmetric form, Angle between a line a plane, Incidence and Co-planarity, Skew-lines and shortest distance between them, Length of the perpendicular from a point to a line.

3. The Sphere-Equation of sphere, Plane sections and Circles, Tangent lines and tangent planes, polar plane and conjugacy, Angle of intersection of two spheres, Radical plane and Coaxial systems.

(Chapters-8,9&10: Sections 8.1 to 10.6 except 9.7 & 9.8 from the prescribed book)

(One 15 marks question and three 5 mark questionnaire to be set from this portion)

**Text Books:**

1. Prof. U.M.Swamy, Prof. K.P.R Sastry, Prof. I. Ramabhadara sarma, *Scope and treatment as in Abstract Algebra and Real Analysis,* Telugu Academy, Himayatnagar, Hyderabad

2. Santhi Narayana & M.D. Raisinghania, *Elements of Real Analysis*, S.Chand & Co.Ltd. (revised Edition)

3. Sri. V. Srinivasulu, Dr.C.Govardhan, P.Rajamouli, A.Satyanarayana Murthy, *Scope and treatment as in Differential Equations and Solid Geometry,* Telugu Academy, Himayatnagar, Hyderabad.

**Books for Reference:**

1. I.N. Herstein, *Topics in Algebra* , Willy-Eastern Ltd.

2. S.C.Malik and SavitaArora, *Mathematical Analysis*, Wiley Eastern Ltd

3. Santhi Naraayana & P.K.Mittal, *Analytical Solid Geometry* , Published by S.Chand & Co.Ltd

## MICROBIOLOGY

**Paper-2:  Microbial Physiology And Genetics**

Unit-I: Nutrition, Growth and Enzymes

> Chapter-1**:**  Microbial nutrition - nutritional requirements and uptake of nutrients by cells.  Nutritional groups of microorganisms - autotrophs, heterotrophs, mixotrophs, methylotrophs.
>
> Growth media - synthetic, nonsynthetic, selective, enrichment and differential media.  Microbial growth – Bacterial Growth curve.
>
> Factors influencing microbial growth.
>
> Methods for measuring microbial growth – Direct microscopy, viable count estimates, turbiodometry, biomass.
>
> Chapter-2**:** Enzymes - properties and classification, enzyme Unit.
>
>  Biocatalysis - induced fit, and lock and key model, coenzymes, cofactors, factors affecting catalytic activity of enzymes.

Unit-II: Intermediary Metabolism

> Chapter-1**:-** Aerobic respiration - Glycolysis, HMP pathway, ED pathway, TCA cycle,  electron transport, oxidative and substrate-level phosphorylation.
>
> Glyoxylate cycle. Anaerobic respiration (nitrate, sulphate respiration).
>
> Chapter-2**:** Fermentation - Common microbial fermentations with special reference to alcohol and lactic acid fermentations. Photosynthetic apparatus in prokaryotes. Outlines of oxygenic and  anoxygenic photosynthesis in bacteria.

Unit-III: Microbial Genetics

> Chapter-1: Fundamentals of genetics - Mendelian laws. DNA and RNA  as genetic materials. Structure of DNA – Watson and Crick model. Extrachromosomal genetic elements – Plasmids and transposons. Replication of DNA – Semiconservative mechanism. Outlines of DNA damage and repair mechanisms.
>
> Chapter-2**:** Mutations – spontaneous and induced, base pair changes, frame shifts, deletions, inversions, tandem duplications, insertions. Various physical and chemical mutagens. Brief account on horizontal gene transfer among bacteria – transformation, transduction and conjugation.

Unit-IV: Gene Expression  and Recombinant DNA Technology

> Chapter**-1:** Definition of Muton, recon and cistron. One gene-one enzyme,  one gene-one polypeptide, one gene-one product hypotheses. Types of RNA and their functions.
>
> Outlines of RNA biosynthesis in prokaryotes-Transcription. Genetic code.  Structure of ribosomes and a brief account of protein synthesis -Translation
>
> Chapter-2**:** Operon concept. Regulation of gene expression in bacteria – *lac* operon.
>
> Basic principles of genetic engineering - restriction endonucleases, DNA polymerases and ligases, vectors. Outlines of gene cloning methods. General account on application of genetic engineering in industry agriculture and medicine. Disadvantages of Genetically modified food.

**Books for Reference**  :

1. *Reddy, S.M. and Reddy, S.R*.,    A Text Book of Microbiology Vol-II. Microbial Metabolism and Molecular Biology.  Himalaya  Publishing House, Mumbai, 2005.
2. Lehninger, A.L., Nelson, D.L. and Cox, M.M.,  *Principles of Biochemistry*, 2$^{nd}$ Edition, CBS Publishers and Distributors, New Delhi, 1993.
3. Elliot, W.H. and Elliot, D.C., *Biochemistry and Molecular Biology*,  2$^{nd}$ Edition, Oxford University Press, U.S.A, 2001.
4. Verma, P.S. and Agarwal, V.K., *Cell Biology, Genetics, Molecular Biology,*

*Evolution and Ecology*. S. Chand & Co. Ltd., New Delhi, 2004.
5. Freifelder, D., *Essentials of Molecular Biology*, Narosa Publishing House, New Delhi, 1997.
6. Freifelder, D., *Microbial Genetics,* Narosa Publishing House, New Delhi, 1990.
7. Strickberger, M.W. , *Genetics*., Oxford & IBH, New Delhi, 1967.
8. Lewin, B., **Genes VIII.** Oxford University Press, England, 2000.
9. Turner, P.C., Mclennan, A.G., Bates, A.D. and White, M.R.H., *Instant Notes in Molecular Biology*, Viva Books Pvt., Ltd., New Delhi, 1998.

**Practicals - 2: Microbial Physiology And Genetics**

1. Preparation of media for culturing autotrophic and heterotrophic microorganisms - Algal medium, mineral salts medium, nutrient agar medium, McConkey agar, Sabourad's agar and blood agar .
2. Enrichment culturing and isolation of phototrophs.
3. Enrichment culturing and isolation of chemoautotrophs.
4 Setting and observation of Winogradsky column.
5. Determination of viable count of bacteria.
6. Bacterial growth curve.
7. Factors affecting bacterial growth – pH, temperature,
8. Factors affecting bacterial growth salts.
9. Qualitative analysis of sugars.
10. Qualitative analysis of amino acids.
11. Colorimetric estimation DNA by diphenylamine method.
12. Colorimetric estimation of proteins by Biuret/Lowry method
13. Paper chromatographic separation of sugars.
14. Paper chromatographic separation of amino acids
15. Estimation of glucose by DNS Method.
16. Qualitative test and estimation of glucose.

**Books for Reference:**

1. Dubey, R.C. and Maheswari, D.K., ***Practical Microbiology,*** S. Chand & Co. Ltd., New Delhi, 2002.
2. Plummer, D.T. , *An Introduction to Practical Biochemistry,* 3rd Edition, Tata Mc GrawHill, New Delhi, 1988.
3. Reddy, S.M. and Reddy, S.R., *Microbiology – Practical Manual*, 3rd Edition, Sri Padmavathi Publications, Hyderabad, 1998.
4. Sashidhara Rao, B. and Deshpande, V., *Experimental Biochemistry: A student Companion,* I.K. International Pvt. Ltd, 2007.

**PHYSICS**

**Paper – 2: Thermodynamics and Optics**
Unit-I: Kinetic theory of gases and Thermodynamics:
> Introduction – Deduction of Maxwell's law of distribution of molecular speeds, Transport Phenomena – Viscosity of gases – thermal conductivity – diffusion of gases.
>
> Introduction – Reversible and irreversible processes – Carnot's engine and its efficiency – Carnot's theorem – Second law of thermodynamics, Kelvin's and Claussius statements – Thermodynamic scale of temperature – Entropy, physical significance – Change in entropy in reversible and irreversible processes – Entropy and disorder – Entropy of universe – Temperature- Entropy (T-S) diagram.

Unit-II: Thermodynamic potentials and Maxwell's equations:
> Thermodynamic potentials – Derivation of Maxwell's thermodynamic relations – Clausius-Clayperon's equation – Derivation for ratio of specific heats – Derivation for difference of two specific heats for perfect gas. Joule Kelvin effect – expression for Joule Kelvin coefficient for perfect and Vanderwaal's gas.

Unit-III: Low temperature Physics:
> Introduction – Joule Kelvin effect – liquefaction of gas using porous plug experiment. Joule expansion – Distinction between adiabatic and Joule Thomson expansion – Expression for Joule Thomson cooling – Liquefaction of helium, Kapitza's method – Adiabatic demagnetization – Production of low temperatures – Principle of refrigeration, vapour compression type. Working of refrigerator and Air conditioning machines. Effects of Chloro and Fluro Carbons on Ozone layer.

Unit-IV: Quantum theory of radiation:
> Black body-Ferry's black body – distribution of energy in the spectrum of Black body – Wein's displacement law, Wein's law, Rayleigh-Jean's law – Quantum theory of radiation - Planck's law – deduction of Wein's law and Rayleigh-Jeans law from Planck's law - Measurement of radiation – Earth as a Black Body. Types of pyrometers – Disappearing filament optical pyrometer – experimental determination – - determination of solar constant, effective temperature of sun.

Unit-V: The Matrix methods in paraxial optics and Aberrations:
> Introduction, the matrix method, effect of translation, effect of refraction, imaging by a spherical refracting surface. Imaging by a co-axial optical system. Unit planes. Nodal planes. A system of two thin lenses.
>
> Introduction – Monochromatic aberrations, spherical aberration, methods of minimizing spherical aberration, coma, astigmatism. Chromatic aberration – the achromatic doublet – Removal of chromatic aberration of a separated doublet. Defects of Eye – Myopia and Hypermetropia – correction.

Unit-VI: Interference:
> Principle of superposition – coherence– conditions for Interference of light
>
> **Interference by division of wave front**: Fresnel's biprism – determination of wave length of light. Determination of thickness of a transparent material using Biprism – change of phase on reflection – Lloyd's mirror experiment.
>
> **Interference by division of amplitude**: Oblique incidence of a plane wave on a thin film due to reflected and transmitted light (Cosine law) – Colours of thin films – Non reflecting films – interference by a plane parallel film illuminated by a point source – Interference by a film with two non-parallel reflecting surfaces (Wedge shaped film) – Determination of diameter of wire-Newton's rings in reflected light with contact between lens and glass plate – Determination of wave length of monochromatic light

– Michelson Interferometer – types of fringes – Determination of wavelength of monochromatic light and thickness of a thin transparent plate.

Unit-VII: Diffraction:

Introduction – Distinction between Fresnel and Fraunhoffer diffraction Fraunhoffer diffraction:- Diffraction due to single slit– Limit of resolution – Fraunhoffer diffraction due to double slit – Fraunhoffer diffraction pattern with N slits (diffraction grating). Resolving Power of grating – Determination of wave length of light in normal and oblique incidence methods using diffraction grating.

Fresnel diffraction:-Fresnel's half period zones – area of the half period zones –zone plate – Comparison of zone plate with convex lens – Phase reversal zone plate– difference between interference and diffraction.

Unit-VIII: Polarization, Laser, Fiber Optics:

Polarized light : Methods of Polarization, Polarizatioin by reflection, refraction, Double refraction, selective absorption , scattering of light – Brewsters law – Malus law – Nicol prism polarizer and analyzer – Refraction of plane wave incident on negative and positive crystals (Huygen's explanation) – Quarter wave plate, Half wave plate– Optical activity, analysis of light by Laurent's half shade polarimeter.

Lasers: Introduction – Spontaneous emission – Stimulated emission – Population inversion . Laser principle– Types of Lasers – He-Ne laser – Ruby laser – Applications of lasers.

Fiber Optics : Introduction – Optical fibers – Types of optical fibers – Step and graded index fibers –Fiber  material – Principles of fiber communication (qualitative treatment only) and advantages of fiber communication. Holography: Basic Principle of Holography and its applications.

 **Note:** Problems should be solved at the end of every chapter.

**Textbooks:**
1. Ajoy Ghatak, *Optics,* The McGraw-Hill companies.
2. Subramaniyam and Brijlal, *Optics,* S. Chand & Co.
3. Halliday/Resnick/Walker, *Fundamentals of Physics,* C. Wiley India Edition  2007.
4. Telugu Academy, Second Year Physics
5. R. Murugeshan and Kiruthiga Siva Prasath (for statistical Mechanics) *Modern Physics,* S. Chand & Co.
6. K.Thyagarajan  and A.Ghatak, *Lasers: Fundamentals and Applications*
7. K.Thyagarajan  and A.Ghatak , *An Introduction to Fibre Optics*

**Books for Reference:**
1. G. Aruldhas and P. Rajagopal, *Modern Physics,* Eastern Economy Education.
2. F. Reif, Berkeley Physics Course. Volume-5, *Statistical Physics*. The McGraw-Hill Companies.
3. Daniel V. Schroeder., *An Introduction to Thermal Physics* Pearson Education Low Price Edition.
4. R.C. Srivastava, Subit K. Saha & Abhay K. Jain , *Thermodynamics,* Eastern Economy Edition.
5. A.S. Vasudeva, *Modern Engineering Physics* S.Chand & Co. Publications.
6. Jenkins A. Francis and White E. Harvey, *Fundamentals of Optics*, McGraw Hill Inc.

**Practicals - 2: Thermodynamics and Optics**
1. Co-efficient of thermal conductivity of a bad conductor-Lee's method
2. Heating efficiency of an electrical kettle with varying voltages
3. Thickness of a wire – wedge method
4. Determination of wavelength of light – Fresnel's biprism
5. Determination of radius of curvature of given convex lens – Newton's rings
6. Determination of wavelength of light – diffraction at thin wire
7. Resolving power of grating
8. Determination f mean diameter of Lycopodium powder (Diffraction)
9. Study of optical rotation Polarimeter
10. Dispersive power of a prism
11. Determination of wavelength of light using diffraction grating minimum deviation method.
12. Pulrich diffraction determination of refractive index of a liquid
13. Wavelength of light using diffraction grating –normal incidence method
14. I-d curve using spectrometer
15. Resolving power of a telescope
16. Refractive index of liquid and glass
17. Wavelength of a laser using diffraction grating
18. Stefan's constant
19. Carey-Foster's bridge – Temperature coefficient of a resistance
   * One has to complete a minimum of 10 experiments

**STATISTICS**

**Paper-2: Statistical Inference**

Unit-I: Theory of Attributes: Analysis of categorical data, independence and association and partial association of attributes, Consistency of data, Conditions for consistency of two and three attributes cases, various measures of association - Yule's coefficient of association, coefficient colligation for two way data and relation between them.

Curve Fitting: Least square principle, fitting of straight line, quadratic, exponential and power curves.

Correlation: Bivariate data, correlation coefficient and its properties. Scattered diagram, Karl Pearson correlation coefficient for grouped and ungrouped data. Spearman's rank correlation coefficient and its properties. Correlation Ratio. Concepts of partial and multiple correlation coefficients (only for three variables) and its properties.

Regression: Principle of least squares, simple linear regression, properties of regression coefficients and correlation verses regression.

(One 15 mark question and two 5 marks questions are to be set from this Unit)

Unit-II: Exact sampling distributions: Statement and properties of $\chi^2$, t and F distributions and their interrelationships.

Point estimation: Concepts of population, parameter, random sample, statistic, sampling distribution and standard error. Independence of sample mean and variance in random sampling from normal distributions, concept of bias and mean square error of an estimate. Criteria of good estimator - consistency, biasedness, efficiency and sufficiency with examples. Statement of Neyman's Factorization theorem, derivations of sufficient statistics in case of Binomial, Poisson, Normal and Exponential (one parameter only) distributions, complete statistic, derivation of complete statistic in case of Binomial, Poisson and Normal distributions. Estimation by method of moments, Maximum likelihood (ML), statements of asymptotic properties of MLE. Concept of interval estimation.

(One 15 mark question and three 5 marks questions are to be set from this Unit)

Unit-III: Testing of Hypothesis: Concepts of statistical hypotheses, null and alternative hypothesis, critical region, two types of errors, level of significance and power of a test. One and two tailed tests, test function (non-randomized and randomized). Neyman-Pearson's fundamental lemma for Randomized tests. Examples in case of Binomial, Poisson, Exponential and Normal distributions and their powers. Use of central limit theorem in testing. Likelihood Ratio test – test for single mean and single variance of Normal Population.

Large sample tests: Tests and confidence intervals for mean(s), proportion(s) and standard deviation(s) .

(One 15 mark question and one 5 mark question is to be set from this Unit)

Unit-IV: Small Sample Tests: Tests of significance based on $\chi^2$, *t* and F. $\chi^2$-test for goodness of fit, test for independence of attributes and test for single variance. *t* test for singe mean, difference of means, paired 't' test, observed sample correlation coefficient, F test for difference of variances.

Non parametric tests: Advantages and disadvantages, comparison with parametric tests. One sample test*:* runs test, sign test and Wilcoxon-signed rank tests (single and paired samples). Two independent sample tests*:* Median test, Wilcoxon –Mann-Whitney U test, Wald Wolfowitz's runs test.

(One 15 mark question and two 5 marks questions are to be set from this Unit)

**Text Book:**
1. Dr. T.C.Ravi Chandra kumar, Dr. R. Sudhakar Reddi, Sri A. Mohan Rao, Sri, S. Srinivasa Rao, *Statistics Paper II - Statistical Methods and Inference*, Academy.

**Books for Reference:**
1. V.K.Kapoor and S.C.Gupta, *Fundamentals of Mathematical Statistics*, Sultan Chand&Sons, New Delhi.
2. Goon AM, Gupta MK, Das Gupta B, *Outlines of Statistics*, Vol-II, the World Press Pvt.Ltd., Kolakota.
3. Sanjay Arora and Bansi Lal, *New Mathematical Statistics* Satya Prakashan, New Delhi.
4. Parimal Mukhopadhyay, *Mathematical Statistics*, New Central Book agency.
5. Levin, Stephan, Krehbiel, Berenson, *Statistics for Managers using Microsoft Excel, 4th edition,* Pearson Publication.

**Practicals – 2: Statistical Inference**
1. Generation of random samples from Uniform (0,1), Uniform (a, b) and exponential distributions.
2. Generation of random samples from Normal and Poisson distributions.
3. Simulation of random samples from Uniform (0,1), Uniform (a, b),Exponential, Normal and Poisson distributions using MS Excel or using StatDisk.
4. Fitting of straight line and parabola by the method of least squares.
5. Fitting of straight line and parabola by the method of least squares using MS Excel or using Statdisk.
6. Fitting of power curves of the type $y = ax^b$, $y = ab^x$ and $y = ae^{bx}$ by the method of least squares.
7. Fitting of power curves of the type $y = ax^b$, $y = ab^x$ and $y = ae^{bx}$ by the method of least squares using MS Excel.
8. Computation of Yule's coefficient of association.
9. Computation of correlation coefficient and regression lines for ungrouped data.
10. Computation of correlation coefficient, forming regression lines using MS Excel or using StatDisk.
11. Computation of correlation coefficient, forming regression lines for grouped data.
12. Computation of multiple and partial correlation coefficients.
13. Computation of multiple and partial correlation coefficients using MS Excel or using StatDisk.
14. Computation of correlation ratio.
15. Large sample tests for mean(s), proportion(s), and Standard deviation(s).
16. Large sample tests for mean(s), proportion(s), and Standard deviation(s) using excel or using StatDisk.
17. Small sample tests for single mean and difference of means, Paired '*t*' test and correlation coefficient.
18. Small sample tests for mean(s), paired t-test and correlation coefficient using MS Excel or using StatDisk.
19. Small sample test for single and difference of variances.
20. Small sample test for single and difference of variances using MS Excel.
21. $\chi^2$ – test for goodness of fit and independence of attributes.
22. $\chi^2$ – test for goodness of fit and independence of attributes using MS Excel or using Statdisk.
23. Nonparametric tests for single and related samples (sign test and Wilcoxon signed rank test) and one sample runs test.

24. Nonparametric tests for single and related samples (sign test and Wilcoxon signed rank test) and one sample runs test using Excel or using Statdisk.

25. Nonparametric tests for two independent samples (Median test, Wilcoxon Mann Whitney - U test, Wald - Wolfowitz's runs test)

Note: 1. Training shall be on establishing formulae in Excel cells and derive the results. excel output shall be exported to MS word for writing inference.

2. The Statdisk related experiments output hardcopy shall be attached to the record.

3. The practical problems must be related to real life situations.

**ZOOLOGY**

**Paper-2: "Chordates, Embryology, Ecology and Zoogeography"**
Unit-I: Protochordata to Amphibia:
    a.  Protochordates: Salient features of Urochordata and Cephalochordata
        Structure and life-history of *Herdmania*, Significance and retrogressive
        Metamorphosis.
    a.  General organization of Chordates
    b.  General characters of Cyclostomes
    c.  General characters of fishes, classification up to sub-class level with
        examples.
        i.  Type study - *Scoliodon* : Morphology, respiratory system, circulatory
           system, excretory system, nervous system and sense organs.
        ii.  Migration in fishes and types of scales
     e. General characters and classification of Amphibia up to order level.
        i. Type study - *Rana* : Morphology,  respiratory system, circulatory system and
          reproductive system.
        ii. Parental care in amphibians
Unit-II: Reptilia to Mammalia:
    a.  General characters and classification of Reptilia up to order level.
        i. Type study – *Calotes* : Morphology, digestive system, respiratory system,
          circulatory system, urinogenital system and nervous system.
    b.  General characters and classification of Aves up to order level with examples.
        ii. Type study - Pigeon (*Columba livia*) : Exoskeleton, respiratory system,
          circulatory system and excretory system.
        iii.  Significance of migration in birds
        iv. Flight adaptation in birds
    c.  General characters and classification of Mammalia up to order level
        with  examples.
        i. Dentition in Mammals.
Unit-III: Embryology:
    1. Spermatogenesis, Oogenesis and Fertilization.
    2. Types of eggs
    3. Types of cleavages
    4. Development of frog up to gastrulation and formation of primary germ layers
    5. Foetal membranes and their significance
    6. Placenta : types and functions
    7. Regeneration with reference to Turbellarians and Lizards
Unit-IV: Ecology:
    1. Biogeochemical cycles or nutrient cycles - Gaseous cycles of Nitrogen and
       Carbon; Sedimentary cycle- phosphorus.
    2. Definition of Community- Habitat and ecological niche
      a.Community interactions : Brief account on Competition, predation,
        mutualism,commensalism and parasitism.
      b. Ecological succession: Primary and secondary, seral stages, climax
        community  with examples
    3. Population ecology:
      a. Density and dispersions of animal populations
      b. Growth curves and growth of animal populations- r-selected and k-selected
        species

    c. Population regulation mechanisms – both biotic and abiotic
4. Zoogeography:
    a. Fauna of Oriental Realm
    b. Fauna of Australian Realm

**Practicals - 2: "Chordates, Embryology, Ecology and Zoogeography"**
Chordata, Embryology and Ecology
Observation of the following slides / specimens / models:
1. Protochordata : *Herdmania, Amphioxus, Amphioxus* T.S through pharynx.
2. Cyclostomata : *Petromyzon and Myxine.*
3. Pisces : *Pristis, Torpedo, Channa, Pleuronectes, Hippocoampus , Exocoetus, Echeneis, Labeo, Catla, Clarius, Anguilla.* Scales of fishes.
4. Amphibia : *Ichthyophis, Amblystoma, Siren, Axolotl larva, Rana, Hyla, Alytes.*
5. Reptilia: *Draco, Chamaeleon, Uromastix, Russels viper, Naja,* Krait, *Enhydrina, Testudo, Trionyx, Crocodile.*
6. Aves : *Picus, Psittacula, Eudynamis, Bubo, Alcedo.*
7. Mammalia: *Ornithorhynchus*, *Tachyglossus*, *Hedgehog, Pteropus,Funambulus, Manis.*

Osteology*:*
    1. Appendicular skeletons of *Varanus*, Pigeon and Rabbit.
Embryology:
    1. Mounting of sperms (Grasshopper/Rat)
    2. Observations of following slides / models
      T.S. of testis and ovary (Rat / Rabbit / Human)
    3. Different stages of cleavage (2-cell, 4- cell and 8- cell), Morula.
    4. Blastula and gastrula of frog.
Ecology:
    1. Determination of $_pH$ in a given sample.
    2. Estimation of dissolved oxygen in the given samples at different temperatures.
    3. Estimation of salinity (chloride) of water in the given samples.
    4. Estimation of hardness of water in terms of Carbonates , bicarbonates in the given samples

**Books for Reference:**

1. E.L.Jordan and P.S. Verma, *Chordate Zoology* , S. Chand Publications.
2. Parker and Haswell, *Text book of Zoology* – Vertebrates.
3. N. Arumugam, *A text book of Embryology* .
4. Odum, *Elements of Ecology*.
5. P.D.Sharma, *Environmental Biology*.