B.Sc.

GENERAL STREAM WITH NO COMPUTER COURSE AS CORE SUBJECT

B.Sc. SECOND YEAR

OFFICE AUTOMATION TOOLS

UNIT - 1

Excel basics : The usual spread sheet features, Overview of excel features, Getting Started, Creating a new work sheet, Selecting cells, Navigating with the mouse and keyboard, Entering and editing text, text boxes, text notes, checking spelling, undoing and repeating actions, entering and formatting numbers, entering and editing formulas, referencing cells, order of evaluation in formulas, look up tables, copying entries and equations to minimize typing, more auto fill examples, creating custom fill lists, protecting and unprotecting documents and cells.

Rearranging worksheets : Moving cells, copying cells, sorting cell data, inserting rows, inserting columns, inserting cells, inserting as you paste, deleting parts of a worksheet, clearing parts of a worksheet, how formulas react to worksheet design changes, Auditing tools help spot potential problems.

Excel formatting tips and techniques : Excel page setup, Changing column widths and row heights, auto format, manual formatting, using styles, format codes alter a number's appearance, format painter speeds up format copying, changing font sizes and attributes, adjusting alignments, centering text across columns, using border buttons and commands, changing colors and shading, inserting and removing page breaks, hiding rows and columns.

Organizing large projects : Using names, splitting windows and fixing titles, outlining your worksheets, working with multiple worksheets, using multiple worksheets in a workbook, viewing multiple windows, summarizing information from multiple worksheets.

An introduction to functions : Parts of a function, functions requiring add-ins, online functions help, the function wizard, examples of functions by category, error messages from functions.

UNIT - 2

Excel's chart features : chart parts and terminology, instant charts with the chart wizard, creating charts on separate worksheets, resizing and moving charts, adding chart notes and arrows, editing charts, rotating 3-D charts, Changing worksheet values by dragging chart parts, printing charts, deleting charts, setting the default chart type, controlling with series on which axis, adding overlay charts, creating trend lines, data map.

Working with graphics in Excel : Creating and placing graphic objects, resizing graphics, positioning graphics on worksheets, drawing lines and shapes, examples of graphics in Excel, possible sources of excel graphics, Excel slide shows.

Introduction to Excel's command macros : Recording your own macros, running macros, assigning macros to buttons.

Using worksheets as databases : Database concepts and terms, Creating an excel database, Working with data forms, filtering-a better way to find, sorting excel databases, cross-tabulating databases, adding subtotals to databases.

Automating what-if projects : General organizational tips, scenario manager, finding the right number with solver.

Auditing and trouble shooting worksheets : Using error values to locate problems, using iteration to solve circular references, using the info window to find errors, using the auditing command to trouble shoot.

UNIT - 3

Introduction to Access : Access concepts and terms, starting and quitting access, the access workspace and tools, the views.

Creating a simple database and tables : The access table wizard, creating databases without the wizard, field names, data types and properties, adding or deleting fields in tables, renaming fields and their captions, moving fields, deleting fields in tables, resizing fields, changing the appearance' of text in tables, freezing columns, primary key fields, indexing fields, viewing a list of database properties.

Forms : The form wizard, saving forms, modifying forms.

Entering and editing data : Typing, adding records, duplicate previous entries without retyping, switching out of data entry mode, when do entries get saved?, undo, correcting entries, global replacements, moving from record to record in a table, entry and navigational shortcuts.

Finding, sorting and displaying data : Queries and dynasets, creating and using select queries, returning to the query design, multiple search criteria, finding incomplete matches, using wildcards in queries, requesting range of records, hiding columns, reformatting dynasets, multilevel sorts, showing all records after a query, saving queries for latter use, cross tab queries, find and replace.

UNIT - 4

Printing reports, forms, letters and labels: simple table, form, and database printing, defining advanced reports, manual reporting and modifying, modifying section contents, properties in reports, saving report formats for reuse, printing mailing labels, changing label designs.

Relational databases : Flat versus relational, how relationships work, Exercise: creating a simple relationship, types of relationships, defining and redefining relationships, deleting relationships, creating relationships.

Expressions, macros and other automation : Expressions, using expressions in reports, using expressions in queries, using expressions in forms, expression builders.

Graphics in databases : Objects: linked, embedded, bound and unbound, unbound graphics as form and report embellishments, bound graphics in records, adding graphics to buttons, chart wizard: charting your data.

Linking, importing and exporting records : Importing versus linking, linking other databases as tables, importing data from spread sheet files, importing data from word files, exporting access data.

Unit - 5

The Internet and the World Wide Web : Overview: what is Internet, The Internet's history, The Internet's major services, Understanding the world wide web, Using your browser and the world wide web,

navigating the web, closing your browser, getting help with your browser, searching the web, search results and web sites .

E-mail and other Internet Services : Overview: communicating through the Internet, Using E-mail, Using an E-mail program, Stoping out spam, Using web-based e-mail services, More features of the Internet.

Connecting to the Internet: Overview: Joining the Internet phenomenon, Connecting to the Internet through wires, How PC applications access the Internet, Connecting to the Internet wirelessly.

Doing business in the online world : Overview: commerce on the world wide web, E-commerce at the consumer level, E-conmerce at the business level, Business, the Internet and every thing, Telecommuters.

Prescribed books:

1. Ron Mansfiled, Working in Microsoft office, Tata McGraw Hill (2008) (chapters 13 to 23 and 29 to 38)

2. Peter Norton, Introduction to computers, Sixth Edition Tata McGraw Hill (2007) (Chapters 8A, 8B, 9A, 9B) .

Reference Books :

1. Michael Miller, Absolute Beginner's guide to computer Basics, Fourth Edition, Pearson Education (2007).

2. Deborah Morley, Charles S.Parker, understanding computers today and tomorrow, 11th edition, Thomson (2007).

3. Ed Bott, woody Leonhard, using Microsoft Office 2007, Pearson Education (2007).

4. Rajkamal, Internet and web Technologies, Tata McGraw Hill (2007) .

PART - II
B.Sc.

B.Sc. BOTANY (BZC)

Theory & Practicals Syllabus

FIRST YEAR

PAPER - I : Mocrobial Diversity, Cryptogams and Gymnosperms

SECOND YEAR

PAPER - II : Anatomy, Embryology, Taxonomy and Medicinal Botany

THIRD YEAR

PAPER - III : Cell Biology, Genetics, Ecology and Biodiversity

PAPER - IV : Physiology, Tissue Culture, Biotechnology, Seed Technology and Herticulture

B.Sc. BOTANY (BZC)
Theory & Practical Syllabus

FIRST YEAR

PAPER - I
MICROBIAL DIVERSITY, CRYPTOGAMS AND GYMNOSPERMS

UNIT – I : Evolution of Life and Diversity of Microbes

1. Origin and evolution of Life – an outline.

2. **Viruses :** Structure, replication and transmission; plant diseases caused by viruses and their control.

3. **Bacteria :** Structure, nutrition, reproduction and economic importance. An outline of Plant diseases of important crop plants caused by bacteria and their control.

4. Brief account of Archaebacteria, Chlamydia, Actinomycetes and Mycoplasma.

5. **Cyanobacteria :** Cell structure, thallus organisation and their prospecting (uses) – Biofertilizers. Structure and life history of *Oscillatoria, Nostoc* and *Anabaena*.

UNIT – II : Algae and Fungi

6. **Algae :** General account, thallus organisation, structure, reproduction, classification and economic importance.

7. Structure, reproduction, life history and systematic position of *Oedogonium, Coleochaete, Chara, Ectocarpus* and *Polysiphonia.*

8. **Fungi :** General characters, classification and economic importance.

9. Structure, reproduction and life history of *Albugo, Saccharomyces, Penicillium, Puccinia, Altermania*. General account of plant diseases caused by Fungi and their control.

10. **Lichens :** Structure and reproduction; ecological and economic importance.

UNIT – III : Bryophyta and Pteridophyta

11. **Bryophytes :** General characters, classification and alternation of generations.

12. Structure, reproduction, life history and systematic position of *Marchantia, Anthoceros* and *Polytrichum*. *Evolution* of Sporophyte in Bryophytes.

13. **Pteridophytes :** General characters, classification, alternation of generations and evolution of sporophyte.

14. Structure, reproduction, life history and systematic position of *Rhynia, Lycopodium, Equisetum* and *Marsilea*.

15. Evolution of stele, heterospory and seed habit in Pteridophytes.

UNIT – IV : Gymnosperms and Palaeobotany

16. **Gymnosperms :** General characters, structure, reproduction and classification.

17. Morphology of vegetative and reproductive parts, systemic position, life history of *Pinus* and *Gnetum*

18. Distribution and economic importance; endangered Gymnosperms.

19. **Palaeobotany :** Introduction, Fossils and fossilization; Geological time scale; Importance of fossils.

20. Bennettitales : General account

Suggested Readings:

1. Alemopolus, J. and W.M. Charles. 1988. Introduction to Mycology. Wiley Eastern, New Delhi.

2. Mckane, L. and K. Judy. 1996. Microbiology – Essentials and Applications. McGraw Hill, New York.

3. Pandey, B.P. 2001. College Botany, Vol. I: Algae, Fungi, Lichens, Bacteria, Viruses, Plant Pathology, Industrial Microbiology and Bryophyta. S. Chand & Company Ltd, New Delhi.

4. Pandey, B.P. 2006. College Botany, Vol. II: Pteridophyta, Gymnosperms and Paleobotany. S. Chand & Company Ltd, New Delhi.

5. Pandey, B.P. 2007. Botany for Degree Students: Diversity of Microbes, Cryptogams, Cell Biology and Genetics. S. Chand & Company, New Delhi.

6. Sambamurthy, A.V.S.S. 2006. A Textbook of Plant Pathology. I.K. International Pvt. Ltd., New Delhi.

7. Sambamurthy, A.V.S.S. 2006. A Textbook of Algae. I.K. International Pvt. Ltd., New Delhi.

8. Sharma, O.P. 1992. Textbook of Thallophyta. McGraw Hill Publishing Co., New Delhi.

9. Sporne, K.R. 1965. Morphology of Gymnosperms. Hutchinson Co., Ltd., London.

10. Thakur, A.K. and S.K. Bassi. 2008. A Textbook of Botany: Diversity of Microbes and Cryptogams. S. Chand & Company Ltd. New Delhi.

11. Vashishta, P.C., A.K. Sinha and Anil Kumar. 2006. Botany – Pteridophyta (Vascular Cryptogams). S. Chand & Company Ltd, New Delhi.

12. Vashishta, B.R. A.K. Sinha and V.P. Singh. 2008. Botany for Degree Students: Algae. S. Chand & Company Ltd, New Delhi.

13. Vashishta, P.C., A.K. Singha and Anil Kumar. 2006. Botany for Degree Students: Gymnosperms. S. Chand & Company Ltd, New Delhi.

14. Vashishta, B.R. 1990. Botany for Degree Students: Fungi, S. Chand & Company Ltd, New Delhi.

15. Watson, E.V. 1974. The structure and life of Bryophytes, B.I. Publications, New Delhi.

SECOND YEAR

PAPER - II

ANATOMY, EMBRYOLOGY, TAXONOMY AND MEDICINAL BOTANY

UNIT - I: ANATOMY

1. ***Meristems:*** Types, histological organization of shoot and root apices and theories.
2. **Tissues** and **Tissue Systems:** Simple, complex and special tissues.
3. Leaf: Ontogeny, diversity of internal structure; Stomata and epidermal outgrowths.
4. **Stem** and **root anatomy,** Vascular cambium - Formation and function. Anomalous Secondary growth-general account. *Ex:* ***Stem****-Achyranthes, Boerhavia, Bignonia, Dracaena;* **Root-** *Beta vulgaris*
5. ***Wood structure:*** General account. Study of local timbers - Teak (*Tectona grandis*),Rosewood, *(albergia latifolia),* Red sandal, *(Pterocarpus santalinus)Nalamaddi, (Terminalia tomentosa (T. alat)* Peddagi *(Pterocarpus marsupiun),* and Neem *(Azadirachta indica)*

UNIT - II: EMBRYOLOGY

6. Introduction to Embryology. Anther structure, Microsporogenesis and development of male gametophyte.
7. Ovule structure and types; Megasporogenesis; types and development of female gametophyte.
8. Pollination - Types; Pollen - pistil interaction. Fertilization.
9. Endosperm - Development and types. Embryo - development and types; Polyembryony and Apomixis - an outline
10. Palynology: Pollen morphology, NPC systems, application of Palynology.

UNIT - III: TAXONOMY

11. Introduction : Principles of Plant Systematics, Systematics vs Taxonomy, Types of classification : Artificial, Natural and Phylogenetic

12. Systems of classification : Salient features and comparative account of Bentham & Hooker and Engler & Prantle. An introduction to Angiosperm Phylogeny Group (APG)

13. Current concepts in Angiosperm Taxonomy : Embryology in relation to taxonomy, Cytotaxonomy, Chemotaxonomy and Numerical Taxonomy.

14. Nomenclature and Taxonomic resources: An introduction to ICBN, Vienna code - a brief account. Herbarium: concept, techniques and applications.

15. Systematic study and economic importance of plants belonging to the following families: Annonanceae, Capparadaceae, Rutaceae, Fabaceae (Faboideae/papilionoideae, Caesalpinioideae, Mimosoideae), Cucurbitaceae, Apiaceae, Asteraceae. Asclepiadaceae, Lamiaceae, Amaranthaceae, Euphorbiaceae, Orchidacae and Poaceae

UNIT- IV : MEDICINAL BOTANY

16. Ethnomedicine: Scope, interdisciplinary nature, distinction of Ethnomedicine from Folklore medicine. Outlines of Ayurveda, Sidda, Unani and Homeopathic systems of traditional medicine. Role of AYUSH, NMPB, CIMAP and CDRI.

17. Plants in primary health care: Common medicinal plants - Tippateega *(Tinospora cordifolia),* tulasi *(Ocimum sanctum),* Pippallu *(piper longum),* Karaka *(Terminalia chebula),* Kalabanda *(Aloe vera),* Turmeric *(Curcuma longa.).*

18. Traditional medicine vs Modern medicine : Study of select plant examples used in traditional medicine as resource (active principles, structure, usage and pharmacological action) of modern medicine : Aswagandha *(Withania somnifera),* Sarpagandha *(Rauvolfia serpentina),* Nela usiri *(Phyllanthus amarus),* Amla *(Phyllanthus emblica)* and Brahmi *(Bacopa monnieri).*

19. Pharmacognosy : Introduction and scope, Adulteration of plant crude drugs and methods of identification - some examples. Indian Pharmacopoeia.

20. Plant crude drugs : Types, methods of collection , processing and storage practices, Evaluation of crude drugs.

SUGGESTED READINGS:

1. Bhattacharya et. al 2007 . A text book of Palynology, Central, New Delhi.
2. Bhojwani, S.S. and S.P. Bhatnagar, 2000. The Embryology of Angiosperms (4th Ed.), Vikas Publishing House, Delhi.
3. Davis, P.H. and V.H. Heywood. 1963, Principles of Angiosperm Taxonomy. Oliver and Boyd, London.
5. Esau, K. 1971. Anatomy of Seed Plants. John Wiley and Son, USA.
6. Heywood, V.H. 1965. Plant Taxonomy, ELBS, London
7. Heywood, V.H. and D.M. Moore (Eds). 1984. Current Concepts in Plant Taxonomy. Academic Press, London
8. Jain, S.K. and V.Mudgal. 1999. A Handbook of Ethnobotany. Bishen Singh Mahedra Pal Singh, Dehradun.
9. Jeffrey, C. 1982. An Introduction to Plant Taxonomy. Cambridge University Press, Cambridge, London.
10. Johri, B.M. 1984. Embryology of Angiosperms. Springer-Verleg, Berlin.
11. Joshi, S.G. 2000. Medicinal Plants. Oxford and IBH, New Delhi.
12. Kapil, R.P. 1986. Pollination biology. Inter India Publishers, New Delhi.
13. Kokate,C. and Gokeale - Pharmacognosy - Nirali Prakashan, New Delhi.
14. Lad, V. 1984. Ayurveda — The Science of Self-healing. Motilal Banarasidass, New Delhi.
15. Lewis, W.H. and M.P.F. Elwin Lewis. 1976. Medical Botany, Plants Affecting Man's Health. A Wiley Inter Science Publication, John Wiley and Sons, New York.
16. Maheswari.P. 1971. An Introduction to Embryology of Angiosperms. McGraw Hill Book Co., London.
17. Pandey, B.P. 2007. Botany for Degree Students : Diversity of Seed Plants and their Systematics, Structure, Development and Reproduction in Flowering Plants. S. Chand & Company Ltd., New Delhi.
18. Rastogi, R.R. and B.N. Mehrotra. 1993. Compendium of Indian Medicinal Plants. Vol.1 & II.CSIR, Publication and Information Directorate, New Delhi.
19. Sivarjan, V.V. and I. Balasubramaniyan. 1994. Ayurvedic Drugs and their Plant Sources. Oxford and IBH, New Delhi.
20. Stace, C.A. 1989. Plant Taxonomy and Biostatistics (2nd Ed.). Edward Arnold, London
21. Singh, G. 1999. Plant Systematics: Theory and Practice. Oxford and IBH, New Delhi.

Practical - II :

ANATOMY, EMBRYOLOGY, TAXONOMY AND MEDICINAL BOTANY

(Total Hours of Laboratory Exercises : 90 @ 3 h/Week in 30 sessions)

Suggested Laboratory Exercises:

1. Demonstration of double staining techniques
2. Tissue organization in root and shoot apices using permanent slides
3. Preparation of double staining slides
   Primary structure: Root - *Cicer, Canna;* Stem *Tridox, Sorghum*
   Secondary structure: Root - *Tridox sp.;* Stem - *Pongamia*
   Anomalous secondary structure: *Achyranthes, Boerhavia, Bignonia, Dracaena, Beta vulgaris*
4. Stomatal types using epidermal peels
5. Microscopic study of wood in T.S., T.L.S. and R.L.S
6. Structure of anther and microsporogenesis using permanent slides
7. Structure of pollen grains using whole mounts
   (Catharanthus, Hibiscus, Acacia, Zea)
8. Pollen viability test using *in-vitro* germination
   (Catharathus)
9. Study of ovule types and developmental stages of Embryo sac.
10. Structure of endosperm (nuclear ad cellular);
    Developmental stages of dicot and monocot
    Embryos using permanent slides
11. Isolation and mounting of embryo
    (using *Cymopsis/Senna/Crotalaria)*
12. Systematic study of locally available plants
    belonging to the families prescribed in theory
    Syllabus (minimum of one plant representative for each family)
13. Demonstration of herbarium techniques and collection
    of Medicinal Plants.

THIRD YEAR

Paper- III :

CELL BIOLOGY, GENETICS, ECOLOGY AND BIODIVERSITY

UNIT-I: Cell Biology

1. *Plant cell envelops:* Ultra structure of cell wall, molecular organization of cell membranes.
2. *Nucleus*- Ultrastructure, Nucleic acids - Structures and replication of DNA; Types and functions of RNA.
3. *Chromosomes:* Morphology, organization of DNA in a chromosome. Euchromatin and Heterochromatin, Karyotype.
4. *Special types of chromosomes:* Lampbrush, polytene and B - chromosomes.
5. *Cell division:* Cell cycle and its regulation ; mitoses, meiosis, and their significance.

UNIT- II: Genetics

6. *Mendelism :* Laws of inheritance. Genetic interactions - Epistasis, Complementary, Supplementary and inhibitory genes.
7. *Linkage and crossing over:* A brief account, construction of genetic maps - 2 point and 3 point test cross data.
8. *Mutations:* Chromosomal aberrations - structural and numerical changes; Gene mutations, transposable elements.
9. *Gene Expression:* Organization of gene, transcription, translation, mechanism and regulation of gene expression in prokaryotes (Eac.and Trp Operons).
10. Extra nuclear genome: Mitochondria! and plastid DNA, Plasmids.

UNIT-III: Ecology

11. Concept and components of Ecosystem. Energy flow, food chains, food webs, ecological pyramids, biogeochemical cycles Carbon. Nitrogen. Phosphours.
12. Plants and environment: Ecological factors Climatic (light and temperature), edaphic and biotic. Ecological adaptations of plants.

13. Population ecology: Natality, Mortality, growth curves, ecotypes. ecads.

14. Community ecology: Frequency, density, cover life forms, biological spectrum, Ecological succession (Hydrosere, Xerosere).

15. Production ecology: Concepts of productivity, GPP.NPP, CR (Community -- Respiration) and secondary production, P/R ration and Ecosystems.

UNIT - IV : Biodiversity and Conservation

16. Biodiversity: Concepts, Convention on Biodiversity - Earth Summit. Types of biodiversity.

17. Level, threats and value of Biodiversity.

18. Hot spots of India - endemism. North Eastern Himalayas, Western Ghats.

19. Agro-biodiversity: Vavilov centres of crop plants.

20. Principles of conservation: IUCN threat - categories, RED data book- Threatened & endangered plants of India. Role of organizations in the Conservation of Biodiversity - IUCN, UNEP, WWF, NBPGR, NBD.

Practical- III :

CELL BIOLOGY, GENETICS, ECOLOGY AND BIODIVERSITY

(Total Hours of Laboratory Exercises:
90 @ 3 h/Week in 30 sessions)

Suggested Laboratory Exercises:

I. Major Experiments

1. Demonstration of cytochemical methods: Fixation of plant material and nuclear staining for mitotic and meiotic studies.

2. Study of various stages of mitosis using cytological preparations of onion root tips.

3. Study of various stages of meiosis using cytological preparation of onion flower buds

4. Study of plant community by quadrate method

5. Estimation of chemical oxygen demand (COD) in a given water sample.

II. Minor Experiments

6. Karyotype study using cytological preparation of dividing root tip cells of onion/photographs/permanent slides
7. Study of polytene chromosomes using salivary glands from *Chironomus /* prepared slides/ photographs.
8. Solving genetic problems related to monohybrid, dihybrid ratio and interaction of genes (Minimum of six problems in each topic). **See annexure-I**
9. Demonstration of soil texture (composition of clay, sand silt etc.) pH.
10. Estimation of water purity in given water samples
11. Estimation of OT in given water samples
12. Estimation of chlorides in given water samples

III. Scientific Observations

13. Study in the ultra structure of cell organelles using electron microphotographs.
14. Geographical spotting of certain endemic and endangered plant species of A.P.
15. Minimum of two field visits to local areas of ecological/ conservation of biodiversity Importance (Sacred grove/ Reserved Forest / Botanical garden/ Lakes etc.)

IV. Critical notes on spotters of scientific interest

16. Salivary gland chromosome
17. Lampbrush chromosome
18. Solenoid model of chromosome structure
19. Operon model
20. *Mirabilis jalapa*
21. *Eichhornia 11. Hydrilla*
23. *Pistia*
24. *Nymphaea*
25. *Vallisnaria*
26. *Asperagus*
27. *Opuntia*
28. *Euphorbia antiquorum*
29. *Rhizophora*
30. *Avecenia*

B.Sc. Botany Practical Syllabus

Paper - III
Annexure - I

Monohybrid cross:

(i) In pea, tall plant is dominant over dwarf plant. If a homozygous tall is crossed with a dwari plant, describe (i) the genotypes and phenotypes of F_1 and F_2 progeny, (ii) the gametes produced by F_1 and (iii) the genotypes and phenotypes of test cross and back cross progeny.

(ii) In pea, yellow cotyledon is dominant over green cotyledon colour. A plant heterozygous for yellow cotyledon is crossed with a plant homozygous for green cotyledon colour. Determine the gametes produced by these plant, and the genotypes and the phenotypes of progeny obtained from their cross.

(iii) In a cross between two parents 22 plants are round and 8 plants are wrinkled. Find out the genotype of the parents involved in the above cross.

(iv) What gametes will be produced by the plants involved in the following four crosses and what will be the size of the offspring from the each cross.

(i) TT x Tt (ii) Tt xTt (iii) TT x tt (iv) Tt x tt.

(v) A tall plant is crossed with a dwarf plant. In the progeny, about one-half of the plants are tall and the renaming one-half dwarf. Determine the genotypes of the tall and dwarf plants.

(vi) In *Mirabilis* (Four *'O'* clock), a plant hybrid for red ® and whiter flowers ® had pink flower (Rr). A plant with pink flowers is crossed with one having red flowers and with another having white flowers. Give the genotypic and phenotypic ratios expected in progenies from these crosses.

Dihybrid cross:

(vii) A dwarf pea plant with yellow seed is crossed with a tall plant with green seeds. Give the genotype and phenotype of FI, the gametes produced by FI, the genotypes and phenotypes of p2 and testcross progeny.

(viii) In snapdragon, tall (DD) is dominant dwarf (dd) and red flowers (RR) are incompletely dominant over white (rr), the hybrid being pink. A pure tall white is crossed to a pure dwarf red and the FI are self-fertilised. Give the expected genotypes and phenotypes in F_1 and F_2

(ix) Let Y.y, S and s represent yellow, green, round and wrinkled characters of the seed of *Pisum sativum*, what will be the colour and shape of the seeds produced by the offspring of the flowing crosses : (i) YYss x yySS, (ii) Yy Ss x Yyss.

(x) In man, brown eyes (V0) are dominant to blue (b) and dark hairs ® dominant to red hairs (r). A man with brown eyes and red hairs and marries a woman with blue eyes and dark hairs. They have two children, one with brown eyes and red hairs and the other with blue eyes and dark hairs. Give the genotypes of the parents and children.

(xi) In Guinea pigs rough coat colour (R0) is dominant over smooth coat ® and black colour (B) is dominant over white (b). when two pigs are mated the following offspring are formed. 28 rough black, 31 rough white, 11 smooth black, 10 smooth white. Find out the genotypic parents involve in the mating.

(xii) In summer squash white fruit colour id governed by a dominant allele W and yellow fruit colour by its recessive w. a dominant allele had another locus (s) produces disc shaped fruit and its recessive (s) is produces sphere shaped fruit. A homozygous white disc variety of genotype WWSS is crossed with a homozygous yellow sphere variety (wwss). What are the phenotypes expected in the F_1, F_2 backcross and test cross progenies?

Gene interactions:

(xiii) A pure Rose combed chicken is mated with a pure Pea combed chicken. All the F1 Wulnut with Rose and Pea separately and how phenotypes and genotypes.

(xiv) A cross between Rose combed chicken and Walnut combed chicken produced 15 Walnut, 14 Rose, 5 Pea and 6 Single comb offspring. Determine the genotypes of the parents.

(xv) In sweet pea, genes C&P are necessary for coloured flowers. The absence of either or both of these genes the flowers are white. What will be the ratio of the offsprings of the following crosses. (i) Cc xccPp (ii) Cc x Ccpp © CcPp x CcPp.

(xvi) Coloured flowered (purple) are dependent on dominant genes C&P. Presence of any one dominant gene fails to produce colour becoming white. A purple flowered plant is crossed with a white flowered plant. 17 Purple and 16 white flowered plants are produced. Give the genotypes of the parents.

(xvii) In mice, black colour of hair is determined by a dominant gene C. Agouti is a wild character which is dependent on dominant gene A. this wild character is expressed when ever it interacts with coloured gene. Albino micro mice are with recessive genes. Find out the ratios of F1 & F2 offsprings resulting from a cross between black and albino mice.

(xviii) In Shepherd purse, triangular fruits are dependent either one or two dominant genes. Top shaped fruits are recessive. A cross was made between two triangular fruited plants. What will be the first shape of offsprings?

Suggested Readings :

1. Bharucha, E. 2005. Textbook of Environmental Studies for Undergraduate Courses. Universities Press (India) Private Limited, Hyderabad.
2. Fukui, K. and S. Nakayama. 1996. Plant Chromosomes: Laboratory Methods. CRC Press, Boca Raton, Florida.
3. Harris, N. and K.J. Oparka. 1994. Plant Cell Biology: A Practical Approach. IRL Press at University Press. Oxford. UK.
4. Khitoliya, R.K. 2007. Environmental Pollution - Management and Control for Sustainable Development. S. Chand & Company Ltd., New Delhi.
5. Kormondy, E. 1989. Concepts of Ecology (3rd Ed.). Printice Hall of India, New Delhi.
6. Kothari, A. 1997. Understanding Biodiversity: Life, Sustainability and Equity: Tracts for the Times. 11. Orient Longman Ltd., New Delhi.
7. Michael, S. 1996. Ecology. Oxford University Press London.
8. Mishra. D.D. 2008. Fundamental Concepts in Environmental Studies. S. Chand & Company Ltd., New Delhi.
9. Odum, E.P. 1983. Basics of Ecology. Saunder's International Students Edition, Philadelphia.

10. Pandey. B.P. 2007. Botany for Degree Students: Diversity of Microbes, Croptogames, Cell Biology and Genetics. S. Chand & Company Ltd., New Delhi.

11. Sharma P.D. 1989. Elements of Ecology. Rastogi Publications, Meerut.

12. Sharma, A.K. and A. Sharma. 1999. Plant Chromosomes: Analysis, manipulation and Engineering. Harwood Academic Publishers, Australia.

13. Shukla, R.S. and P.S. Chandel. 2007. Cytogenetics, Evolution, Biostatistics and Plant Breeding. S. Chand & Company Ltd., New Delhi.

14. Singh, H.R. 2005. Environmental Biology. S. Chand & Company Ltd., New Delhi.

15. Snustad, D.P. and M.J. Simmons. 2000. Principles of Genetics. John Wiley & Sons, Inc., USA.

16. Strickberger, M.W. 1990. Genetics (3rd Ed). Macmillan Publishing Company.

17. Verma, P.S. and V.K. Agrawal. 2004. Cell Biology, Genetics, Molecular Biology, Evolution and Ecology. S. Chand & Company., New Delhi.

18. Verma, P.S. and V.K. Agrawal. 2006. Genetics. S. Chand & Company., New Delhi.

Paper - IV :

PHYSIOLOGY, TISSUE CULTURE, BIOTECHNOLOGY, SEED TECHNOLOGY AND HORTICULTURE

UNIT - I : Physiology (Part A)

1. *Water Relations:* Importance of waster to plant life, physical properties of water, diffusion, transport of water, ascent of sap; transpiration; Stomatal structure and movements.

2. *Mineral Nutrition:* Essential macro and micro mineral nutrients and their role; symptoms of mineral deficiency; absorption of mineral ions; passive and active transport.

3. *Enzymes:* Nomenclature, characteristics, regulation of enzyme action.

4. *Photosynthesis:* Photosynthetic pigments, absorption and action spectra; Red drop and Emerson enhancement effect; concept of two photosystems; mechanism of photosynthetic electron

transport and evolution of oxygen; photophosphorylation; Carbon assimilation pathways: C3, C4 and CAM; photorespiration.

5. *Translocation of organic substance:* Mechanism of phloem transport; source-sink relationships.

UNIT - II : Physiology (Part - B)

6. *Respiration:* Aerobic and Anaerobic; Glycolysis, Kreb cycle; electron transport system, mechanism of oxidative phosphorylation, pentose phosphate pathway.

7. *Nitrogen Metabolism :* Biological nitrogen fixation, nitrate reduction, ammonia assimilation, amino acid synthesis and protein synthesis.

8. *Lipid Metabolism :* Structure and functions of lipids; conversion of lipids to carbohydrates, ß-oxidation.

9. *Growth and Development :* Definition, phases and kinetics of growth. Physiological Effects of phytohormon- auxins, gibberellins, cytokinins, ABA, ethylene and brassinosteroids; Physiology of flowring and photoperiodism, role of phytochrome in flowing.

10. *Stress physiology:* Concept and plant response to water, salt and temperature stresses.

UNIT - II : Tissue Culture and Biotechnology

11. Tissue culture: Introduction, sterilization procedures, culture media - composition and preparation; explants.

12. Callus culture; cell and protoplast culture. Somatic hybrids and cybrids.

13. Applications of tissue culture: Production of pathogen free plants and somaclonal variants, production of stress resistance plants, secondary metabolites and synthetic seeds.

14. Biotechnology: Introduction, history and scope.

15. rDNA technology: Vectors and gene cloning and transgenic plants.

UNIT - IV : Seed Technology and Horticulture

16. Seed: Structure and types. Seed dormancy; causes and methods of breaking dormancy.

17. Seed storage: Seed banks, factors affecting seed viabiligy, genetic erosion. Seed production technology; seed testing and certification.

18. Horticulture techniques: Introduction, Cultivation of ornamental and vegetable Crops, Bonsai and landscaping.

19. Floriculture: Introduction. Imporatance of green house, polyhouse, mist chamber, shade nets; Micro irrigation systems. Floriculture potential and its trade in India.

20. Vegetative Propagation of plants: Stem, root and leaf cuttings. Layering and bud grafting. Role of plant growth regulators in horticulture.

Practical - IV :

PHYSIOLOGY, TISSUE CULTURE, BIOTECHNOLOGY, SEED TECHNOLOGY AND HORTICULTURE

(Total Hours of Laboratory Exercises : 90 @ 3 h/Week in 30 sessions)

Suggested Laboratory Exercises:

I. Major Experiments

1. Determination of osmotic potential of vacuolar sap by plasmolytic method using leaves of *Rhoeo / Tradenscantia.*
2. Determination of stomatal frequency using leaf epidermal peeling.
3. Separation of chloroplast pigments using paper chromatography technique.
4. Estimation of protein by biuret method.
5. Estimation of DNA

II. Minor Experiments

6. Determination of rate of transpiration using cobalt chloride method.
7. Determination of catalase activity using plant material/photographs.
8. Demonstration of seed dressing using fungicide to control diseases.
9. Demonstration of seed dressing using biofertiliser *(Rhizobium)* to enrich nutrient supply.
10. Demonstration of Micropropagation using explants like axillary buds and shoot meristems.

11. Testing of seed viability using 2,3,5 - triphenyl tetrazolium chloride (TTC).

III. Scientific Observations

12. Study of mineral deficiency symptoms using plant material / photographs.
13. Study of non-dormant seed germination: Breaking of seed dormancy caused by hard seed coat using scarification technique.
14. Demonstration vegetative plant propagation: Rooting of cutting-Leaf and stem: layering: stem net, glass house and mist chamber.
15. Study of the applications of plant growth regulator (IBA) for rooting of cuttings using Ornamental plants.
16. Study of protocols and photographs/charts related to Plant biotechnology: Isolation of nuclear and plasmid DNA, separation of DNA by gel electrophoresis.
17. Study visits to places of horticultural and biotechnological interest-Commercial nurseries/Botanical gardens; Biotechnology R&D laboratories/Industries.

IV. Critical notes on spotters of scientific interest.

18. Rake	19. Hoe	20. Spade
21. Trowel	22. Digger	23. Pick-axe
24. Shade net (photo)	25. Glass house (picture)	26. Mist chamber (picture)
27. Antibiotics	28. Vaccines	29. Biofertiliers
30. Single Cell Protein	31. Cosmetics	32. Multiple shoots
33. Somatic embryos	34. Artificial/Synthetic seeds	

Suggested Readings :

1. Adams, C.R., K.M. Banford and M.P. Early. 1993. Principles of Horticulture. Butterworth Heineman Ltd., London.
2. Agarwal, P.K. 1993. Hand Book of Seed Technology. Dept. of Agriculture and Cooperation. National Seed Corporation Ltd., New Delhi.
3. Balasubramanian, D., C.F.A. Bryce, K. Dharmalingam, J. Green and K. Jayaraman. 2004. Biotechnology. Universities Press (India) Private Ltd., Hyderabad.
4. Bedell. Y.E. Seed Science and Technology. Indian Forest Species. Allied Publishers Ltd., New Delhi.

5. Channarayappa. 2007. Molecular Biotechnology – Principles and Practices. Universities Press (India) Private Ltd., Hyderabad.
6. Chawala, H.S. 2002. Introduction to Plant Biotechnology. Oxford & IBH Publising Company, New Delhi.
7. Dubey, R.C. 2001. A Textbook of Biotechnology, S. Chand & Company Ltd., New Delhi.
8. Edmond, J.B., T.L. Senn, F.S. Adrews and R.J. Halfacre. 1977. Fundamentals of Horticulture (4th Ed.). Tata McGraw-Hill, New Delhi.
9. Gorer, R. 1978. The Growth of Gardens. Faber and Faber Ltd., London
10. Hartman, H.T. And D.E. Kestler. 1976. Plant Propagation: Principles and practices. Prentice & Hall of India, New Delhi.
11. Hopkins, W.G. 1995. Introduction to Plant Physiology. John wiley & Sons Inc., New York, USA.
12. Jain, J.L., S. Jain and Nitin Jain. 2008. Fundamentals of Biochemistry. S. Chand & Company Ltd., New Delhi.
13. Jha, T.B. and B. Ghosh. 2005. Plant Tissue Culture – Basic and Applied. Universities Press (India) Private Ltd., Hyderabad.
14. Janick Jules. 1979. Horticulture Science. (3rd Ed). W.H. Freeman and Co., San Francisso, USA.
15. Lewin, B. 1994. Genes V. Oxford University Press, Oxford.
16. Lewin, B. 2002. Genes VII. Oxford University Press, Oxford.
17. Pandey, B.P. 2007. Botany for Degree Students: Plant Physiology, Biochemistry, Biotechnology, Ecology and Utilization of Plants. S. Chand & Company Ltd., New Delhi.
18. Ramawat, K.G. 2008. Plant Biotechnology. S. Chand & Company Ltd., New Delhi.
19. Rao, K.M. 1991. A Text Book of Horticulture. Mc Millan India Ltd., New Delhi.
20. Salisbury, F.B. and C.W. Ross. 1992. Plant Physiology. 4th edn. (India Edition) Wordsworth, Thomson Learning Inc., USA.
21. Taiz, L. and E. Zeiger. 1998. Plant Physiology (2nd Ed.). Sinauer Associates, Inc., Publishers, Massachusetts, USA.
22. Tiwari, G.N., R.K. Goal. Green House Technology – Fundamentals, Design, Modelling and Application. Narosa Publishing House, New Delhi.
23. Tunwar, N.S. and S.V. Singh. 1988. Indian Minimum Seed Certification Standards. The Central Seed Certification Board, Govt. of India, New Delhi.

B.Sc.
CHEMISTRY

FIRST YEAR

PAPER - I : 1) Inorganic Chemistry - I
2) Physical Chemistry - I
3) Organic Chemistry - I
4) General Chemistry - I

SECOND YEAR

PAPER - II **:** 1) Inorganic Chemistry - II
2) Organic Chemistry - II
3) Physical Chemistry - II
4) General Chemistry - II

THIRD YEAR

PAPER - III **:** 1) Inorganic Chemistry - III
2) Organic Chemistry - III
3) Physical Chemistry - III

PAPER - IV **:** 1) Physio Chemical Methods of Analysis
2) Drugs, Cormulations, Pesticide and Green Chemistry
3) Macromolecules and Catalysis

B.Sc. Chemistry

FIRST YEAR

PAPER - I

UNIT - I : Inorganic Cheistry - I

1. s-block elements : General characteristics of groups I & II elements, diagonal relationship between Li & Mg, Be & Al.

2. p-block elements :

General characteristics of elements of groups 13, 14, 15, 16 and 17

Group-13 : Synthesis and structure of diborane and higher boranes (B_4H_{10} and B_5H_9), boron-nitrogen compounds ($B_3N_3H_6$ and BN)

Group-14 : Preparation and applications of silanes and silicones, graphitic compounds.

Group-15 : Preparation and reactions of hydrazine, hydroxylamine, phosphazenes.

Group-16 : Classifications of oxides based on (i) Chemical behaviour and (ii) Oxygen content.

Group-17 : Inter halogen compounds and pseudo halogens

3. Organometallic Chemistry

Definetion and classification of organometallic compounds, nomenclature, preparation, properties and applications of alkyls of 1, 2 and 13 group elements.

UNIT-II : Organic Chemistry-I

1. Structural theory in Organic Chemistry

Types of bond fission and organic reagents (Electrophilic, Nucleophilic, and free radical reagents including neutral molecules like H_2O, NH_3 & $AlCl_3$).

Bond polarization : Factors influencing the polarization of covalent bonds, electro negativity - inductive effect. Application of inductive effect (a) Basicity of amines (b) Acidity of carboxylic acids (c) Stability of carbonium ions. Resonance or Mesomeric effect,

application to (a) acidity of phenol, and (b) acidity of carboxylic acids. Hyper conjugation and its application to stability of carbonium ions, Free radicals and alkenes, carbanions, carbenes and nitrenes.

Types of Organic reactions : Addition - electrophilic, nucleophilic and free radical. Substitution - electrophilic, nucleophilic and free radical. Elimination- Examples (mechanism not required).

2. Acyclic Hydrocarbons

alkanes- IUPAC Nomenclature of Hydrocarbons. Methods of preparation: Hydrogenation of alkynes and alkenes, Wurtz reaction, Kolbe's electrolysis, Corey- House reaction. Chemical reactivity - inert nature, free radical substitution mechanism. Halogenation example- reactivity, selectivity and orientation.

Alkenes - Preparation of alkenes (a) by dehydration of alcohols (b) by dehydrohalogenation of alkyl halides (c) by dehalogenation of 1,2 dihalides (brief mechanism), Saytzeff rule. Properties: Addition of hydrogen - heat of hydrogenation and stability of alkenes. Addition of halogen and its mechanism. Addition of HX, Markovnikov's rule, addition of H_2O, HOX, H_2SO_4 with mechanism and addition of HBr in the presence of peroxide (anti - Markovnikov's addition). Oxidation - hydroxylation by $KMnO_4$, OsO_4, peracids (via epoxidation) hydroboration, Dienes - Types of dienes, reactions of conjugated dines - 1,2 and 1,4 addition of HBr to 1,3 - butadiene and Diel's - Alder reaction.

Alkynes - Preparation by dehydrohalogenation of dihalides, dehalogenation of tetrahalides, Properties; Acidity of acetylenic hydrogen (formation of Metal acedtylides). Preperation of higher acetylenes, Metal ammonia reductions Physical properties. Chemical reactivity - electrophilic addition of X_2, HX, H_2O (Tautomerism), Oxidation with $KMnO_4$, OsO_4, reduction and Polymerisation reaction of acetylene.

3. Alicyclichydrocarbons (Cycloalkanes)

Nomenclature, Preparation by Freunds methods, heating dicarboxylic metal salts. Properties - reactivity of cyclopropane and cyclobutane by comparing with alkanes, Stability of cycloalkanes - Baeyer's strain theory, Sachse and Mohr predictions and Pitzer's strain theory. Conformational structures of cyclobutane, cyclopentane, cyclohexane.

4. Benzene and its reactivity

Concept of resonance, resonance energy. Heat of hydrogenation, heat of combustion of Benzene, mention of C-C bond lengths and orbital picture of Benzene.

Concept of aromaticity - aromaticity (definition), Huckel's rule - application to Benzenoid (Benzene, Napthalene) and Non - Benzenoid compounds (cyclopropenyl cation, cyclopentadienyl anion and tropylium cation)

Reactions - General mechanism of electrophilic substitution, mechanism of nitration. Friedel Craft's alkylation and acylation. Orientation of aromatic substitution - Definition of ortho, para and meta directing groups. Ring activating and deactivating groups with examples (Electronic interpretation of various groups like NO_2 and Phenolic). Orientation of (i). Amino, methoxy and methyl groups (ii). Carboxy, nitro, nitrile, carbonyl and Sulfonic acid groups. (iii). Halogens (Explanation by taking minimum of one example from each type).

5. Polynuclear Hydrocarbons -

Structure of naphthalene and anthracene (Molecular Orbital diagram and resonance energy) Any two methods of preparation of naphthalene and reactivity. Reactivity towards electrophilic substitution. Nitration and sulfonation as examples.

UNIT - III : Physical Chemisty-I

I Gaseous state

Compression factors, deviation of real gases from ideal behavior. Van der Waal's equation of state. P-V Isotherms of real gases, Andrew's isotherms of carbon dioxide, continuity of state. Critical phenomena. The van der Waal's equation and the critical state. Relationship between critical constants and van der Waal's constants. The law of corresponding states and reduced equation of states. Joule Thomson effect. Liquefaction of gases: i) Linde's method and ii) Claude's method.

II Liquid state

Intermolecular forces, structure of liquids (qualitative description). Structural differences between solids, liquids and gases. Liquid crystals, the mesomorphic state. Classification of liquid crystals into

Smectic and Nematic. Differences between liquid crystal and solid/ liquid. Application of liquid crystals as LCD devices.

III Solid state

Symmetry in crystals. Law of constancy of interfacial angles. The law of rationality of indices. The law of symmetry. Definition of lattice point, space lattice, unit cell. Bravis lattices and crystal systems. X-ray diffraction and crystal structure. Bragg's law. Determination of crystal structure by Bragg's method and the power method. Indexing of planes and structure of NaCl and KCl crystals. Defects in crystals. Stoichiometric and non-stoichiometric defects. Band theory of semoconductors. Extrinsic and intrinsic semiconductors, n- and p-type semiconductors and their applications in photo electrochemical cells.

IV Solutions

Liquid-liquid - ideal solutions, Raoult's law. Ideally dilute solutions. Henry's law. Non-ideal solutions. Vapour pressure - composition and vapour pressure-temperature curves. Azeotropes-HCl-H_2O, ethanol-water systems and fractional distillation. Partially miscible liquids-phenol-water, trimethylamine-water, nicotine-water systems. Effect of impurity on consulate temperature. Immiscible liquids and steam distillation.

Nernst distribution law. Calculation of the partition coefficient. Applications of distribution law.

V Colloids and surface chemistry

Definition of colloids. Solids in liquids (sols), preparation, purifications, properties - kinetic, optical, electrical. Stability of colloids, Hardy-Schulze law, protective colloid. Liquids in liquids (emulsions) preparation, properties, uses. Liquids in solids (gels) preparation, uses.

Adsorption: Physical adsoption, chemisorption. Freundlich, Langmuir adsorption isotherms. Applications of adsorption

UNIT - IV : General Chemistry - I

1. Atomic Structure and elementary quantum mechanics

Blackbody radiation, Planck's radiation law, photoelectric effect, Compton effect, de Broglie's hypothesis, Heisenberg's uncertainty

principle. Postulates of quantum mechanics. Schrodinger wave equation and a particle in a box, energy levels, wave functions and probability densities. Schrodinger wave equation for H-atom. Separation of variables, Radial and angular functions, hydrogen like wave functions, quantum numbers and their importance.

2. Chemical Bonding

Valence bond theory, hybridization, VB theory as applied to ClF_3, BrF_5, $Ni(CO)_4$, XeF_2. Dipole moment - orientation of dipoles in an electric field, dipole moment, induced dipole moment, dipole moment and structure of molecules. Molecular orbital theory - LCAO method, construction of M.O. diagrams for homo-nuclear and hetero-nuclear diatomic molecules (N_2, O_2, HCl, CO and NO). Comparision of VB and MO theories.

3. 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.

4. General Principles of Inorganic qualitative analysis

Solubility product, common ion effect, characteristic reactions of anions, elimination of interfering anions, separation of cations into groups, group reagents, testing of cations

LABORATORY COURSE - I

Practical Paper - I : 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: Carbonate, sulfide, 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.

SECOND YEAR

PAPER - II

UNIT - I : Inorganic Chemistry - I

I. Chemistry of d-block elements : Characteristics of d-block elements with special reference to electronic configuration, variable valence, magnetic properties, catalytic properties 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 triods in respect of electronic configuration and reactivity of different oxidation states.

II. 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.

III. 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.

IV. Metal carbonyls and related compounds - EAN rule, classification of metal carbonyls, structures and shapes of metal carbonyls of V, Cr, Mn, Fe, Co and Ni. Metal nitrosyls and metallocenes (only ferrocene).

UNIT - II : Organic Chemistry - II

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 SN^1 and SN^2.

Energy profile diagram of S_N1 and S_N2 reactions. Stereochemistry of S_N2 (Walden inversion) S_N1 (Racemisation). Explanation of both by taking the example of optically active alkyl halide - 2bromobutane. Ease of hydrolysis - comparision of alkyl, benzyl, alkyl, vinyl and allyl halides

2. Hydroxy compounds

Nomenclature and classification of hydroxy compounds.

Alcohol: Preparation with hydroboration rection, 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, Kolbe-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.

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) □□□-unsaturated carboxylic acids (crotonic acid).

Reaction with urea.

6. Exercises in interconversion

UNIT - III : Physical chemistry - II

1. Phase rule

Concept of phase, components, degree of freedom. Definition 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. Determinattion 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. Applications of EMF measurements, Calculation of thermodynamic quantities of cell reactions (□G, □H and K). Determination of pH using quinhydrone electrode, Solubility product of AgCl. Potentiometric titrations.

UNIT - IV : General Chemistry - II

1. Molecular summetry

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. Theory of quantitative analysis

a Principles of volumetric analysis. Theories of acid-base, redox, complexometric, iodometric and precipitation titrations, choice of indicators for these titrations.

b) Principles of gravimetric analysis: precipitation, coagulation, peptization, coprecipitation, post precipitation, digestion, filtration and whashing of precipitate, drying and ignition, precipitation from homogenous solutions, requirements of gravimetric analysis.

3. Evalution of analytical data

Theory of errors, idea of significant figures and its importance, accuracy - methods of expressing accuracy, error analysis and minimization of errors, precision - methods of expressing precision, standard deviation and confidence limit.

4. 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), Linear, Convergent and Combinatorial syntheses, Target molecule (TM). Retrosynthesis of the following molecules
a) acetophenone 2) cyclohexene 3) phenylethylbromide

c) Asymmetric (Chiral) synthesis

Definitions-Asymmetric synthesis, enantiometric excess, diastereometric excess. stereospecific reaction, definition, example, dehalogenation of 1,2-dibromides by I, stereoselective reaction, definition, example, acid catalysed dehydration of 1-phenylpropanol

LABORATORY COURSE - II

Practical Paper - II : Inorganic Chemistry)

I. Titrimetric analysis :

1) Determination of carbonate and bicarbonate in a mixture
2) Determination of Fe(II) using $K_2Cr_2O_7$
3) Determination of Fe(II) using $KMnO_4$ with oxalic acid as primary standard.
4) Determination ofCu(II) using $Na_2S_2O_3$ with $K_2Cr_2O_7$ as primary standard
5) Determination of Zinc using EDTA
6) Determination of hardness of water
7) Determination of Zinc by ferrocyanide

II. Gravimetric analysis (any three of the following)

1) Determination of barium as barium sulphate
2) Determination of sulphate as barium sulphate
3) Determination of lead as lead chromate
4) Determination of nickel as Ni-DMG complex
5) Determination of magnesium as magnesium pyrophosphate.

THIRD YEAR

PAPER - III

UNIT - I : Inorganic Chemistry - III

I. Coordination Chemistry : IUPAC nomenclature, bonding theories review of Werner's theory and Sidgwick's concept of coordination, Valence bond theory, geometries of coordinatiaon numbers 4-tetrahedral and square planar and 6-octahedral and its limitations, crystal filed theory, splitting of d-orbitals in octahedral, tetrahedral and square-planar complexes - low spin and high spin complexes - factors affecting crystal - field splitting energy, merits and demerits of crystal-field theory. Isomerism in coordination compounds - structural isomerism and stereo isomerism, stereochemistry of complexes with 4 and 6 coordination numbers.

2. Spectral and magnetic properties of metal complexes: Electronic absorption spectrum of $(Ti(H_2O)6)^{3+}$ ion. Types of magnetic behavior, spin-only formula, calculation of magnetic moments, experimental determination of magnetic susceptibility - Gouy method.

3. Reactivity of metal complexes: Labile and inert complexes, ligand substitution reactions - S_N1 and S_N2, substitution reactions of square planar complexes - Trans effect and applications of trans effect.

4. Stability of metal complexes: Thermodynamic stability and kinetic stability, factors affecting the stability of metal complexes, chelate effect, determination of composition of complex by Job's method and mole ratio method.

5. Hard and soft acids bases (HSAB) : Classification, Pearson's concept of hardness and softness, application of HSAB principles - Stability of compounds / complexes, predicting the feasibility of a reaction.

6. Bioinorganic chemistry : Essential elements, biological significance of Na, K, Mg, Ca, Fe and Chloride (Cl). Metalloporphyrins - Hemoglobin, structure and funtion, chlorophyll, structure and role in photosynthesis.

UNIT - II : Organic Chemistry-III

1. Nitrogen compounds

Nitro hydrocarbons : Nomenclature and classification - Nitro hydrocarbons - structure. Tautomerism of nitroalkanes leading to

acid and keto form. Preparation of Nitroalkanes. Reactivity - Halogenation, reaction with HONO (Nitrous acid), Nef reaction and Mannich reaction leading to Michael addition and reduction.

Amines (aliphatic and aromatic): Nomenclature, Classification into 1^0, 2^0, 3^0. Amines and Quarternary ammonium compounds. Prepaative methods-1. Amonolysis of alkyl halides. 2. Gabriel synthesis. 3. Hoffman's bromamide reduction reaction (mechanism). 4. Reduction of Amides and Schmidt reaction. Physical properties and basic character Comparative basic strength of Ammonia, methyl amine, dimethyl amine, trimethyl amine and aniline - comparative basic strength of aniline, N-methylaniline and N,N-dimethyl aniline (in aqueous and non-aquous medium), steric effects and substituent effects. Use of amine salts as phase transfer catalysts. Chemical properties: a) Alkylation b) Acylation c) Carbylamine reaction d) Hinsberg separation e) reaction with nitrous acid of 1^0, 2^0,3^0 (Aliphatic and aromatic amines). Electrophilic substitutions of Aromatic amines - Bromination and Nitration oxidation of aryl and 3^0 amines.Diazotization Cyanides and isocyanides: Nomenclature (Aliphatic and aromatic) structure. preparation of cyanides from a) Alkyl halides b) from amides c) from aldoximes. Preparation of isocyanides from Alkyl halides and Amines. Properties of cyanides and isocyanides, a) hydrolysis b) addition of Grignard reagent iiI) reduction iv) oxidation.

2. heterocyclic compounds

Introduction and definition: Simple 5 membered ring compounds with one hetero atom Ex. Furan. Thiophene and pyrrole. Importance of ring system - presence in important natural products like hemoglobin and chlorophyll. Numbering the ring systems as per Greek letter and Numbers. Aromatic character - 6-electron system (four-electrons from two double bonds and a pair of non-bonded electrons from the hetero atom). Tendency to undergo substitution reactions.

Resonance structures: Indicating electron surplus carbons and electron deficient heteroatom. Explanation of feebly acidic character of pyrrole, electrophillic substitution at 2 or 5 position, Halogenation, Nitration and Sulphonation under mild conditions. Reactivity of furan as 1,3-diene, Diels Alder reactions (one example). Sulphonation of thiophene purification of Benzene obtained from coal tar). Preparation of furan, Pyrrole and thiophene from 1,4-

dicarbonyl compounds only, Paul-Knorr synthesis, structure of pyridine, Basicity - Aromaticity - Comparison with pyrrole - one method of preparation and properities - Reactivity toward Nucleophilic substitution reaction - chichibabin reaction.

3. Carbohydrates

Monosaccharides: All discussion to be confined to (+) glucose as an example of aldo hexoses and D(-) fructose as example of ketohexoses. Chemical properties and structural elucidation: Evidences for straight chain pentahydroxy aldehyde structure (Acetylation, reduction to n-hexane, cyanohydrin formation, reduction of Tollen's and Fehling's reagents and oxidation to gluconic and saccharic acid). Number of optically active isomers possible for the structure, configuration of glucose based on D-glyceraldehyde as primary standard (no proof for configuration is required). Evidence for cyclic structure of glucose. Decomposition of cyclic structure (Pyranose structure, anomeric Carbon and anomers). Proof for the ring size (methylation, hydrolysis and oxidation reactions). Different ways of writing pyranose structure (Haworth formula and chair conformation formula). Structure of fructose: Evidence of 2-ketohexose structure (formation of penta acetate, formation of cyanohydrin its hydrolysis and reduction by HI to give --carboxy-n-hexane). Same osazone formation from glucose and fructose, Hydrogen bonding in osazones, cyclic structure of fructose (Furanose structure and Hawroth formula).

Interconversion of Monosaccharides: Aldopentose to aldo hexose-eg: Arabinose to D-Glucose, D-Mannose (Kiliani - Fischer method). Epimers, Epimerisation - Lobry de bruyn van Ekenstein rearrangement. Aldohexose to Aldopentose eg: D-glucose to D-arabinose by Ruff's degadation. Aldohexose (+) (glucose) to ketohexose (-) (Fructose) and Ketohexose (Fructose) to aldohdexose (Glucose).

4. Amino acids and proteins

Introduction : Definition of Amino acids, classification of Amino acids into alpha, beta, and gama amino acids. Natural and essential amino acids - definition and examples, classification of alpha amino acids into acidic, basic and neutral amino acids with examples. Methods of synthesis : General methods of synthesis of alpha amino acids (specific examples - Glycine, Alanine, Valine and Leucene)

by following methods: a) from halogenated carboxylic acid b) Malonic ester synthesis c) strecker's synthesis.

Physical properties : Optical activity of naturally occurring amino acids: L-configuration, irrespective of sign rotation, Zwitterion structure - salt like character - solubility, melting points, amphoteric character, definition of isoelectric point.

Chemical properties: General reactions due to amino and carboxyl groups - lactams from gamma and delta amino acids by heating peptide bond (amide linkage). Structure and nomenclature of peptides and proteins.

5. Mass Spectrometry :

Basic principles - Molecular ion / parent ion, fragment ions / daughter ions. Theory formation of parent ions. Representation of mass spectrum. Identification of parent ion, (M + 1), (M + 2), base peaks (relative abundance 100%). Mass spectra of ethylbenzene, acetophenone, n-butylamine and 1-propanol

UNIT - III : Physical Chemistry - III

1. Chemical kinetics

Rate of reaction, factors influencing the rate of a reaction-concentration, temperature, pressure, solvent, light, catalyst. Experimental methods to determine the rate of reaction. Definition of order and molecularity. Derivation of rate constants for first, second and zero order reactions and examples. Derivation for half life period. Methods to determine the order of reactions. Effect of temperature on rate of reaction Arrhenius equation, concept of activation energy. Theories of reaction rates-collision theory-derivation of rate constant for biomolecular reaction. The transition state theory (Elementary treatment).

2. Photochemistry

Difference between thermal and photochemical processes. Laws of photochemistry-grothus-Draper's law and Stark-Einstein's law of photochemical equivalence. Quantum yield. Photochemical hydrogen-chlorine, hydrogen-bromine reaction. Jablonski diagrm depicting various processes occurring in the excited state, qualitative description of fluorescence, phosphorescence, non-radiative process (internal conversion, intersystem crossing). Photosensilized reactions - energy transfer processes (simple example).

3. Thermodynamics

The first law of themodynamics : Statement, definition of internal energy and enthalpy. Heat capacities and their relationship. Joule's law Joule-Thomson effect and coefficient. Calculation of w, q, dE and dH for the expansion of perfect gas under Isotherm and Adiabatic conditions for reversible processes. State function. Temperature dependence of enthalpy of formation-Kirchoff's equation.

Second law of thermodynamics : Different Statements of the law. Carnot cycle and its efficiency. Carnot theorem. Thermodynamic scale of temperature. Concept of entropy, entropy as a state function, entropy changes in cyclic, reversible, and irreversible processes and reversible phase change. Calculation of entropychanges with changes in V & T and P & T. Entropy changes in spontaneous and equilibrium processes.

The Gibbs (G) and Helmholtz (A) energies. A & G as criteria for thermodynamic equilibrium and spontaneity-advantage over entropy change. Gibbs equation and Variation of G with P and T.

PAPER - IV :
CHEMISTRY AND INDUSTRY

UNIT - I : Physico Chemical Methods of analysis

1. Seperation Techniques

1. Chromatography : Classification of chromatography methods, principles of differential migration adsorption phenomenon, Nature of adsorbents, solvent systems, Rf values, factors effecting Rf values.

   a) Paper chromatography : Principles, Rf Values, Experimental procedures, choice of paper and solvent systems, development of chromatogram - ascending, descending and radial. Two dimensional chromatography, applications.

   b) Thin layer Chromatography (TLC): Advantages. Principles, factors effecting Rf values. Experiment procedures. Adsorbents and solvents. Preparation of plates. Development of the chromatogram. Detection of the spots. Applications.

   c) Column Chromatigraphy : Principle, experimental procedures, Stationary and mobile Phase, Separation technique. Applications.

2. Spectrophotometry

General features of absorption - spectroscopy , Beer-Lambert's law and its limitations, trasmittance, Absorbance, and molar absorptivity.

Double beam spectrophotometer. Application of Beer-Lambert law for quantitative analysis of

1. Chromium in $K_2Cr_2O_7$
2. Mangnanese in $KMnO_4$
3. Iron (III) with thiocyanate.

3. Molecular spectroscopy

(i) Electronic spectroscopy :

Interaction of electromagnetic radiation with molecules and types of molecular spectra. Potential energy curves for bonding and antibonding molecular orbitals. Energy levels of molecules (□□ □□n). Selection rules for electronic spectra. Types of electronic transitions in molecules effect of conjugation. Concept of chromophore.

(ii) Infra red spectroscopy

Energy levels of simple harmonic oscillator, molecular vibration spectrum, selection rules. Determination of force constant. Qualitative relation of force constant to bond energies. Modes of vibrations in like CO CO_2 & H_2O molecules. Characteristic absorption bands of various functional groups. Finger Print nature of infrared specturm.

(iii) Proton magnetic resonance spectroscopy (^{1}H-NMR)

Principles of nuclear magnetic resonance, equivalent and non-equivalent protons, position of signals. Chemical shift, NMR splitting of signals - spin-spin coupling, coupling constants. Applications of NMR with suitable examples - ethyl bromide, ethonol, acetaldehyde, 1,1,2-tribromo ethane, ethyl acetate, toluene and acetophenone.

(iv) Spectral interpretation

Interpretation of IR, UV-Visible, ^{1}H-NMR and mass spectral data of the following compounds 1. Phenyl acetylene 2. Acetophenone 3. Cinnamic acid 4. Para-nitro aniline.

UNIT - II : Drugs, formulations, pesticides and green chemistry

1. Drugs

1. Introduction: Drug, Disease (definition), Historical evolution, Sources - Plant, Animal synthetic, Biotechnology and human gene therapy

2. Terminology: Pharmacy, Pharmocology, Pharmacophore, Pharmacodynamics, Pharmacokinetics (ADME, Receptors - brief teartment) Metabolites and anti metabolites.
3. Nomenclature: Chemical name, Generic name and trade names with examples.
4. Classification: Classification based on structures and therapeutic activity with one example each.
5. Synthesis: Synthesis and therapeutic activity of the following drugs., L-Dopa, chloroquin, Omeprazole, Albuterol and ciprofloxacin.
6. Drug Development : Pencillin, Separation and isolation, structures of different pencillins.
7. Monographs of drugs: Eg Paracetamol, Sulpha methoxazole (Tablets).

2. Formulations

1. Need of conversion of drugs into medicine. Additives and their role (Brief account only)
2. Different types of formulations.

3. Green Chemistry

Introduction : Definition of green Chemistry, need of green chemistry, basic principles of green chemistry.

Green synthesis : Evalution of the type of the reation i) Rearrangements (100% atom economic), (ii) Addition reaction (100% atom economic), pericyclic reactions (No by-product).

Selection of solvent :

i) Aqueous phase reactions ii) reactions in ionic liquids iii) Solid supported synthesis iv) Solvent free reactions (solid phase reactions)

Microwave and Ultrasound assisted green synthesis :

1) Aldol condensation
2) Cannizzaro reaction
3) Diels-Alder reactions
4) Strecker synthesis

5) Willaimson synthesis

6) Dieckmann condensation

UNIT - III: (polymers, material science, and catalysis)

1. Polymers

Classification of polymers, chemistry of polymerization, chain polymerization, step polymerization, coordination polymerization - tacticity (isotactic, syndiotactic, atactic poly propelene). Molecular weight of polymers - number average and weight average molecular weight, degree of polymerization, determination of molecular weight of polymers by viscometry, Osmometry : mechanism of free radical polymerization, Preparation and industrial application of polyethylene, PVC, Teflon, polyacrylonitrile, terylene and Nylon-66.

2. Material Science :

Properties and applications of nano-materials.

3. Catalysis

Homogeneous and heterogeneous catalysis, comparison with examples. Kinetics of specific acid catalyzed reactions, inversion of cane sugar. Kinetics of specific base catalyzed reactions base catalyzed conversion of acetone to diacetone alcohol. Acid and base catalyzed reactions hydrolysis of esters, mutarotation of glucose. Enzyme catalysis: Classification, characteristics of enzyme catalysis. Kinetics of enzyme catalyzed reactions-Michael's Menten law, significance of Michael's constant (K_m) and maximum velocity (V_{max}). Factors affecting enzyme catalysis effect of temperature, pH, concentration and inhibitor. Catalytic efficiency, Mechanism of oxidation of ethanol by alcohol dehydrogenase.

LABORATORY COURSE - III

Practical Paper - III : Organic Chemistry

I. Synthesis of Organic Compounds

i. Aromatic electrophilic substitution Nitration: Preparation of nitro benzene and p-nitro acetanilide, Halogenation: Preparation of p-bromo acetanilide and 2,4,6- tribromo phenol.

ii. Diazotization and coupling: Preparation of pheyl azo □-napthol

iii. Oxidation: Preparation of benzoc acid frombenzyl chloride

iv. Reduction: Preparation of m-nitro aniline from m-dinitro benzene

v. Esterfication: Preparation of methyl para nitro benzoate from p-nitro Benzoic Acid.

vi. Methylations : Preparation of □-napthyl methyl ether

vii. Condensation: Preparation of benzilidine aniline

2. Thin layer Chromatography

i. Preparation of the TLC plates. Checking the purity of the compounds by TLC.

ii. Seperation of ortho and p-nitro aniline mixture by column chromatography.

3. Organic Qualitative Analysis :

i. Identification of an organic compound through the functional group analysis. Determination of melting point and preparation of suitable derivatives.

i. Aniline+Naphthalene ii. Benzoicacid+Benzophenone.
iii. p-cresol-chlorobenzene

ii. Separation of two component mixture Benzoic acid+benzophenone

4. Demonstration experiments

1. Steam distillation experiment: Separation of ortho and para nitro phenols 2) Microwave assisted Green synthesis, two example: 1. Hydrolysis of Benzamide 2. Oxidation of Toluene.

LABORATORY COURSE - IV

Practical Paper - IV : Physical Chemistry

1. Chemical Kinetics

i. Kinetic study of Acid Catalyzed hydrolysis of methyl acetate and determination of rate constant - Graphical method.

ii. Kinetic study of Acid catalysed Acetone - Iodine reaction and determination of rate constant - Graphical method.

iii. Kinetic study of persulphate iodide reaction and determination rate constant - Graphical method

2. Distribution law

i. Determination of distribution coefficient of iodine between water and carbon Tetrachloride.

ii. Determination of molecular state and partition coefficient of benzoic acid in Toluene and water.

3. Electrochemistry

i. Determination of concentration of HCl conductometrically using standard NaOH solution.

ii. Determination of concentration of acetic acid conductometrically using standard NaOH solution.

iii. Determination of solubility and solubility product of $BaSO_4$.

iv. Determination of redox potentials of Fe2+ by potentiometric titration of ferrous ammonium sulphate vs. $KMnO_4$.

4. pH metry

i. Preparation of phosphate buffer solutions

ii. pH metric titration of weak acid, acetic acid with strong base NaOH and calculation of dissociation constant.

5. Colorimetry

i. Verification of Beer-Lambert law for $KMnO_4K_2Cr_2O_7$and determination of concentration of the given solution

ii. Verification of Beer-Lambert law for $CuSO_4$ and determination of concentration of the given solution.

6. Adsorption

i. Surface tension and viscosity of liquids

ii. Adsorption of acetic acid on animal charcoal, verification of Freundlich isotherm

7. Project work :

i. Collection of spectral data of a minimum of six compounds belonging to different functional groups and submission of the report. (other than those included in the syllabus)

Note : Apart from the experiments (1 to 6) the project work (7) shall also be included in the University Examination.

Recommended Text Books and Reference Books :

Inorganic Chemistry

1. Concise Inorganic Chemistry by J.D. Lee
2. Basic Inorganic Chemistry by Cotton and Wilkinson
3. Advanced Inorganic Chemistry Vol-I by Satyaprakash, Tuli, Basu and Madan
4. Inorganic Chemistry by R R Heslop and P.L. Robinson
5. Modern Inorganic Chemistry by C F Bell and K A K Lott
6. University Chemistry by Bruce Mohan
7. Qualitative Inorganic analysis by A.I. Vogel
8. A textbook of qualitative inorganic analysis by A.I. Vogel.
9. Inorganic Chemistry by J.E. Huheey
10. Inorganic Chemistry by Chopra and Kapoor
11. Coordination Chemistry by Basalo and Johnson
12. Organometallic Chemistry - An introduction by R.C. Mehrotra and A. Singh
13. Inorganic Chemistry by D.F. Shriver, P.W. Atkins and C.H. Langford
14. Inorganic Chemistry by Philips and Williams, Lab Manuals
15. Introduction to inorganic reactions mechanisms by A.C. Lockhart
16. Theoretical inorganic chemistry by McDay and J. Selbin
17. Chemical bonding and molecular geometry by R.J. Gillepsy and P.L. Popelier

18. Advanced Inorganic Chemistry By Gurudeep Raj
19. Analytical chemistry by Gary D Christian, Wiley India.
20. Analytical Chemistry by G.L. David Krupadanam, et al, Univ. Press
21. Selected topics in inorganic chemistry by W.D. Malik, G.D. Tuli, R.D. Madan
22. Concepts and models of Inorganic Chemistry by Bodie Douglas, D. McDaniel and J. Alexander
23. Modern Inorganic Chemistry by William L. Jolly
24. Concise coordination chemistry by Gopalan and Ramalingam
25. Satyaprakash's modern inorganic chemistry by R.D. Madan

Organic Chemistry :

1. Organic Chemistry By R T Morrison and R.N. Boyd
2. Organic Chemistry by T.J. Solomons
3. Organic Chemistry by L.G. Wade Sr
4. Organic Chemistry by D. Cram, G.S. Hammond and Herdricks
5. Modern Organic Chemistry by J.D. Roberts and M.C. Caserio
6. Textbook of Organic Chemistry by Ferguson
7. Problems and their solutions in organic Chemistry by I.L. Finar
8. Reaction mechanisms in Organic Chemistry by S.M. Mukherji and S.P. Singh
9. A guide book to mechanisms in Organic Chemistry by Peter Sykes
10. Organic spectroscopy by J.R. Dyer
11. Organic Spectroscopy by William Kemp
12. Fundamentals of organic synthesis and retrosynthetic analysis by Ratna Kumar kar
13. Comprehensive practical organic qualitative analysis by V.K. Ahluwalia & Sumta Dhingra
14. Comprehensive practical organic chemistry: Preparation and quantitive analysis by V.K. Ahluwalia and Reena Agarwal.
15. Organic Chemistry by Janice Gorzynski
16. Organic Chemistry by Stanley H Pine
17. Fundamentals of Organic Chemistry by John Mc Murray, Eric Simanek
18. Organic Chemistry by Francis A Carey
19. Text book of Organic Chemistry by K.S. Mukherjee
20. Organic Chemistry by Bhupinder Mehta & Manju Mehta

21. Organic Chemistry by L.G. Wade Jr, Maya Shankar Singh
22. Elementary organic spectroscopy by Y.R. Sharma
23. Chemistry & Industry by Gurdeep R. Chatwal
24. Applied Chemistry by Jayashree Ghosh
25. Drugs by David Krupadanam
26. Pharmacodynamics by R.C. Srivastava, Subit Ghosh
27. Analytical Chemistry by David Krupadanam
28. Green Chemistry - V.K. Ahluwalia
29. Organic Synthesis by V.K. Ahluwalia and R. Agarwal
30. New trends in Green Chemistry - by V.K. Ahulwalia & M. Kidwai
31. Industrial Chemistry by B.K. Sharma
32. Industrial Chemistry by Banerji
33. Industrial Chemistry by M.G. Arora
34. Industrial Chemistry by O.P. Veramani & A.K. Narula
35. Synthetic Drugs by O.D. Tyagi & M. Yadav
36. Medicinal Chemistry by Ashutoshkar
37. Medicinal Chemistry by P. Parimoo
38. Phaarmcology & Pharmacotherapeutics by R.S. Satoshkar & S.D. Bhandenkar
39. Medicinal Chemistry by Kadametal P-I & P-II
40. European Pharmacopoeia
41. Vogel's Qualitative organic analysis.
42. Laboratory manual of Organic Chemistry by Raj K Bansal

Physical Chemistry Books :

1. Physical chemistry A molecular approach by Donald A. Mcquarrie and John. D. Simon
2. Physical chemistry by G M Barrow
3. Principles of physical chemistry by Prutton and Marron
4. Physical chemistry by Peter Atkins, Julio D. Paula
5. Physical Chemistry by Ira N Levine
6. Elements of Physical Chemistry by Peter Atkins, Julio D. Paula
7. Text Book of Physical Chemistry by P.L. Soni, O.P. Dharmarha and Q.N. Dash
8. Solid State Chemistry and its applications by Anthony R.West

9. Text book of physical chemistry by k L Kapoor
10. Thermodynamics for Chemists by S Glasston
11. Chemical Kinetics by K J Laidler
12. An Introduction to Electrochemisty by S. Glasston
13. Physical Chemistry through problems by S.K. Dogra
14. Thermodynamics by J. Jayaram and J.C. Kuriakose
15. Introductory Quantum Chemistry by A.K. Chandra
16. Physical Chemistry by J.W. Moore
17. Kinetics and mechanism by J.W. Moore and R.G. Pearson
18. Fundamentals of photochemistry by K.K. Rohtagi Mukharjee
19. Chemical thermodynamics by R.P. Rastogi and S.S. Misra
20. Advanced physical chemistry by Gurudeep Raj
21. Physical chemistry by G.W. castellan
22. Physical chemistry by Silbey, Alberty and Bawendi.
23. Elements of physical chemistry by S. Glasstone
24. Text book of physical chemistry by S. Glasstone
25. Fundamentals of Molecular spectroscopy by C.N. Banwell and E.M. McCash
26. Nanochemistry by Geoffrey Ozin and Andre Arsenault
27. Catalysis : Concepts and green applications by Gadi Rotherberg
28. Green Chemistry: Theory and practice by P.T. Anastas and J.C. Warner
29. Polymer Science by Gowriker, Viswanathan and Jayadev Sridhar
30. Introduction Polymer Chemistry by G.S. Misra
31. Polymer Chemistry by Bilmayer
32. Kinetics and Mechanism of Chemical Transformations by Rajaram and Kuriacose.
33. Senior practical physical chemistry by Khosla

B.Sc.
PHYSICS

FIRST YEAR

PAPER - I : Mechanics, Waves and Oscillations

SECOND YEAR

PAPER - II : Thermodynamics and Optics

FINAL YEAR

PAPER - III : Electricity, Magnetism and Electronics

PAPER - IV : Modern Physics

B.Sc. PHYSICS

FIRST YEAR

THEORY PAPER – I

MECHANICS, WAVES AND OSCILLATIONS

UNIT -I

1. Vector Analysis

Scalar and vector fields, gradient of a scalar field and its physical significance. Divergence and curl of a vector field and related problems. Vector integration, line, surface and volume integrals. Stokes, Gauss and Green's theorems- simple applications.

2. Mechanics of Particles

Laws of motion, motion of variable mass system, motion of a rocket, multi-stage rocket, conservation of energy and momentum. Collisions in two and three dimensions, concept of impact parameter, scattering cross-section, Rutherford scattering

3. Mechanics of rigid bodies

Definition of Rigid body, rotational kinematic relations, equation of motion for a rotating body, angular momentum and inertial tensor. Euler's equation, precession of a top, Gyroscope, precession of the equinoxes

UNIT - II

4. Mechanics of continuous media

Elastic constants of isotropic solids and their relation, Poisson's ratio and expression for Poisson's ratio in terms of y, n, k. Classification of beams, types of bending, point load, distributed load, shearing force and bending moment, sign conventions, simple supported beam carrying a concentrated load at mid span, cantilever with an end load

5. Central forces

Central forces - definition and examples, conservative nature of central forces, conservative force as a negative gradient of potential energy, equation of motion under a central force, gravitational potential and gravitational field, motion under inverse square law, derivation of Kepler's laws, Coriolis force and its expressions.

6. Special theory of relativity (10)

Galilean relativity, absolute frames, Michelson-Morley experiment, Postulates of special theory of relativity. Lorentz transformation, time dilation, length contraction, addition of velocities, mass-energy relation. Concept of four vector formalism.

UNIT - III

7. Fundamentals of vibrations (12)

Simple harmonic oscillator, and solution of the differential equation- Physical characteristics of SHM, compound pendulum, measurement of 'g', torsion pendulum, - measurements of rigidity modulus. Combination of two mutually perpendicular simple harmonic vibrations of same frequency and different frequencies, Lissajous figures

8. Damped and forced oscillations (12)

Damped harmonic oscillator, solution of the differential equation of damped oscillator. Energy considerations, comparison with undamped harmonic oscillator, logarithmic decrement, relaxation time, quality factor, differential equation of forced oscillator and its solution, amplitude resonance, velocity resonance

9. Complex vibrations (6)

Fourier theorem and evaluation of the Fourier coefficients, analysis of periodic wave functions-square wave, triangular wave, saw-tooth wave

UNIT - IV

10. Vibrations of bars (12)

Longitudinal vibrations in bars- wave equation and its general solution. Special cases (i) bar fixed at both ends ii) bar fixed at the mid point iii) bar free at both ends iv) bar fixed at one end. Transverse vibrations in a bar- wave equation and its general solution. Boundary conditions, clamped free bar, free-free bar, bar supported at both ends, Tuning fork.

11. Vibrating Strings (12)

Transverse wave propagation along a stretched string, general solution of wave equation and its significance, modes of vibration of stretched string clamped at both ends, overtones, energy transport, transverse impedance

12. Ultrasonics (6)

Ultrasonics, properties of ultrasonic waves, production of ultrasonics by piezoelectric and magnetostriction methods, detection of ultrasonics, determination of wavelength of ultrasonic waves. Velocity of ultrasonics in liquids by Sear's method. Applications of ultrasonic waves.

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

Text books

1. Berkeley Physics Course. Vol.1, Mechanics by C. Kittel, W. Knight, M.A. Ruderman -Tata-McGraw hill Company Edition 2008.
2. Fundamentals of Physics. Halliday, Resnick and Walker Wiley India Edition 2007.
3. Waves and Oscillations. S. Badami, V. Balasubramanian and K. Rama Reddy Orient Longman.
4. First Year Physics - Telugu Academy.
5. Mechanics of Particles, Waves and Oscillations. Anwar Kamal, New Age International.
6. College Physics-I. T. Bhimasankaram and G. Prasad. Himalaya Publishing House.
7. Introduction to Physics for Scientists and Engineers. F.J. Ruche. McGraw Hill.
8. Waves and Oscillations. N. Subramaniyam and Brijlal Vikas Publishing House Private Limited

Reference Books:

1. Fundamentals of Physics by Alan Giambattista et al Tata-McGraw Hill Company Edition, 2008.
2. University Physics by Young and Freeman, Pearson Education, Edition 2005.
3. Sears and Zemansky's University Physics by Hugh D. Young, Roger A. Freedman Pearson Education Eleventh Edition.
4. An introduction to Mechanics by Daniel Kleppner & Robert Kolenkow. The McGraw Hill Companies.
5. Mechanics. Hans & Puri. TMH Publications.
6. Engineering Physics. R.K. Gaur & S.L. Gupta. Dhanpat Rai Publications.

Practical Paper -I

FIRST YEAR PRACTICALS

1. Study of a compound pendulum determination of ‘g’ and ‘k’.
2. Study of damping of an oscillating disc in Air and Water logarithmic decrement.
3. Study of Oscillations under Bifilar suspension.
4. Study of oscillations of a mass under different combination of springs.
5. ‘Y’ by uniform Bending (or) Non-uniform Bending.
6. Verification of Laws of a stretched string (Three Laws) - Sonometer
7. Moment of Inertia of a fly wheel.
8. Measurement of errors - Simple Pendulum.
9. Determination of frequency of a Bar - Melde’s experiment.
10. ‘n’ by torsion pendulum.
11. Observation of Lissajous figures from CRO.
12. Study of flow of liquids through capillaries.
13. Determination of Surface Tension of a liquid by different methods.
14. Study of Viscosity of a fluid by different methods.
15. Volume Resonator -determination of frequency of a tuning fork.

Note: Any twelve of the experiments are to be performed.

SECOND YEAR

Theory Paper-II

THERMODYNAMICS AND OPTICS

UNIT - I

1. Kinetic theory of gases:

Introduction - Deduction of Maxwell's law of distribution of molecular speeds, Experimental verification Toothed Wheel Experiment, Transport Phenomena -Viscosity of gases - thermal conductivity - diffusion of gases.

2. Thermodynamics:

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 - Change of entropy of a perfect gas-change of entropy when ice changes into steam.

3. 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 Vanderwals gas.

UNIT - II

4. Low temperature Physics:

Introduction - Joule-Kelvin effect - liquefaction of gas using porous plug experiment. Joule expansion - Distinction between Joule-adiabatic and Joule- Thomson expansions - 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; applications of substances at low-temperature.

5. Quantum theory of radiation: (10)

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, Rayleigh-Jeans law, from Planck's law - Measurement of radiation - Types of pyrometers - Disappearing filament optical pyrometer - experimental determination - Angstrom pyroheliometer - determination of solar constant, effective temperature of sun.

6. Statistical Mechanics:

Introduction to statistical mechanics, concept of ensembles, Phase space, Maxwell- Boltzmann's distribution law, Molecular energies in an ideal gas, Bose-Einstein Distribution law, Fermi-Dirac Distribution law, comparison of three distribution laws. Black body radiation, Rayleigh - Jean's formula, Plank's radiation Law, weins displacement, Stefan's Boltzmann's Law from Plank's formula. Application of Fermi-Dirac statistics to white dwarfs and Neutron stars.

UNIT - III

7. Interference:

Principle of superposition - coherence - temporal coherence and spatial coherence -conditions for Interference of light

Interference by division of wave front: Fresnel's biprism - determination of wavelength of light. Determination of thickness of a thin 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 and with out contact between Lens and glass plate, Newton's rings in transmitted light (Haidinger fringes). Determination of wavelength of monochromatic light -Michelson Interferometer - types of fringes - Determination of wavelength of monochromatic

light, Difference in wave length of sodium DI, D2 lines and thickness of a thin transparent plate.

8. Diffraction:

Introduction - Distinction between Fresnel and Fraunhoffer diffraction Fraunhoffer diffraction:- Diffraction due to single slit and circular aperture - Limit of resolution -Fraunhoffer diffraction due to double slit - Fraunhoffer diffraction pattern with N slits (diffraction grating)

Resolving Power of grating - Determination of wavelength of light in normal and oblique incidence methods using diffraction grating.

FresneI 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- diffraction at a straight edge - difference between interference and diffraction.

UNIT - IV

9. Polarization (10)

Polarized light : Methods of Polarization, Polarizatioin by reflection, refraction, Double refraction, selective absorption , scattering of light - Brewster's law - Malus law - Nicol prism - polarizer and analyzer - Quarter wave plate, Half wave plate -Babinet's compensator - Optical activity, analysis of light by Laurent's half shade polarimeter.

10. Laser, Fiber Optics and Holography: (10)

Lasers: Introduction - Spontaneous emission - Stimulated emission - Population inversion . Laser principle - Einstein coefficients - 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 - Rays and modes in an optical fiber - Fiber material - Principles of fiber communication (qualitative treatment only) and advantages of fiber communication.

Holography: Basic Principle of Holography - Gabor hologram and its limitations, Holography applications.

11. The Matrix method in paraxial optics: (8)

Introduction, the matrix method, effect of translation, effect of refraction, system matrix, imaging by a spherical refracting surface. Imaging by a co-axial optical system. Unit planes. Nodal planes. A system of two thin lenses.

NOTE: Problems should be solved at the end of every chapter of all units.

Textbooks

1. Optics by Ajoy Ghatak. *The McGraw-Hill companies.*
2. Optics by Subramaniyam and Brijlal. *S. Chand & Co.*
3. Fundamentals of Physics. Halliday/Resnick/Walker.C. *Wiley India Edition 2007.*
4. Optics and Spectroscopy. R. Murugeshan and Kiruthiga Siva Prasath. *S. Chand & Co.*
5. Second Year Physics - *Telugu Academy.*
6. Modern Physics by R. Murugeshan and Kiruthiga Siva Prasath (for statistical Mechanics) *S. Chand & Co.*

Reference Books

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

Practical Paper - II

SECOND YEAR PRACTICALS

1. Co-efficient of thermal conductivity of a bad conductor by Lee's method.
2. Measurement of Stefan's constant.
3. Heating efficiency of electrical kettle with varying voltages.
4. Determination of diameter of Lycopodium particles.
5. Thickness of a wire-wedge method.
6. Determination of wavelength of light-Biprism.
7. Determination of Radius of curvature of a given convex lens-Newton's rings.
8. Resolving power of grating.
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. Wavelength of light using diffraction grating - normal incidence method.
13. Resolving power of a telescope.
14. Refractive index of a liquid and glass (Boy's Method).
15. Pulfrich refractometer- determination of refractive index of liquid.
16. Wavelength of Laser light using diffraction grating.

Note: Any twelve of the above experiments to be performed.

FINAL YEAR

Theory Paper-III

ELECTRICITY, MAGNETISM AND ELECTRONICS

UNIT - I

1. Electrostatics

Gauss' law and its applications-Uniformly charged sphere, charged cylindrical conductor and an infinite conducting sheet of charge. Deduction of Coulmb's law from Gauss law, Mechanical force on a charged conductor Electric potential -Potential due to a charged spherical conductor, electric field strength from the electric dipole and an infinite line of charge. Potential of a uniformly charged circular disc.

2. Dielectrics

An atomic view of dielectrics, potential energy of a dipole in an electric field. Polarization and charge density, Gauss's law for dielectric medium- Relation between D,E, and P. Dielectric constant, susceptibility and relation between them. Boundary conditions at the dielectric surface. Electric fields in cavities of a dielectric- needle shaped cavity and disc shaped cavity.

3. Capacitance

Capacitance of concentric spheres and cylindrical condenser, capacitance of parallel plate condenser with and without dielectric. Electric energy stored in a charged condenser- force between plates of condenser, construction and working of attracted disc electrometer, measurement of dielectric constant and potential difference.

UNIT - II

1. Moving charge in electric and magnetic field

Hall effect, cyclotron, synchrocyclotron and synchrotron - force on a current carrying conductor placed in a magnetic field, force and torque on a current loop, Biot -Savart's law and calculation of B due to long straight wire, a circular current loop and solenoid.

2. Electromagnetic induction

Faraday's law -Lenz's law - expression for induced emf - time varying magnetic fields - Betatron -Ballistic galvanometer - theory - damping

correction - self and mutual inductance, coefficient of coupling, calculation of self inductance of a long solenoid - toroid - energy stored in magnetic field - transformer - Construction, working, energy losses and efficiency.

UNIT - III

1. Varying and alternating currents

Growth and decay of currents in LR, CR and LCR circuits - Critical damping. Alternating current, relation between current and voltage in pure R,C and L-vector diagrams - Power in ac circuits. LCR series and parallel resonant circuit - Q-factor. AC & DC motors-single phase, three phase (basics only).

2. Maxwell's equations and electromagnetic waves

A review of basic laws of electricity and magnetism - displacement current -Maxwell's equations in differential form - Maxwell's wave equation, plane electromagnetic waves - Transverse nature of electromagnetic waves, Poynting theorem, production of electromagnetic waves (Hertz experiment)

UNIT - IV

1. Basic Electronics

Formation of electron energy bands in solids, classification of solids in terms of forbidden energy gap. Intrinsic and extrinsic semiconductors, Fermi level, continuity equation - p-n junction diode, Zener diode characteristics and its application as voltage regulator. Half wave and full wave rectifiers and filters, ripple factor (quantitative) - p n p and n p n transistors, current components in transistors, CB,CE and CC configurations - transistor hybrid parameters - determination of hybrid parameters from transistor characteristics - transistor as an amplifier — RC coupled amplifier (qualitative) concept of negative feed back and positive feed back -Barkhausen criterion, and phase shift oscillator (qualitative).

2. Digital Principles

Binary number system, converting Binary to Decimal and vice versa. Binary addition and subtraction (1's and 2's complement methods). Hexadecimal number system. Conversion from Binary to Hexadecimal - vice versa and Decimal to Hexadecimal vice versa.

Logic gates: OR,AND,NOT gates, truth tables, realization of these gates using discrete components. NAND, NOR as universal gates,

Exclusive - OR gate, De Morgan's Laws - statement and proof, Half and Full adders. Parallel adder circuits.

NOTE: Problems should be solved from every chapter of all units.

Textbooks

1. Modern Physics by R. Murugeshan and Kiruthiga Siva Prasath - *S. Chand & Co.* for semi conductor & Digital Principles)
2. Fundamentals of Physics- Halliday/Resnick/Walker - *Wiley India Edition 2007.*
3. Berkeley Physics Course - Vol. II - Electricity and Magnetism - Edward M Purcell -*The McGraw-Hill Companies.*
4. Electricity and Magnetism - D.N. Vasudeva. *S. Chand & Co.*
5. Electronic devices and circuits - Millman and Halkias. *Mc.Graw-Hitt Education.*
6. Electricity and Magnetism Brijlal and Subramanyam. *Ratan Prakashan Mandir.*
7. Digital Principles and Applications by A.P. Malvino and D.P. Leach. *McGraw Hill Education.*

Reference Books

1. Electricity and Electronics - D.C. Tayal. *Himalaya Publishing House.*
2. Electricity and Magnetism -C.J. Smith. *Edward Arnold Ltd.*
3. Electricity, Magnetism with Electronics - K K Tewari. *R.Chand & Co.*
4. Third year Physics - *Telugu Akademy*
5. Principles of Electronics by V.K. Mehta - *S. Chand & Co.*

Paper - IV

MODERN PHYSICS

UNIT - 1 : SPECTROSCOPY

1. Atomic Spectra (13 periods)

Introduction - Drawbacks of Bohr's atomic model - Sommerfeld's elliptical orbits -relativistic correction (no derivation). Stern & Gerlach experiment, Vector atom model and quantum numbers associated with it. L-S and j-j coupling schemes. Spectral terms, selection rules, intensity rules - spectra of alkali atoms, doublet fine structure, alkaline earth spectra, singlet and triplet fine structure. Zeeman Effect, Paschen-Back Effect and Stark Effect (basic idea).

2. Molecular Spectroscopy: (12 periods)

Types of molecular spectra, pure rotational energies and spectrum of diatomic molecule. Determination of inter nuclear distance Vibrational energies and spectrum of diatomic molecule. Raman effect, classical theory of Raman effect. Experimental arrangement for Raman effect and its applications.

UNIT - II:

Quantum Mechanics

3. Inadequacy of classical Physics: (5 periods)

Spectral radiation - Planck's law (only discussion). Photoelectric effect - Einstien's photoelectric equation. Compton's effect - experimental verification. Limitations of old quantum theory.

4. Matter Waves(10 periods): de Broglie's hypothesis - wavelength of matter waves, properties of matter waves. Phase and group velocities. Davisson and Germer experiment. Davisson and Germer experiment. Double slit experiment. Standing de Brogile waves of electron in Bohr orbits.Heisenberg's uncertainty principle for position and momentum (x and p_x), Energy and time (E and t). Gamma ray microscope. Diffraction by a single slit. Position of electron in a Bohr orbit. Complementary principle of Bohr.

5. Schrodinger Wave Equation (10 periods): Schrodinger time independent and time dependent wave equations. Wave function properties - Significance. Basic postulates of quantum mechanics. Operators, eigen functions and eigen values, expectation values. Application of Schrodinger wave equation to particle in one and three dimensional boxes, potential step and potential barrier.

Unit - III

Nuclear Physics

6. **Nuclear Structure** (5 **periods):** Basic properties of nucleus - size, charge, mass, spin, magnetic dipole moment and electric quadrupole moment. Binding energy of nucleus, deuteron binding energy, p-p, n-n, and n-p scattering (concepts), nuclear forces. Nuclear models- liquid drop model, shell model.

7. **Alpha and Beta Decays** (5 **periods):** Range of alpha particles, Geiger - Nuttal law. Gammow's theory of alpha decay. Geiger - Nuttal law from Gammow's theory. Beta spectrum - neutrino hypothesis, Fermi's theory of □-decay (qualitative).

8. **Nuclear Reactions and Nuclear Detectors (5 periods) :** Types of nuclear reactions, nuclear reaction kinematics. Compound nucleus, direct reactions, channels (concepts).

   GM counter, proportional counter, scintillation counter, Wilson cloud chamber and solid state detector

Unit-IV

Solid State Physics Crystolography

9. **Crystal Structure** : Crystalline nature of matter. Cystal lattice, Unit Cell, Elements of symmetry. Crystal systems, Bravais lattices. Miller indices. Simple crystal structures (S.C., BCC, FCC, CsCl, NaCl, diamond and Zinc Blende)

   X-ray Diffraction: Diffraction of X -rays by crystals, Bragg's law, Experimental techniques - Laue's method and powder method.

10. **Bonding in Crystals (5 periods):** Types of bonding in crystals - characteristics of crystals with different bondings. Lattice energy of ionic crystals - determination of Madelung constant for NaCl crystal. Calculation of Born Coefficient and repulsive exponent. Born-Haber cycle.

11. **Superconductivity: (6 periods)**

    Basic experimental facts - zero resistance, effect of magnetic field, Meissner effect, persistent current, Isotope effect, Thermodynamic properties, specific heat, entropy. Type I and Type II superconductors. High temperature superconductors (discussion only)

12. Nanomaterials (4 periods) : Introduction, nanoparticles, metal nanoclusters, semiconductor nanoparticles, carbon clusters, carbon nanotubes, quantum nanostructures - nanodot, nanowire and quantum well. Fabrication of quantum nanostructures.

NOTE: Problems should be solved from every chapter of all units.

Textbooks

1. Modern Physics by G. Aruldhas & P. Rajagopal. *Eastern Economy Edition.*
2. Concepts of Modern Physics by Arthur Beiser. *Tata McGraw-Hill Edition.*
3. Modern Physics by R. Murugeshan and Kiruthiga Siva Prasath. *S. Chand & Co.*
4. Nuclear Physics by D.C. Tayal, *Himalaya Publishing House.*
5. Molecular Structure and Spectroscopy by G. Aruldhas. *Prentice Hall of India, New Delhi.*
6. Spectroscopy -Atomic and Molecular by Gurdeep R Chatwal and Shyam Anand -*Himalaya Publishing House.*
7. Third Year Physics - *Telugu Academy.*
8. Elements of Solid State Physics by J.P. Srivastava. (for chapter on nanomaterials)-*Prentice-hall of India Pvt. Ltd.*

Reference Books

1. University Physics with Modern Physics by Young & Freedman. *A. Lewis Ford. Low Price Edition (Eleventh Edition).*
2. Quantum Physics by Eyvind H. Wichman. Volume.4. *The McGraw-Hill Companies.*
3. Quantum Mechanics by Mahesh C. Jani. *Eastern Economy Edition.*
4. Nuclear Physics Irving Kaplan - *Narosa Publishing House.*
5. Introduction to Solid State Physics by Charles Kittel. *John Wiley and Sons.*
6. Solid State Physics by A.J. Dekker. *Mac Millan India*

Practical Paper - III

THIRD YEAR PRACTICALS

1. Carey-Foster's Bridge - comparison of resistances.
2. Internal resistance of a cell by potentiometer.
3. Figure of merit of a moving coil galvanometer.
4. Voltage sensitivity of a moving coil galvanometer.
5. RC circuit - time constant
6. LR circuit - time constant
7. RC circuit (Frequency response)
8. LR circuit (Frequency response)
9. LCR circuit series/parallel resonance, Q-factor
10. Determination of M and H
11. Power factor of an A.C. Circuit
12. Determination of ac-frequency-sonometer.
13. Design and construction of multimeter.
14. Construction of a model D.C. power supply.
15. Verification of Kirchoff s laws. Note: Any twelve of the above experiments to be performed.

Practical Paper - IV

THIRD YEAR PRACTICALS

1. e/m of an electron by Thomson method.
2. Characteristics of a junction diode
3. Characteristics of a zener diode
4. Characteristics of Transistor
5. Energy gap of semiconductor using a junction diode
6. Temperature-resistance characteristics of thermistor
7. R.C. coupled amplifier
8. Verification of Logic gates AND, OR, NOT, X-OR gates

9. Verification of De Morgan's theorems.
10. Construction and verification of truth tables for half and full adders.
11. Phase shift Oscillator
12. Hysteresis curve of transformer core
13. Determination of Planck's constant (photocell)
14. Study of hydrogen spectrum (Rydberg constant)
15. Study of absorption of a and P rays

Note: Any twelve of the above experiments to be performed.

Not for examination:

Servicing of domestic appliances - Electric Iron, immersion heater, fan, hot plate grinder, emergency lamp, battery charger, micro-oven, loud speaker, eliminator, cell-phones, servicing of refrigerator.

Suggested Books for Practicais

1. A textbook of Practical Physics by M.N. Srinivasan. *S. Chand& Co.*
2. Practical Physics by M. Arul Thakpathi by *Comptek Publishers.*
3. A. Laboratory manual for Physics Course by B.P. Khandelwal.
4. B.Sc. Practical Physics - C.L. Arora - *S. Chand & Co.*
5. Viva-voce in Advanced Physics - R.C. Gupta and Saxena P.N. - *Pragathi Prakashan, Meerut.*
6. Viva-Voce in Physics - R.C. Gupta, *Pragathi Prakashan, Meerut.*

B.Sc.
ELECTRONICS

FIRST YEAR

PAPER - I : Circuit Analysis and Electronic Devices

SECOND YEAR

PAPER - II : Analog Circuits and Communications

THIRD YEAR

PAPER - III : Digital Electronics and Microprocessor

PAPER - IV : Embedded Systems and Applications

B.Sc ELECTRONICS
FIRST YEAR

Paper - I
CIRCUIT ANALYSIS AND ELECTRONIC DEVICES

UNIT - I

AC Fundamentals : The sine wave - average and rms values - The j operator - polar and rectangular forms of complex numbers- phasor diagram - complex impedance and admittance.

Passive networks: Concept of voltage and current sources - KVL and KCL Application to simple circuits (ac and dc) consisting of resistors and sources (one or two) - Node voltage analysis and method of mesh currents.

Network theorems (dc and ac): Superposition theorem - Thevenin's theorem -Norton's Theorem-maximum power transfer theorem-Millmans Theorem-reciprocity theorem-Application to simple networks.

UNIT - II

RC and RL Circuits: Transient response of RL and RC circuits with step input-time contants. Frequency response of RC and RL circuits-Types of Filters: Low pass filter-High pass filter-frequency response-Passive differentiating and integrating circuits.

Response: Series resonance and parallel resonance LCR circuits-resonant frequency-Q factor band width-selectivity.

UNIT - III

PN Junction: Depletion region -Junction capacitance-Diode equation (no derivation)- Effect of temperature on reverse saturation current. Construction, working, V-I characteristics and simple application of (i) Junction diode (ii) Zener diode (iii) Tunnel diode and (iv) Varactor diode.

Bipolar Junction Transistor (BJT): PNP and NPN transistors-current components in BJT-BJT static characteristics (Input and Output)- Early effect - CB, CC, CE configurations(cut off, active,

and saturation regions). CE configuration as two port network- h-parameters h-parameter equivalent circuit. Experimental arrangement to study input and output characteristics of BJT in CE configuration. Determination of h-parameters from the characteristics. Biasing and load line analysis-Fixed bias and self bias arrangement.

UNIT-IV

Field Effect Transistor (FET): Structure and working of JFET and MOSFET -output and transfer characteristics- Experimental arrangement for studying the characteristics and to determine FET parameters. Application of FET as voltage variable resistor and MOSFET as a switch-Advantages of FET over transistor.

Uni Junction Transistor (UJT): Structure and working of UJT-Characteristics, Application of UJT as a relaxation oscillator.

Silicon Controlled Rectifier (SCR): Structure and working of SCR, Two transistor representation, Characteristics of SCR, Experimental set up to study the SCR characteristics. Application of SCR for power control.

Photo Electric Devices: Structure and operation of LDR, Photo voltaic cell, Photo diode, Photo transistor and LED.

(NOTE: Solving related problems in all the Units)

Reference Books:

1. Grob's Basic Electronics-Mitchel E.Schultz 10th Edn. Tata McGraw Hill (TMH)
2. Network lines and fields-Ryder-Prentice Hall of India (PHI)
3. Circuit analysis- P.Gnanasivam-Pearson Education
4. Circuits and Networks- A.Sudhakar & Shyammohan S.Palli-TMH
5. Network Theory-Smarajit Ghosh-PHI
6. Electronic Devices and Circuits-Millman and Halkias-TMH
7. Electronic Devices and circuits-Alien Mottershead-PHI
8. Principles of Electronics -V.K.Mehta and Rohit Mehta-S Chand &co
9. Electronic Devices and Circuit Theory-R.L.Boylestad and L.Nashelsky-Pearson Eduction.
10. Pulse digital switching waveforms-Millman & Taub -TMH

11. Applied Electronics-R.S.Sedha - S Chand & Co
12. A First course in Electronics-AA Khan & KK Day -PHI
13. Principles of Electronic circuits-Stanely G.Burns and Paul R.Bond-Galgotia
14. Electronic Principles and Application -A.B. Bhattacharya-New Central Book Agency Pvt.

PRACTICALS PAPER

CIRCUIT ANALYSIS AND ELECTRONIC DEVICES LAB

1. Measurement of peak voltage, frequency and phase using CRO.
2. Thevenin's theorem - verification
3. Norton's theorem-verification.
4. Maximum power transfer theorem - verification.
5. CR and LR circuits Frequency response- (Low pass and High pass)
6. CR and LR circuits Differentiation and integration - tracing of waveforms
7. LCR-Series resonance circuit-Frequency response-Determination of f_0, Q and band width.
8. To draw volt-ampere characteristics of Junction diode and determine the cut-in voltage, forward and reverse resistance.
9. Zener diode V-I Characteristics-Determination of Zener breakdown voltage
10. Voltage regulator using Zener diode
11. BJT input and output characteristics (CE configuration) and determination of 'h' parameters
12. FET- characteristics and determination of FET parameters.
13. UJT
14. (i) V-I Characteristics (ii) Relaxation Oscillator
15. (LDR-characteristics
16. SCR Volt-ampere characteristics.

Note: Student has to perform any 12 experiments

SECOND YEAR

PAPER -II
ANALOG CIRCUITS AND COMMUNICATIONS

UNIT - I

Power Supplies: Rectifiers-Halfwave, fullwave and bridge rectifiers- Efficiency-Ripple factor - Regulation - Harmonic components in rectified output - Types of filters - Choke input (inductor) filter-Shunt capacitor filter-L section and ð section filters - Block diagram of regulated power supply - Series and shunt regulated power supplies -Three terminal regulators (78 XX and 79 XX)-Principle and working of switch mode power supply (SMPS).

UNIT - II

RC Coupled Amplifier: Analysis and frequency response of single stage RC coupled CE amplifier.

Feedback: Positive and negative feedback- Effect of feedback on gain, band width, noise, input and output impedances.

Operational Amplifiers: Differential amplifier- Block diagram of Op-Amp- Ideal characteristics of Op-Amp- Op-Amp parameters-Input resistance Output resistance Common mode rejection ratio (CMMR)-Slew rate Offset voltages- Input bias current-Basic Op-Amp circuits-Inverting Op-Amp Virtual ground- Non-inverting Op-Amp Frequency response of Op-Amp. Interpretation of Op-Amp data sheets.

UNIT - III

Applications of Op-Amps: Summing amplifier- subtractor-Voltage follower-Integrator Differentiator-Comparator-Logarithmic amplifier-Sine wave [Wein Bridge] and square wave {Astable} generators- Triangular wave generator-Monostable multivibrator-Solving simple second order differential equation. Basic Op-Amp series regulator and shunt regulator.

Unit - IV

Communications: Need for modulation-Types of modulation-Amplitude, Frequency and Phase modulation.

Amplitude modulation-side bands-modulation index-square law diode modulator-Demodulation-diode detector.

Frequency modulation working of simple frequency modulator-Ratio detection of FM waves-

Advantages of frequency modulation.

AM and FM radio receivers [block diagram approach].

NOTE: (Solving related problems in all the Units)

Reference Books:

1. Electronic Devices and Circuits-Millman and Halkias-Tata Me Graw Hill (TMH)
2. Microelectronic- J.Milman and A.Grabel-TMH
3. Operational Amplifiers and Linear Integrated Circuits-Ramakant A. Gayakwad-Prentice Hall of India (PHI).
4. Operational Amplifiers and Linear Integrated Circuits-K. Lalkishore - Pearson Education
5. Analog Electronic-L.K.Maheswari and M.M.S.Anand-PHI
6. Applied Electronic-R.S.Sedha-S.Chand&Co
7. Principles of Electronics-V.K.Mehta and Rohit Mehta-S Chand&Co
8. A first Course in Electronics-A.A.Khan & K.K.Dey-PHI
9. Electronic Communication Systerms-George Kennedy & Bernard Davis-TMH.
10. Electronic Communication-D.Roddy & J.Coolen -PHI
11. Principles of Electronic Communication Systerms-Louis E.Frenzel-TMH.

THIRD YEAR

PAPER - III

DIGITAL ELECTRONICS AND MICROPROCESSOR

UNIT -1

Introduction to number systems, Logic gates OR, AND, NOT, X-OR, NAND, NOR gates-Truth tables-Positive and negative logic - Logic families and their characteristics-RTL, DTL, ECL, TTL and CMOS.- Universal bulding blocks NAND and NOR gates. Laws of Boolean algebra De Morgan's Theorems-Boolean identities - Simplification of Boolean expressions-Karnaugh Maps- Sum of products (SOP) and Product of sums (POS).

UNIT - II (22 HOURS)

Combinational and Sequential circuits: Multiplexer and De-Multiplexer-Decoder, Half adder, Full adder and Parallel adder circuits. Flip flops - RS, D, JK and JK Master-Slave (working and truth tables)- Semiconductor memories - Organization and working- Synchronous and asynchronous binary counters, Up/Down counters - Decade counter (7490) - working, truth tables and timing diagrams.

UNIT - III (23 HOURS)

Introduction to Microcomputer and Microprocessor: Intel 8085Microprocessor- central processing unit CPU - arithmetic and logic unit ALU-timing and control unit - register organization - address, data and control buses- pin configuration of 8085 and its description. Timing diagrams- instruction cycle, machine cycle, fetch and execute cycles.

Instruction set of 8085, instruction and data formats- classification of instructions- addressing modes. Assembly language programming examples of 8 and 16 bit addition, subtraction, multiplication and division. Finding the largest and smallest in a data array. Programming examples using stacks and subroutines.

UNIT - IV (22HOURS)

Interfacing peripherals and applications: Programmable peripheral interface (8255)-D/A and A/D converters and their

interfacing to the Microprocessor. Stepper motor control- seven segment LED.

(Note: Solving related problems in all the Units)

Reference Books:

1. Digital Principles and Applications- Malvino & Leach-TMH
2. Digital Fundamentals - F.Loyd & Jain -Pearson Education
3. Modern Digital Electronics -R.P. Jain-TMH
4. Fundamental of Digital Circuits- Anand Kuman -PHI
5. Digital Systems-Rajkamal-Pearson Education
6. Digital Electronic Principles and Integrated Circuits-Maini-Willey India.
7. Digital Electronics- Gothman-
8. Digital Electronics-J.W.Bignel & Robert Donova-Thomson Publishers (Indian 5th Ed)
9. Microprocessor Architecture and Programming - Ramesh S.Goanker - Penram
10. Introduction to Microprocessor-Aditya p. Mathur-TMH
11. Microprocessors and Microcontrollers Hardware and Interfacing-Mathivnnan-PHI
12. Fundamentals of Microprocessors and Microcontrollers-B.Ram-Dhanpat Rai & Sons.
13. Advanced Microprocessor and Peripherals, Architecture, Programming and Interface-A.K.Ray and K.N.Bhurchandi-TMH
14. Microprocessor Lab Premier-K.A. Krishna Murthy.

PRACTICALS

PAPER - III

DIGITAL ELECTRONICS AND MICROPROCESSOR LAB

A) Digital Experiments

1. Verifying truth of OR,AND,NOT,NAND,NOR and EX-OR gates (By using 7400 -series).
2. Constructing other gates using NAND and NOR gates
3. Construction of Half and Full adders and verify their truth tables.

4. Operation and verifying truth tables of flip-flops-RS,D, and JK using ICs.
5. Construction of Decade counters (7490).
6. Driving Stepper motor using JK flip-flop.
7. Simulation experiments using appropriate electronic circuit simulation.
   a) 4-bit parallel adder using combinational circuits.
   b) Decade counter using JK flip flops.
   c) Up/Down counter using JK flip flops.
   d) Up/Down counter using 7493.

B) Microprocessor (Software)

1. Binary addition & subtraction . (8-bit & 16- bit)
2. Multiplication & division.
3. Picking up largest/smallest number.
4. Arranging - ascending / descending order.
5. Decimal addition (DAA) & Subtraction.
6. Time delay generation.

C) Microprocessor (Hardware)

1. Interfacing R-2R Ladder network (DAC) (4 bits) to generate waveforms.
2. Interfacing a stepper motor and rotating it clockwise/anti clockwise through a known angle.
3. Interfacing a seven segment display.
4. Interfacing ADC for temperature measurement. **Note: Student has to perform the following experiments:**

   (i) In Section (A) any four experiments among experiment numbers 1 to 6

   (ii) Experiment Number 7 (a,b,c and d) is compulsory

   (iii) All experiments in section (B)

   (iv) Any two experiments in section (C)

B.Sc. ELECTRONICS

THIRD YEAR

ELECTIVE PAPER - IV (A):
EMBEDDED SYSTEMS AND APPLICATIONS

UNIT -I

The 8051 Microcontroller

Introduction to microcontrollers and embedded systems: Overview and block diagram of 8051. Architecture of 8051. Program counter and memory organization. Data types and directives, Flag bits and PSW Register banks and Stack; Pin diagram, Port organization, I/O Programming, Bit manipulation. Interrupts and timer.

UNIT - II

Addressing modes, instruction set and assembly language programming of 8051

Addressing modes and accessing memory using various addressing modes. Instruction set: Arithmetic, Logical, Single Bit, Jump, Loop and Call Instructions and their usage. Time Delay Generation and Calculation; Timer/Counter Programming. Programming examples: Addition, multiplication, subtraction, division, arranging a given set of numbers in ascending / descending order, picking the smallest / largest number among a given set of numbers, Accessing a specified port terminal and generating a rectangular waveform.

UNIT - III

Interfacing of peripherals to Microcontroller

Interfacing of-PPI 8255, DAC. ADC. Serial communication-modes and protocols

UNIT - IV

Applications of Embedded Systems

Temperature measurement, displaying information on a LCD, Control of a Stepper Motor, Interfacing a keyboard and generation different types of waveforms.

Reference Books:

1. The 8051 Microcontrollers and Embedded Systems - By Muhammad Ali Mazidi and Janice Gillispie Mazidi-Pearson Education Asia, 4th Reprint, 2002.
2. Microcontrollers - Theory and applications by Ajay V.Deshmukh - Tata McGraw-Hill
3. The 8051 Microcontroller - architecture, programming & applications By Kenneth J. Ayala-Penram International Publishing, 1995
4. Programming and Customizing the 8051 Microcontroller - By Myke Predko-TMH, 2003
5. Design with Microcontrollers By - JB Peatman - TMH.
6. The 8051 Microcontroller - Programming, interfacing and applications by Howard Boyet and Ron Katz - (MII) Microcontrollers Training Inc.
7. The concepts & features of Microcontrollers by Rajkamal-Wheeler Pub.

ELECTIVE PAPER - IV (A) :

PRACTICALS

EMBEDDED SYSTEMS AND APPLICATIONS LAB

Microcontroller Experiments using 8051 kit

1. Multiplication of two numbers using MUL command (later using counter method for repeated addition)
1. Division of two numbers using DIV command (later using counter method for repeated subtraction)
2. Pick the smallest number among a given set of numbers
3. Pick the largest number among a given set of numbers
4. Arrange ‘n’ numbers in ascending order
5. Arrange ‘n’ numbers in descending order
6. Generate a specified time delay
7. Interface a ADC and a temperature sensor to measure temperature
8. Interface a DAC & Generate a stair case wave form-with step duration and no. of steps as variables
9. Flash a LED connected at a specified out put port terminal
10. Interface a stepper motor- and rotate it clock wise or anti clock wise through given angle steps.

11. Using Keil software write a program to pick the smallest among a given set of numbers
12. Using Keil software write a program to pick the largest among a given set of numbers
13. Using Keil software write a program to arrange a given set of numbers in ascending order
14. Using Keil software write a program to arrange a given set of numbers in descending order
15. Using Keil software write a program to generate a rectangular wave form at a specified port terminals

Note: Students has to perform the following experiments

(1) 8 Experiments among experiment numbers 1 to 11
(2) Experiment Numbers from 12 to 15 are compulsory

STUDENTS ARE ENCOURAGED TO DO
A SMALL PROJECT WORK DURING THIRD YEAR

B.Sc.
STATISTICS

FIRST YEAR

PAPER - I : Descriptive Statistics and Probability Distributions

SECOND YEAR

PAPER - II : Statistical Methods and Inference

THIRD YEAR

PAPER - III : Applied Statistics

PAPER - IV : Elective

1. Quality, Reliability and Operations Research

B.Sc. STATISTICS

FIRST YEAR

Paper -I :

DESCRIPTIVE STATISTICS AND PROBABILITY DISTRIBUTIONS

UNIT - I

Descriptive Statistics: Concept of primary and secondary data. Methods of collection and editing of primary data. Designing a questionnaire and a schedule. Sources and editing of secondary data. Classification and tabulation of data. Measures of central tendency (mean, median, mode, geometric mean and harmonic mean) with simple applications. Absolute and relative measures of dispersion (range, quartile deviation, mean deviation and standard deviation) with simple applications. Importance of moments, central and non-central moments, and their interrelationships, Sheppard's corrections for moments for grouped data. Measures of skewness based on quartiles and moments and kurtosis based on moments with real life examples.

Probability: Basic concepts in probability—deterministic and random experiments, trail, outcome, sample space, event, and operations of events, mutually exclusive and exhaustive events, and equally likely and favourable outcomes with examples. Mathematical, statistical and axiomatic definitions of probability with merits and demerits. Properties of probability based on axiomatic definition. Conditional probability and independence of events. Addition and multiplication theorems for n events. Boole's inequality and Bayes' theorem. Problems on probability using counting methods and theorems.

UNIT-II

Random Variables: Definition of random variable, discrete and continuous random variables, functions of random variables, probability mass function and probability density function with illustrations. Distribution function and its properties. Transformation of one-dimensional random variable (simple 1-1 functions only). Notion of bivariate random variable, bivariate distribution and statement of its properties. Joint, marginal and conditional distributions. Independence of random variables.

Mathematical Expectation: Mathematical expectation of a function of a random variable. Raw and central moments and covariance using mathematical expectation with examples. Addition and multiplication theorems of expectation. Definition of moment generating function (m.g.f), cumulant generating function (c.g.f), probability generating function (p.g.f) and characteristic function (c.f) and statements of their properties with applications. Chebyshev's, and Cauchy-Schwartz's inequalities and their applications. Statement and applications of weak law of large numbers and central limit theorem for identically and independently distributed (i.i.d) random variables with finite variance.

UNIT-III

Discrete distributions: Uniform, Bernoulli, Binomial, Poisson, Negative binomial, Geometric and Hyper-geometric(mean and variance only) distributions. Properties of these distributions such as m.g.f ,c.g.f, p.g.f., c.f., and moments up to fourth order and their real life applications. Reproductive property wherever exists. Binomial approximation to Hyper-geometric, Poisson approximation to Binomial and Negative binomial distributions.

UNIT-IV

Continuous distributions: Rectangular and Normal distributions. Normal distribution as a limiting case of Binomial and Poisson distributions. Exponential, Gamma, Beta of two kinds (mean and variance only) and Cauchy (definition and c.f. only) distributions. Properties of these distributions such as m.g.f, c.g.f., c.f, and moments up to fourth order, their real life applications and reproductive productive property wherever exists.

List of reference books:

1. Willam Feller : Introduction to Probability theory and its applications. Volume -I, Wiley
2. V.K.Kapoor and S.C.Gupta: Fundamentals of Mathematical Statistics, Sultan Chand&Sons, New Delhi
3. GoonAM,Gupta MK,Das Gupta B : Fundamentals of Statistics , Vol-I, the World Press Pvt.Ltd., Kolakota.
4. Hoel P.G: Introduction to mathematical statistics, Asia Publishing house.
5. M.JaganMohan Rao and Papa Rao: A Text book of Statistics Paper-I.

6. Sanjay Arora and Bansi Lah.New Mathematical Statistics : Satya Prakashan , New Delhi

7. Hogg.Tanis.Rao: Probability and Statistical Inference. 7th edition. Pearson

8. Sambhavyata Avadhi Siddantalu—Telugu Academy

9. Sahasambandham-Vibhajana Siddantamulu - Telugu Academy

10. K.V.S. Sarma: statistics Made Simple:do it yourself on PC. PHI

11. Gerald Keller :Applied Statisticswith Microsoft excel . Duxbury, Thomson Learning.

12. Levine, Stephen, Krehbiel, Berenson: Statistics for Managers using Microsoft Excel 4th edition. Pearson Publication.

Practical Paper -I

1. Basics of Excel- data entry, editing and saving, establishing and copying a formulae, built in functions in excel, copy and paste and exporting to MS word document.

2. Graphical presentation of data (Histogram, frequency polygon, Ogives).

3. Graphical presentation of data (Histogram, frequency polygon, Ogives) using MS Excel

4. Diagrammatic presentation of data (Bar and Pie).

5. Diagrammatic presentation of data (Bar and Pie) using MS Excel

6. computation of non-central and central moments - Sheppard's corrections for grouped data.

7. Computation of coefficients of Skewness and Kurtosis - Karl Pearson's and Bowley's $\hat{a}$, and $\hat{a}_2$.

8. Computation of measures of central tendency, dispersion and coefficients of Skew -ness, Kurtosis using MS Excel.

9. Fitting of Binomial distribution - Direct method.

10. Fitting of Binomial distribution - Direct method using MS Excel.

11. Fitting of binomial distribution - Recurrence relation Method.

12. Fitting of Poisson distribution - Direct method.

13. Fitting of Poisson Distribution - Direct method using MS Excel.

14. Fitting of Poisson distribution - Recurrence relation Method.
15. Fitting of Negative Binomial distribution.
16. Fitting of Geometric distribution.
17. Fitting of Normal distribution - Areas method.
18. Fitting of Normal distribution - Ordinates method.
19. Fitting of Exponential distribution.
20. **Fitting of Exponential distribution using MS Excel.**
21. Fitting of a Cauchy distribution.
22. **Fitting of a Cauchy distribution using MS Excel.**

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

SECOND YEAR

Paper - II :
STATISTICAL METHODS AND INFERENCE

Unit-I

Population correlation coefficient and its properties. Bivariate date, scattered diagram, sample correlation coefficient, computation of correlation coefficient for grouped data. Correlation ratio, Spearman's rank correlation conefficient and its properties. Principle of lease squares, simple linear regression correlation verses regression, properties of regression coefficients. Fitting of quadratic and power curves. Concepts of partial and multiple correlation coefficients (Only for three variables). Analysis of categorical data, independence and association and partial association of attributes, various measures of association (Yule's) for two way data and coefficient of contingency (Pearson and Tcherprow), coefficient of colligation. (30 L)

Unit-II

Concepts of population, parameter, random sample, statistic, sampling distribution and standard error. Standard error of sample means(s) and sample proportion(s). Exact sampling distributions-Statement and properties of x^2, t and F distributions and their interrelationships. Independence of sample means and variance in random sampling from normal distributions.

Point estimation of a parameter, concept of bias and mean square error of an estimate. Criteria of good estimator - consistency, unbiasedness, 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. Estimation by method of moments, Maximum likelihood (ML), statements of asymptotic properties of MLE. Concept of interval estimation. Confidence intervals of the parameters of normal population by Pivot method.

Unit-III

Concepts of statistical hypotheses, null and alternative hypothesis, critical regional 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 tests. Large sample tests and confidence intervals for means(s), proportion(s), standard deviation(s) and correlation coefficient(s).

Unit-IV

Tests of significance based on x^2, t and F. x^2-tests goodness of fit and test for independence of attributes. Definition of order statistics and statement of their distributions.

Non-parametric tests-their advantages and disadvantages, comparison with parametric tests. Measurement scale-nominal, ordinal, interval and ratio. One sample 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.

List of Reference Books:

1. V.K.Kapoor and S.C.Gupta: Fundamentals of Mathematical Statistics, Sultan Cahnd & Sons, New Delhi
2. Goon AM, Gupta MK, Das Gupta B: Outlines of Statistics, Vol-II, the World Press Pvt.Ltd.,Kolakota
3. Hoel P.G.: Introduction to matechematical statistics, Asia Publishing house.
4. Sanjay Arora and Bansi Lal: New mathematical Statistisc Satya Prakashan, New Delhi
5. Hogg and Craig: Introduction to Mathematical statistics. Prints Hall
6. Siegal,S.,and Sidney:Non-param etric statistics for Behavioral Science. McGraw Hill.
7. Gibbons J.D. and Subhabrata Chakraborti: Nonparametric Statistical Inference. Marcel Dekker
8. Parimal Mukhopadhyay: Mathematical Statistics. New Central Book agency
9. Conover:Practical Nonparametric Statistics. Wiley series
10. V.K.Rohatgi and A.K.Md.Ehsanes Saleh: An introduction to probability and statistics Wiley series.
11. Mood AM,Graybill FA, Boe's DC.Introduction to theory of statistics. TMH

12. Paramiteya mariyu aparameteya parikshalu. Telugu Academy
13. K.V.S.Sarma: Statistics Made simple do it yourself on PC. PHI
14. Gerald Keller: Applied Statistics with Microsoft excel. Duxbury. Thomson Learning
15. Levin, Stephan, Krehbiel, Berension: Statistics for Managers using Microsoft Excel.4th edition. Pearson Publication
16. Hogg, Tanis, Rao.Probability and Statistical Inference. 7th edition. Pearson Publication.

Practical Paper-II

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.
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.
6. Fitting of power curves of the type $y=a\,x^b$, $y=a\,b^x$ and $y=a\,e^{bx}$ by the method of least squares.
7. Fitting of power curves of the type $y=a\,x^b$, $y=a\,b^x$ and $y=a\,e^{bx}$ by the method of least squares using MS Excel
8. Computation of Yule's coefficient of association
9. Computation of Pearson's, Tcherprows coefficient of contingency
10. Computation of correlation coefficient and regression lines for ungrouped data
11. Computation of correlation coefficient, forming regression lines for ungrouped data
12. Computation of correlation coefficient, forming regression lines for grouped data
13. Computation of correlation coefficient, forming regression lines using MS Excel
14. Computation of multiple and partial correlation coefficients
15. Computation of multiple and partial correlation coefficients using MS Excel

16. Computation of correlation ratio
17. Large sample tests for mean(s), proportion(s), Standard deviation(s) and correlation coefficient.
18. Small sample tests for single mean and difference of means and correlation coefficient
19. Paired t-test
20. Small sample tests for means(s), paired t-test and correlation coefficient using MS Excel
21. Small sample test for single and difference of variances
22. Small sample test for single and difference of variances using MS Excel
23. x^2- test for goodness of fit and independence of attributes
24. x^2- test for goodness of fit and independence of attributes using MS Excel.
25. Nonparametric tests for single and related samples (sign test and Wilcoxon signed rank test) and one sample runs test.
26. Nonparametric tests for two independent samples (Median test, Wilcoxon Mann Whitney - U test, Wald - Wolfowitz' s runs test)

Note: Training shall be on establishing formulae in Excel cells and deriving the results. The excel output shall be exported to MS Word for writing inferences.

THIRD YEAR

Paper - III :
APPLIED STATISTICS

UNIT - I :

Design of Sample Surveys:

Concepts of population, sample, sampling unit, parameter, statistic, sampling errors, sampling distribution, sample frame and standard error.

Principal steps in sample surveys - need for sampling, census versus sample surveys, sampling and non- sampling errors, sources and treatment of non-sampling errors, advantages and limitations of sampling.

Types of sampling: Subjective, probability and mixed sampling methods. Methods of drawing random samples with and without replacement. Estimates of population mean, total, and proportion, their variances and the estimates of variances in the following methods.

(i) SRSWR and SRSWOR

(ii) Stratified random sampling with proportional and Neyman allocation, and

(iii) Systematic sampling when N= nk.

Comparison of relative efficiencies. Advantages and disadvantages of above methods of sampling.

UNIT - II :

Analysis of Variance and Design of Experiments

ANOVA - one-way, two-way classifications with one observation per cell -concept of Gauss-Markoff linear model, statement of Cochran's theorem, concept of fixed effect model and random effect model. Expectation of various sums of squares, Mathematical analysis, importance and applications of design of experiments. Principles of experimentation, Analysis of Completely randomized Design (C.R.D), Randomized Block Design (R.B.D) and Latin Square Design (L.S.D) including one missing observation, expectation of various sum of squares. Comparison of the efficiencies of above designs.

Unit-III

Time series:- Time series and its components with illustrations, additive, multiplicative and mixed models. Determination of trend by least squares, moving average methods. Growth curves and their fitting- Modified exponential, Gompertz and Logistic curves.

Determination of seasonal indices by Ratio to moving average, ratio to trend and link relative methods.

Index Numbers: -Concept, construction, uses and limitations of simple and weighted index numbers. Laspeyer's, Paasche's and Fisher's index numbers, criterion of a good index numbers, problems involved in the construction of index numbers. Fisher's index as ideal index number. Fixed and chain base index numbers. Cost of living index numbers and wholesale price index numbers. Base shifting, splicing and deflation of index numbers.

Official Statistics: - Functions and organization of CSO and NSSO. Agricultural Statistics, area and yield statistics. National Income and its computation, utility and difficulties in estimation of national income.

Unit-IV

Vital statistics: Introduction, definition and uses of vital statistics. Sources of vital statistics, registration method and census method. Rates and ratios, Crude death rates, age specific death rate, standardized death rates, crude birth rate, age specific fertility rate, general fertility rate, total fertility rate. Measurement of population growth, crude rate if natural increase- Pearl's vital index. Gross reproductive rate sand Net reproductive rate, Life tables, construction and uses of life tables and Abridged life tables.

Demand Analysis: Introduction. Demand and supply, price elastics of supply and demand. Methods of determining demand and supply curves, Leontief s ,Pigous's methods of determining demand curve from time series data, limitations of these methods Pigou's method from time series data. Pareto law of income distribution curves of concentration.

List of reference books:

1. V.K.Kapoor and S.C.Gupta : Fundamentals of Applied Statistics. Sultan Chand

2. Parimal Mukhopadhyay : Applied Statistics . New Central Book agency.

3. Daroga Singh and Chowdhary: Theory and Analysis of Sample survey designs. , Wiley Eastern.

4. M.R.Saluja : Indian Official Statistics. ISI publications.

5. B.L.Agarwal: Basic Statistics.New Age publications.

6. S.P.Gupta : Statistical Methods. Sultan Chand and Sons.

7. Pratirupa Sidhanthamulu - Telugu Academy.

8. Prayoga Rachana arid Visleshana - Telugu Academy.

14. K.V.S. Sarma: Statistics made simple : do it yourself on PC. PHI

15. Gerald Keller; Applied Statistics with Microsoft excel. Duxbury. Thomson Learning.

15. Levine, Stephan, Krehbiel, Berenson: Statistics for Managers using Microsoft Excel. Pearson Publication.

16. Anuvartita Sankhyaka sastram - Telugu Academy.

17. Arora, Sumeet Arora, S. Arora: Comprehensive Statistical Methods. S.Chand.

Practical Paper - III

Sampling Techniques

Estimation of population mean, population total and variance of these estimates by

1. Simple random sampling with and without replacement. Comparison between SRSWR and SRSWOR.
2. Stratified random sampling with proportional and optimum allocations. Comparison between proportional and optimum allocations with SRSWOR.
3. Systematic sampling with N=nk. Comparison of systematic sampling with Stratified and SRSWOR.

Design of Experiments:

4. ANOVA - one - way classification with equal number of observations
5. **ANOVA - one-way classification with equal number of observations using** MS **Excel.**

6. ANOVA Two-way classification with equal number of observations.

7. **ANOVA Two-way classification with equal number of observations using** MS **Excel**

8. Analysis of CRD. Analysis of RED with and without missing observation

9. **Analysis of CRD. Analysis of RBD with and without missing observation using MS Excel**

10. Analysis of LSD with and without missing observation

11. **Analysis of LSD with and without missing observation using MS Excel.**

12. Comparison of relative efficiency of CRD with RBD and comparison of relative efficiencies of LSD with RBD and CRD.

Time Series Analysis:

13. Measurement of trend by methods of Least squares and moving averages

14. **Measurement of trend by method s of Least squares and moving averages using MS Excel.**

15. Determination of seasonal indices by methods of Ratio to moving averages, Ratio to trend and Link relatives.

16. **Determination of seasonal indices by methods of Ratio to moving averages, Ratio to trend and Link relatives using MS Excel.**

Index Numbers:

17. Computation of simple and all weighted index numbers.

18. Computation of reversal tests.

19. Construction of cost of living index number and wholesale index number.

20. Construction of fixed base and chain base index numbers.

21. **Base shifting, Splicing and Deflation.**

21 (a). Computation of all weighted indices, cost of living index number, Base shifting, splicing and deflation using **MS** Excel.

Vital Statistics:

22. Computation of various Mortality rates, Fertility rates and Reproduction rates.

23. Construction of Life Tables and Abridged life tables.

24. Construction of various rates, life tables and abridged life tables using MS Excel

Demand Analysis:

25. Construction of Lorenz curve.

26. Fitting of Pareto law to an income data.

27. Construction of Lorenz curve using MS Excel.

Note : Training shall be on establishing formulae in Excel cells and deriving the results. The excel output shall be exported to MSWord for writing inferences.

THIRD YEAR

Paper-IV:

QUALITY, RELIABILITY AND OPERATIONS RESEARCH

(Elective -I)

Unit-I

Statistical Process Control

Importance of SQC in industry. Statistical basis of Shewart control charts. Construction of control charts for variables (mean, range and standard deviation) and attributes (p , np, and c- charts with fixed and varying sample sizes). Interpretation of control charts. Natural tolerance limits and specification limits, process capability index. Concept of Six sigma and its importance.

Unit - II

Acceptance sampling plans: Producers risk and consumer's risk. Concept of AQL and LTPD. Single and Double sampling plans for attributes and derivation of their OC and ASN functions. Design of single and double sampling plans for attributes using Binomial.

Reliability: Introduction. Hazard function, Exponential distribution as life model, its memory- less property. Reliability function and its estimation. Concepts of censoring and truncation. System reliability - series, parallel and k out of N systems and their reliabilities.

Unit-III

Linear Programming:

Meaning and scope of OR. Convex sets and their properties. Definition of general LPP. Formulation of LPP. Solution of LPP by graphical method. Fundamental theorem of LPP. Simplex algorithm. Concept of artificial variables. Big-M /Penalty method and two-phase simplex methods. Concept of degeneracy and resolving it, Concept of duality, duality as LPP. Dual Primal relationship. Statement of Fundamental theorem of duality. Dual simplex method.

Unit - IV

Transportation, Assignment and Sequencing Problems:

Definition of transportation problem, TPP as a special case of LPP, feasible solutions by North-West and Matrix minimum methods and

VAM. Optimal solution through MODI tableau and stepping stone method for balanced and unbalanced transportation problem. Degeneracy in TP and resolving it. Transshipment problem.

Formulation and description of Assignment problem and its variations. Assignment problem as special case of TP and LPP. Unbalanced assignment problem, traveling salesman problem. Optimal solution using Hungarian method.

Problem of Sequencing. Optimal sequence of N jobs on two and three machines without passing.

List of reference books

1. Kanti Swaroop,P.K.Gupta and ManMohan: Operations Research. Sultan Chand.
2. D.C.Montgomary: Introduction to Statistical Quality Control. Wiley.
3. V.K.Kapoor and S.C.Gupta L Fundamentals of Applied Statistics. Sultan Chand
4. S.K.Sinha: Reliability and life testing. Wiley Eastern
5. L.S.Srinath: Reliability Engineering. Affiliated East-West Press.
6. Gass: Linear Programming. Mc Graw Hill.
7. Hadly : Linrar programming. Addison-Wesley.
8. Wayne L. Winston : Operations Research. Thomson, India edition. 4th edition.
9. S.M.Ross: Probability Models. Harcourt India PVT.Ltd.,
10. Parimal Mukhopadhyay : Applied Statistics. New Central Book agency
11. Anuvartita Sankhyaka sastram - Telugu Academy.
12. R.C.Gupta: Statistical Quality Control.
13. Talia : Operations Research: An Introduction : Mac Millan.
14. Parikriya Parishodhana - Telugu Academy.

Practical Paper -IV

(Elective -1)

Statistical Quality Control

1. Construction of mean, range and standard deviation charts.

2. **Construction of mean, range and standard deviation charts using MS Excel**

3. Construction of p, np and c- charts with fixed and varying sample sizes.

4. **Construction of p, np and c- charts with fixed and varying sample sizes using MS Excel.**

5. Designing of Single sampling plan and Double sampling plan for attributes and construction of their OC and ASN curves

6. **Designing of Single sampling plan and Double sampling plan for attributes and construction of their OC and ASN curves using MS Excel.**

Reliability

7. Computation of reliability for series, parallel and k out of n systems. SComputation of reliability for series, parallel and k out of n systems using MS Excel.

Operations Research:

9. Formulation and graphical solutions of LPP (using different inequality type constraints)

10. Solution of LPP by simplex method.

11. **Solution of LPP by simplex method using TORA**

12. Solution of an LPP using Big-M and two phase simplex methods

13. **Solution of an LPP using Big-M method and two phase simplex method using TORA**

14. Solution of an LPP using principal of duality and dual simplex methods.

15. **Solution of an LPP using principal of duality and dual simplex methods using TORA.**

16. Formulation and solution of transportation problem using North-West corner rule, Matrix minimum methods and VAM and to test their optimality.

17. Formulation and solution of transportation problem using North-West corner rule, Matrix minimum methods and VAM and to test their optimality using TORA

18. Optimum solution to balanced and unbalanced transportation problems by MODI method (both maximization and minimization cases).

19. Formulation and solution of Assignment problem using Hungarian method (both maximization and minimization cases),

20. Formulation and solution of Assignment problem using Hungarian method (both maximization and minimization cases using TORA

21. Solution of unbalanced Assignment problem.

22. Solution of traveling salesman problem.

23. Solution of sequencing problem—processing of n jobs through two machines and processing of n jobs through three machines.

Note: Training shall be on establishing formulae in Excel cells and deriving the results. The excel output shall be exported to MSWord for writing inferences.

B.Sc.
MATHEMATICS

FIRST YEAR

PAPER - I : Differntial Equations & Solid Geometry

SECOND YEAR

PAPER - II : Abstract Algebra & Real Analysis

THIRD YEAR

PAPER - III : Linear Algebra, Multiple Integrals and Vector Calculus

PAPER - IV : Electives
1. Numerical Analysis
2. Fourier Series and Integral Transforms

B.A. / B.Sc. MATHEMATICS

FIRST YEAR

Paper -1

DIFFERNTIAL EQUATIONS & SOLD GEOMETRY

DIFFERENTIAL EQUATIONS

UNIT -I

Differential equations of the first order and the first degree:

Linear differential equations, Differential equations reducible to liner form Exact Differential Equations, Integrating factors, Change of Variables, Simultaneous total differential Equations, Orthogonal trajectories in cartesian coordinates

Differential equations of the first order but not of the first degree:

Equations solvable for p, Equations solvable for y, Equations solvable for x; Equations that do not contain x (or y), Equations of the first degree in x and y - Clairaurt's equation.

UNIT - II

Higher order linear differential equations

Solution of homogeneous linear differential equations of order n with constant coefficients, Solution of the non-homogeneous linear differential equations with constant coefficients by means of polynomial operators. Method of undetermined coefficients, Method of variation of parameters, Linear differential equations with non-constant coefficients, The Cauchy - Euler equation

System of linear differential equations:

Solution of a system of linear equations with constant coefficients, An equivalent triangular system. Degenerate Case:

$P_1(D)P_4(D) - P_2(D)P_3(D)=0$.

(Prescribed Text Book: Scope and treatment as in Differential Equations and their Applications by Zafar Ahsan, published by Prentice-Hall of India Pvt. Ltd. New Delhi, Second edition: Sections: -2.5, to 2.9, 3.1, 3.2, 4.20, 5.2 to 5.7, 7.2, 7.3, 7.4.)

Reference Book :

Rai Singhania, ***"Ordinary and Partial Differential Equations",***
S. Chand & company, New Delhi.

SOLID GEOMETRY

UNIT-III

The Plane :

Equation of plane in terms of its intercepts on the axis, Equations of the plane through the given points, Length of the perpendicular from a given point to a given plane, Bisectors of angles between to planes, Joint equation of two planes, Orthogonal projection on a plane.

Right Line :

Equations of a line, Angle between a line and a plane, The condition that a given line may lie in a given plane, The condition that two given lines are coplanar, Number of arbitrary constants in the equations of a straight line, Sets of conditions which determine a line, The shortest distance between two lines. The length and equations of the line of shortest distance between two straight lines, length of the perpendicular from a given point to a given line, Intersection of three planes.

The Sphere :

Definition and equation of the sphere, Equation of the sphere through four given points, Plane sections of a sphere. Intersection of two spheres, Equation of a circle. Sphere through a given circle, Intersection of a sphere and a line, Power of a point, Tangent plane. Plane of contact. Polar plane, Pole of a Plane, Conjugate points, Conjugate planes, Angle of intersection of two spheres, Conditions for two spheres to be orthogonal, Radical plane, Coaxial system of spheres, Simplified form of the equation of two spheres.

UNIT-IV

Cones, Cylinders and Conicoids :

Definitions of a cone, vertex, guiding curve, generators, Equation of the cone with a given vertex and guiding curve, Enveloping cone of a sphere. Quadratic of cones with vertex at origin, Condition that the general equation of the second degree should represent a cone.

Condition that a cone may have three mutually perpendicular generators, Intersection of a line and a quadric cone. Tangent lines and tangent plane at a point. Condition that a plane may touch a cone. Reciprocal cones. Intersection of two cones with a common vertex. Right circular cone. Equation of the right circular cone with a given vertex, axis and semi-vertical angle.

Definition of a cylinder, Equation to the cylinder whose generators intersect a given conic and are parallel to a given line, Enveloping cylinder of a sphere. The right circular cylinder, Equation of the right circular cylinder with a given axis and radius.

The general equation of the second degree, shapes of some surfaces, Nature of Ellipsoid, Nature of Hyperboloid of one sheet.

Prescribed Text Book :

Scope as in **Analytical solid Geometry** by shanti Narayan and P.K Mittal, Published by S.Chand & Company Ltd. Seventeenth edition: Sections : 2.4, 2.7, 2.8, 2.9, 3.1 to 3.8, 6.1 to 6.9, 7.1 to 7.8, 8.1 to 8.2.2.)

Reference Book:

P.K. Jain and Khaleel Ahmed, "A Text book of Analytical Geometry of Three Dimensions" Wiley Eastern ltd. 1999.

SEONCD YEAR

Paper – II

ABSTRACT ALGEBRA & REAL ANALYSIS

UNIT - I : GROUPS:

Binary operations- Definition and properties, Groups- Definition and examples, Elementary properties of groups, Finite groups and group composition tables, Subgroups and cyclic subgroups, Cyclic groups-Elementary properties of cyclic groups, Subgroups of finite cyclic groups. Permutations-groups of permutations, Cayley's theorem, orbits, cycles, even and odd permutations, the alternative groups, cosets, the theorem of Lagrange and its converse, Homomorphism, Definition and examples, properties of homomorphism. The kernel of a homomorphism, normal subgroup. factor groups, The fundamental homomorphism theorem, Normal subgroups and Inner automorphisms.

UNIT - II : RINGS:

Definitions and basic properties, homomorphism and isomorphism, Fields, divisors of zero and cancellation laws, Integral Domain, The characteristic of a ring. Rings of polynomials. Polynomials in an indeterminate, Ideals and factor rings, Homomorphism and factor rings, Fundamental homomorphism theorem, Maximal and prime ideals.

Prescribed text book.

Scope and treatment as in A first course in Abstract Algebra by John B. Fraleigh, Seventh edition, Pearson education (low price edition), New Delhi

Part-I: Sections: 2,4,5,6.
Part-II: Sections: 8,9,10.
Part-Ill: Sections:13,14.
Part-IV: Sections: 18,19, 22.1, 22.2, 22.3
Part-V: Sections : 26,27.1 to 27.16.

Reference Books

(1) A first course in Abstract Algebra by John B. Fraleigh, Third edition, Narosa Publishing house.

(2) Topics in Algebra by I.N.Herstein, Wiley Estern

(3) Contemporary Abstract Algebra by Joseph A Gallian, Narosa Publishing House.

UNIT - III:

REAL NUMBERS:

The Completeness properties of R, Applications of the supremum property. (No question is to be set from this portion)

Sequences and Series-Sequences and their limits, Limit theorems, Monotone Sequences, Sub-sequences and the Bolzano-Weierstrass theorem, The Cauchy's criterion, Properly divergent sequences, Introduction to series, Absolute convergence, test for absolute convergence, test for non-absolute convergence.

Continuous functions : Continuous functions, combinations of continuous functions, Continuous functions on intervals, Uniform continuity.

UNIT - IV :

DIFFERENTIATION AND INTEGRATION:

The derivative, The Mean value theorem, L'Hospital rules, Taylor's theorem. Riemann integral, Riemann integrable functions, Fundamental theorem.

Prescribed text Book:

Scope as in "Introduction to Real analysis", by Robert G. Bartle and Donald R.Sherbert, John Wiley, third edition, Chapter 2(2.3 to2.4),Chapter 3,(3.1 to 3.7), Chapter 5(5.1 to 5.4),Chapter 6(6.1 to 6.4), Chapter 7(7.1 to 7.3.7), Chapter 9 (9.1 to 9.3.2).

Reference Books:

1. A course of Mathematicl Analysis by Shanthi Narayana and P.K..Mittal, S.Chand & Company.
2. Mathematicl Analysis by S.C.Malik and Savita Arora, Wiley Eastern Ltd.

FINAL YEAR

Paper - III

LINEAR ALGEBRA, MULTIPLE INTEGRALS AND VECTOR CALCULUS

Part A: Linear Algebra

UNIT - I :

Vector spaces, General properties of vector spaces, Vector subspaces, Algebra of subspaces, Linear combination of vectors. Linear span, Linear sum of two subspaces, Linear independence and dependence of vectors, Basis of vector space, Finite dimensional vector spaces, Dimension of a vector space, Dimension of a subspace. Linear transformations, Linear operators, Range and null space of linear transformations, Rank and nullity of linear transformations, Linear transformations as vectors, Product of linear transformations, Invertible linear transformation.

UNIT - II :

The adjoint or transpose of a linear transformation, Sylvester's law of nullity, Characteristic values and characteristic vectors, Cayley-Hamilton theorem, Diagonalizable operators. Inner product spaces, Euclidean and unitary spaces, Norm or length of a vector, Schwartz inequality, Orthogonality, Orthonormal set, Complete orthonormal set, Gram-Schmidt orthogonalisation process.

Prescribed text book:

Linear Algebra by J.N.Sharma and A.R.Vasista, Krishna Prakasham Mandir, Meerut-250002.

Reference Books:

1. Linear Algebra by Kenneth Hoffman and Ray Kunze, Pearson Education (low priced edition), New Delhi.

2. Linear Algebra by Stephen H. Friedberg et.al, Prentice Hall of India Pvt.ltd. 4th edition 2007.

Part B: Multiple integrals and Vector Calculus

UNIT - III :

Multiple integrals: Introduction, The concept of a plane, Curve, Line integral- Sufficient condition for the existence of the integral. The area of a subset of R^2 , Calculation of double integrals, Jordan curve, Area, Change of the order of integration.

Prescribed book:

A Course of Mathematical Analysis by Shanti Narayana and P.K.Mittal, S.Chand Publications. Chapter 16.1 to 16.8

UNIT - IV:

Vector differentiation, Ordinary derivatives of vectors, Continuity, Differentiability, Gradient, Divergence, Curl operators, Formulae involving these operators. Vector integration, Theorems of Gauss and Stokes, Green's theorem in plane and applications of these theorems.

Prescribed text book:

Vector Analysis by Murray.R.Spiegel, Schaum series publishing Company, Chapter 3,4,5,6 and 7.

Reference Books:

1. Text book of Vector Analysis by Shanti Narayana and P.K.Mittal, S.Chand and Company Ltd, New Delhi.

2. Mathematical Analysis by S.C.Mallik and Savitha Arora, Wiley Eastern Ltd.

Paper IV (Elective - 1)

NUMERICAL ANALYSIS

UNIT - I :

Errors in Numerical Computations: Numbers and their Accuracy, Errors and their Computation, Absolute, Relative and Percentage errors , A general error formula, Error in a series approximation. Solution of Algebraic and Transcendental Equations: The bisection method, The iteration method, The method of false position, Newton-Raphson method, Generalized Newton-Raphson method, Ramanujan's method, Muller's method.

UNIT - II :

Interpolation: Errors in polynomial interpolation, Forward differences, Backward differences, Central differences, Symbolic relations, Detection of errors by use of D.Tables, Differences of a polynomial, Newton's formulae for interpolation, Gauss's central difference formula, Stirlings's central difference formula, Interpolation with unevenly spaced points, Lagrange's formula, Derivation of governing equations, End conditions, Divided differences and their properties, Newton's general interpolation.

UNIT - III :

Curve Fitting: Least squares curve fitting procedures, fitting a straight line, Non linear curve fitting, Curve fitting by a sum of exponentials.

Numerical Differentiation and Numerical Integration: Numerical differentiation, Errors in numerical differentiation, Maximum and minimum values of a tabulated function, Numerical integration, Trapezoidal rule, Simpsons' 1/3 -rule, Simpsons' 3/8 -rule, Boole's and Weddle's rule.

UNIT - IV :

Linear system of equations: Solution of linear systems-Direct methods, Matrix inversion method, Gaussian elimination method, Method of factorization, ill-conditioned linear systems. Iterative methods: Jacobi's method, Gauss-Siedal method.

Numerical Solution of Ordinary Differential Equations: Introduction, Solution by Taylor's Series, Picards method of successive approximations, Euler's method, Modified Euler's method, Runge-Kutta methods, Predictor-Corrector method, Milne's method.

Prescribed Text Book:

Scope as in Introductory methods of Numerical Analysis by S.S.Sastri, Prentice Hall India (4thEdition), Chapter-1(1.2, 1.4, 1, 1.5, 1.6); Chapter-2(2.2-2.7); Chapter-3(3.2, 3.3, 3.7.2, 3.9.1, 3.9.2, 3.10.1, 3.10.2); Chapter - 5 (5.2-5.4.5); Chapter - 6 (6.3.2, 6.3.4, 6.3.7, 6.4); Chapter - 7 (7.2-7.5, 7.6.2).

Reference Books:

1. G. Shanker Rao New Age International Publishers, New- Hyderabad.
2. Finite Differences and Numerical Analysis by H.C Saxena S.Chand and Company, New Delhi.

MODEL CURRCULLUM - B.A /B.Sc

Mathematics: Paper IV (Elective - 2)

FOURIER SERIES AND INTEGRAL TRANSFORMS

UNIT - I :

Fourier series: Fourier series, theorems, Dirichlet's conditions, Fourier series for even and odd functions, Half range Fourier series, Other forms of Fourier series.

Prescribed Text Book: Scope as in *A course of Mathematical Analysis* by Shanthi Narayana and P.K.Mittal, published by S.Chand and Company, Chapter 10.

UNIT - II :

Laplace transforms: Definition of Laplace transform, Linearity property - Piecewise continuous function. Existence of Laplace transforms, Functions of exponential order and of class A. First and second shifting theorems of Laplace transform, Change of scale property - Laplace transform of derivatives, Initial value problem, Laplace transform of integrals, Multiplication by t , Division by t , Laplace transform of periodic functions and error function, Beta function and Gamma functions. Definition of Inverse Laplace transform, Linearity property, First and second shifting theorems of Inverse Laplace transform, Change of scale property, Division by p , Convolution theorem, Heaviside's expansion formula (with proofs and applications).

UNIT - III :

Fourier transforms: Dirichlet's conditions, Fourier integral formula (without proof), Fourier transform, Inverse theorem for Fourier transform, Fourier sine and cosine transforms and their inversion formulae. Linearity property of Fourier transforms, Change of scale property, Shifting theorem, Modulation theorem, Convolution theorem of Fourier transforms, Parseval's identity, Finite Fourier sine transform, Inversion formula for sine transform, Finite Fourier cosine transform, Inversion formula for cosine transform.

UNIT - IV :

Application of Laplace and Fourier transforms: Application of Laplace transforms to the solution of ordinary differential equations

with constant coefficients and variable coefficients, simultaneous ordinary differential equations, partial differential equations. Applications of Fourier transforms to initial and boundary value problems.

Prescribed Text Book:

Scope as in *Integral transforms* by A.R.Vasishta and Dr. R.K.Gupta published by Krishna Prakashan Mandir Pvt. Ltd. Meerut.

Chapter I, Chapter II: all sections except 2.3 and 2.18; Chapter III: section 3.1, 3.2, 3.3, 3.4; Chapter VI: section 6.1 to 6.20 except 6.16; Chapter VII: section 7.1 to 7.4; Chapter VIII: section 8.2.

Reference Book:

Operational Mathematics by R.V.Churchill, McGraw Hill Company.

B.Sc.
ZOOLOGY

FIRST YEAR

PAPER - I : Biology of Invertebrates and Cell Biology

SECOND YEAR

PAPER - II : Biology of Chordates, Embryology, Ecology and Zoogeography

THIRD YEAR

PAPER - III : Animal Physiology, Genetics and Evolutions

PAPER - IV : Applied Zoology

B.Sc. Zoology

FIRST YEAR

Theory Paper - I

BIOLOGY OF INVERTEBRATES AND CELL BIOLOGY

UNIT - I :

1.0 Protozoa to Annelida

1.1 Phylum Protozoa: Generalcharacters and outline classification up to classes. Type Study : *Paramecium*

1.2. Phylum Porifera : General characters and outline classification up to classes. Type study : *Sycon;* Canal system in Sponges.

1.3. Phylum Coelenterata : General characters and outline classification up to classes. Type study : *Obelia;* Polymorphism in Coelenterates : Corals and Coral reef formation.

1.4. Phylum Platyhelminthes: General characters and outline classification up to classes. Type study : *Fasciola hepatica.*

1.5. Phylum Nemathelminthes: General characters and outline classification up to classes. Type of study : *Ascaris lumbricoides*.

1.6. Phylum Annelida: General characters and outline classification up to classes. Type study : Leech : Coelom and coelomoducts in Annelids.

UNIT - II :

2.0 Arthropoda to Hemichordata

2.1 Phylum Arthropoda: Genera characters and outline classification of up to classes. Type study : *Peripatus* - Characters and Significance.

2.2. Phylum Mollusca: General characters and outline classification of up to classes. Type study : *Pila;* Pearl formation in Molluscs.

2.3. Phylum Echinodermata: General characters and outline classification of up to classes. Type study : Star fish.

2.4. General characters of Hemichordata : Structure and affinities of Balanoglossus.

UNIT - III :

3.0 Cell Biology

3.1 Cell theory

3.2. Ultra structure of Animal cell

3.3. Structure of Plasma membrane - Fluid-mosaic model. Transport functions of Plasma membrane- Passive transport. active transport (Antiport. symport and uniport) and bulk transport.

3.4. Structure and functions of Endoplasmic reticulum Golgi body, Ribosomes, lysosomes and Mitochondrion.

3.5. Chromosomes - nomenclature types and structure. Giant chromosomes - Polytene and Lampbrush chromosomes.

3.6. Cell division - Cell-cycle stages (G_1 S. G_2 and M phases), Cell-cycle check points and regulation. Mitosis: Meiosis - and its significance.

UNIT - IV :

4.0 Biomolecules of the cell

4.1 Carbohydrates :

- 4.1.1 Classification of Carbohydrates
- 4.1.2 Structure of Monosaccharides (Glucose and Fructose)
- 4.1.3 Structure of Disaccharides (Lactose and Sucrose)
- 4.1.4 Structure of Polysaccharides (Starch, Glycogen and Chitin)

4.2 Proteins:

- 4.2.1 Amino acids: General properties. nomenclature. classification and structure.
- 4.2.2 Classification of proteins based on functions, chemical nature and nutrition, peptide bond and structure (Primary, secondary, tertiary and quaternary structures)

4.3 Lipids:

- 4.3.1 Classification. Structure of Fatty acids (Saturated and unsaturated).
- 4.3.2 Triacylglycerols. Phospolipids (Lecithin and cephalin) and Steroids (Cholesterol).

4.4 Nucleic acids:

- 4.4.1 Structure of purines, pyrimidines. ribose and deoxyribose sugars.

4.4.2 Watson and Crick model of DNA-Nucleoside, Nucleotide. Chargaff's rule. Structure of RNA. Types of RNA -rRNA. tRNA and mRNA.

Practical Paper - I

INVERTEBRATES:

1. Observation of the following slides specimens models:

   Protozoa : *Amoeba, Elphidium, Monocystis, Paramoecium* - binary fission and Conjugation, *Vorticella*.

   Poriferea : *Spongilla, Euspongia, Sycon,* Spicules, Gemmule. TS&LS of *Sycon*

   Coelentereate : *Physalia, Velella, Aurelia. Corallium, Gorgonia, Pennatula, Obelia colony,* Meduse

   Platyhelminthes and Nemathelminthes: *Planaria, Fasciola,* Larval stages of *Fasciola;* Miracidium, Redia, Cercaria, Echinococcus gramulosus, Taenia solium *Schistosoma haematobium, Ascaris (Male & Female). T.S. Ascaris.*

   Annelida : *Nereis, Aphrodite, Hirudo.* Trochonphore larva. T.S. of leech.

   Arthropoda : Cancer, Palaemon, Sacculina, Scorpion, Limulus, Julus, Scolopendra, Locust, Mantis. Butterfly. Honeybee. Peripatus. Anopheles and Culex mouthparts (male and female) Housefly Mouthparts

   Mollusca: *Chiton, Pila, Unio. Pteredo. Sepia. Octopus. Nautilus,* Glochidium larva.

   Echinodermata : Asterias, Ophiothrix Fehinus. Clypeaster, Cucumaria, Antedon, Bipinnaria larya.

   Hemichordata: Balanoglossus. Tornaria larva.

2. DESSECTIONS

Praw: Nervous system, mounting of statocyst and appendages.
Pila: Nervous system, Mounting of radula.

CELL BIOLOGY :

1. Identification of stages from permanent slides showing Mitosis and Meiosis.
2. Squash preparation of onion garlic root tip for Mitotic chromosomes.
3. Identification of salivary gland chromosomes and polytene chromosomes (Photographs or figures).

SECOND YEAR

Theory Paper - II

BIOLOGY OF CHORDATES, EMBRYOLOGY, ECOLOGY AND ZOOGEOGRAPHY

UNIT - I

1.0. Protochordata to Amphibia

1.1. Protochordates: Salient features of Urochordata and Cephalochordata. Structure and life-history *of Herdmania.* Significance of retrogressive metamorphosis

1.2. General characters of Chordates

1.3. General characters of Cyclostomes

1.4. General characters of fishes, classification up to sub-class level with examples

1.4.1. Type study - *Scoliodon* (Morphology, digestive system, respiratory system, circulatory system, urinogenital system, nervous system and sense organs.

1.4.2. Types of scales.

1.5. General characters and classification of Amphibia up to order level.

1.5.1. Type study - *Rana* (Morphology, digestive system, respiratory system, circulatory system, excretory system, nervous system and reproductive system and sense organs)

1.5.2. Parental care in amphibia.

UNIT-II

2.0. Reptilia to Mammalia

2.1. General characters and classification of Reptilia up to order level

2.1.1. Type study - *Calotes:* (Morphology. digestive system, respiratory system, circulatory system, nervous system and urinogenital system

2.2. General characters and classifications of Aves up to order level with examples

2.2.1. Type study - *Pigeon (Columba livia)* (Exoskeleton, respiratory system, circulatory system, excretory system, nervous system and reproductive system).

2.2.2. Flight adaptations in birds

2.2.3. Significance of Migration in birds

2.3. General characters and classification of Mammalia up to order level with examples

2.3.1. Dentition in Mammals

UNIT - III

3.0. Embryology

3.1. Gametogensis and Fertilization

3.2. Types of eggs and cleavages

3.3. Development of frog up to gastrulation and formation of primary germ layers

3.4. Foetal membranes and their significance

3.5. Placenta: Types and functions

UNIT - IV

4.0. Ecology

4.1. Biogeochemical cycles - Gaseous cycles of Nitrogen and Carbon; Sedimentary cycle - phosphorus.

4.2. Definition of Community - Habitat and ecological niche

4.2.1. Community interactions: Brief account of Competition, predation, mutualism, commensalisms and parasitism

4.2.2. Ecological succession

4.3. Population ecology: Density, mortality and natality

4.3.1. Growth curves

4.3.2. Population regulation mechanisms - both biotic and abiotic

4.3.3. Zoogeography: Zoogeographical realms. Fauna of Oriental, Ethiopian and Australian regions.

Practical Paper - II

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, Pleurenectes, Hippocampus, 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, Bungarus, Echis carinata*
6. Aves: *Picus, Psittacula, Eudynamis, Bubo, Alcedo, Coracius, Archaeopteryx*
7. Mammalia: *Ornithorhynchus, Tachyglossus, Macropus, Erinacius Pteropus, Funambulus, Mam's, Loris.*

DISSECTIONS:

1. V, VII, IX and X cranial nerves of Scoliodon
2. Arterial system of Scoliodon (afferent, efferent)
3. Brain of Scoliodon

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. Blastulaand gastrula of frog.
5. 24 hours, 48 hours and 72 hours of chick embryo

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 and bicarbonates in the given samples.

THIRD YEAR

Theory Paper - III

ANIMAL PHYSIOLOGY, GENETICS AND EVOLUTIONS

UNIT -I

1.0. Physiology of Digestion

1.1. Definition of digestion and types of digestion - extra and intracellular.

1.2. Digestion of carbohydrates, proteins, lipids and cellulose digestion.

1.3. Absorption and assimilation of digested food materials.

1.4. Gastrointestinal hormones - control of digestion.

2.0. Physiology of respiration

2.1. Types of respiration - external and internal respiration.

2.2. Structure .of mammalian lungs and gaseous exchange.

2.3. Transport of oxygen - formation of oxyhemoglobin and affinity of hemoglobin to oxygen, oxygen dissociation curves.

2.4. Transport of CO_2 - Chloride shift, Bohr effect.

2.5. Cellular respiration - Main steps of glycolysis, Krebs cycle, electron transport, Oxidative phosporylation and ATP production (Chemiosmotic theory).

3.0. Physiology of Circulation

3.1. Open and closed circulation

3.2. Structure of mammalian heart and its working mechanism - Heart beat and cardiac cycle. Myogenic and neurogenic hearts.

3.3. Regulation of heart rate - Tachycardia and Bradycardia.

4.0. Physiology of Excretion

4.1. Definition of excretion

4.2. Forms of nitrogenous waste products and their formation; classification of animals on the basis of excretory products.

4.3. Gross organization of mammalian excretory system and structure of kidney.

4.4. Structure and function of Nephron - Counter current mechanism.

UNIT-II

1.0. Physiology of muscle contraction

1.1 General structure and types of muscles.

1.2 Ultra structure of skeletal muscles.

1.3 Sliding filament mechanism of muscle contraction

1.4 Chemical changes during muscle contraction - role of calcium, ATP utilization and its replenishment.

2.0. Physiology of nerve impulse

2.1. Structure of nerve cell.

2.2. Nature of nerve impulse - resting potential and action potential. Properties of nerve impulse - threshold value, refractory period, all or none response.

2.3. Conduction of nerve impulse along an axon - local circuit theory and salutatory conduction theory

2.4. Structure of synapse, mechanism of synaptic transmission - electrical and chemical transmissions.

3.0. Physiology of Endocrine system

3.1. Relationship between hypothalamus and pituitary gland.

3.2. Hormones of hypothalamus.

3.3. Hormones of Adenohypophysis and Neurohypophysis.

3.4. Hormones of pineal gland, thyroid gland, parathyroid, thymus, adrenal and pancreas.

3.5. Endocrine control of mammalian reproduction - Male and female hormones - Hormonal control of menstrual cycle in humans.

4.0. Physiology of Homeostasis

4.1. Concept of Homeostasis and its basic working mechanism.

4.2. Mechanism of Homeostasis - Giving three illustrations viz., Hormonal control of glucose levels, Water and ionic regulation by freshwater and marine animals and temperature regulation in man.

UNIT - III

1.0. Genetics

1.1. Mendel's laws - Law of segregation and independent assortment; Gene interaction - Incomplete dominance, co-dominance and epistasis

1.2. Identification of DNA as genetic material - Griffith's experiment and Hershey - Chase experiment

1.3. Central dogma of molecular biology - Brief account of DNA replication (Semi- conservative method). Replication fork (Continuous and discontinuous synthesis); Transcription - Brief account of initiation, elongation and termination in eukaryotes; Translation; Genetic code; gene regulation as exemplified by lac operon.

1.4. Human karyotyping, barr bodies and Lyon hypothesis and Amniocentesis, chromosomal disorders - Autosomal and sex chromosomal.

2.0. Organic Evolution

2.1. Genetic basis of Evolution, Gene pool and gene frequencies, Hardy - Weinberg's Law, Force of destabilization, natural selection, genetic drift, Mutation, Isolation and Migration

2.2. Speciation - Allopatry and sympatry.

2.3. Evolution of Man

Practical Paper - III

ANIMAL PHYSIOLOGY, GENETICS AND EVOLUTIONS

ANIMAL PHYSIOLOGY

1. Identification of carbohydrates, proteins and lipids.
2. Unit oxygen consumption in an aquatic animal [Fish or crab]
3. Qualitative analysis of excretory products.
4. Demonstration of salivary amylase.

GENETICS

5. A, B, O blood group identification.
6. Problems based on Blood grouping.

7. Karyotyping of human chromosomes [Human Karyotype figure on paper should be cut in to different sets of chromosomes and students are asked to arrange them in an order and comment on the ideogram].
8. Identification of genetic syndromes given on charts.
9. Problems based on Mendelian inheritance [at least three problems for each for the laws of segregation and law of independent assortment]

Reference Books

1. 'Essentials of Animal Physiology' by SC Rastogi
2. 'Animal Physiology' by H.C. Nigam
3. 'Biology' by Campbell & Reece.
4. 'Animal Physiology' - Agarwal, R.A. Srivastava, Kaushal, Anil and Kumar.
5. 'Animal Physiology and Biochemistry' by Dr. B. Annadurai
6. 'Principles of Animal Physiology' by Christopher D. Moyes, Patricia M Schulte.
7. 'Biology: The Sciences of Life' by R.A. Wallace, G.P. Sanders and R.J. Ferl.
8. 'Biology: Concepts and Applications' by Starr
9. 'Genetics' Vol-I by C.B. Power, Himalaya Publishing House Pvt. Ltd.
10. 'Genetics' by Strickberger
11. 'Genetics' by P.K. Gupta
12. 'Cell Biology, Genetics, Evolution and Ecology' by P.S. Varma and VK Agrawal; S, Chand and Company.
13. 'Principles of Genetics' by S.B. Basu and M. Hossain
14. 'Principles of Genetics' by Gardner, Simmons and Smustard.
15. 'Principles of Genetics' by H.Robert and Tamasin.
16. 'Genetics' by P.S. Verma and VK Agarwal.
17. 'Organic Evolution' by MP Arora and Chandrakanta.
18. 'Organic Evolution' by N. Arumugam.
19. 'Animal nutrition' by P.Mc Donald, R.A. Edwards, J.F.D. Greenhalgh, C.A. Morgan.

THIRD YEAR

(THEORY PAPER - IV) APPLIED ZOOLOGY

UNIT - I

1.0. Fisheries and Aquaculture

1.1. Capture fisheries - Introduction
1.2. Types of fisheries, Fishery resource from Freshwater
1.3. Fin-fish and shell fisheries.
1.4. Fishing gears and fishing crafts.
1.5. Site selection criteria
1.6. Aquaculture systems
1.7. Induced breeding
1.8. Hatchery design and Management
1.9. Shrimp and prawn culture
1.10. Post-harvest technology
1.11. Preservation and processing - Freezing, solar drying, Canning, Salting smoking

UNIT - II

2.0. Clinical Science

2.1. Hematology

2.1.1. Blood composition and functions
2.1.2. Blood groups and Rh factor, transfusion problems
2.1.3. Blood diseases - Anemia, Leukemia, Leucocytosis, Leucopaenia
2.1.4. Biopsy and autopsy - Clinical importance

2.2. Immunology

2.2.1. Types of immunity - Innate and acquired, organs of immune system
2.2.2. Antigens - Haptens and epitopes
2.2.3. Structure and biological properties of human immunoglobulin G (IgG)

2.2.4. Humoral immunity and cell mediated immunity, B and T-cells

2.2.5. Hypersensitivity - immediate and delayed

2.3. **Important Human Parasites**

2.3.1. Blood parasites (Structure and clinical significance of plasmodium.

2.3.2. Intestinal parasites - structure and clinical significance of Entamoeba, Griardia, Taenia, Ancylostoma, Enterobius

UNIT-III

3.0. Animal Biotechnology:

3.1. Animal Biotechnology: Scope of Biotechnology, Cloning vectors - Characteristics of vectors, Plasmids

3.2. Gene Cloning - Enzymatic cleavage of DNA, Restriction enzymes (Endonucleases) and Ligation.

3.3. Transgenesis and Production of transgenic animals (Fish and Goat)

3.4. Application of Stem Cell technology in Cell based therapy (Diabetes and Parkinson's diseases)

Practical Paper - IV

FISHERIES AND AQUACULTURE

1.0. Identification of important Freshwater fishes (Minimum 10)

2.0. Identification of important edible prawns and crabs (Minimum 5)

FIELD WORK:

Field work is compulsory. Field trip to local fisheries/ aquaculture unit is to be conducted and certified Held note book should be submitted at the time of practical examination.

CLINICAL SCIENCE:

1 . Identification of the following protozoan parasites

a) Entamoeba histolystica

b) Giardia intestinalis

c) Balantidium coli

d) Trypanosoma gambiense

e) Plasmodium – Anytwo stages

2. Identification of the following helminth parasites
    a) *Taenia solium*
    b) *Ascaris (Male and Female)*
    c) *Enterobius vermicularis*
    d) *Dracanculus medinensis*
    e) *Ancylostoma duodenale*
3. Blood cell counting - RBC and WBC
4. Estimation of Haemoglobin (Sahli's Method)
5. Differential count
6. Identification of Sugar in urine

ANIMAL BIOTECHNOLOGY:

1.0. Identification of vectors (charts or photographs)

2.0. Identification of Genetic disorders (charts or photographs)

3.0. Identification of transgenic animals (charts or photographs)

B.Sc.
BIO-TECHNOLOGY

FIRST YEAR

Paper - I : Cell Biology and Genetics

SECOND YEAR

Paper - II : Biological Chemistry and Microbiology

THIRD YEAR

Paper - III : Molecular Biology, Genetic Engineering and Immunology

Paper - IV : Applications of Biotechnology

B.Sc. (Biotechnology)

FIRST YEAR

Paper - I

CELL BIOLOGY AND GENETICS

Unit - l : Cell Structure, Function and Cell Division

1.1 Cells as basic units of living organisms

Viral, bacterial, fungal, plant and animal cells

1.2 Ultra structure of prokaryotic cell (Cell membrane, plasmids)

1.3 Ultra structure of eukaryotic cell (Cell wall, cell membrane, mitochondria, chloroplast, endoplasmic reticulum, Golgi apparatus, vacuoles).

1.4 Chromosome organization in Prokaryotes and Eukaryotes

1.5 Structure of specialized chromosomes (Polytene and Lamp Brush)

1.6 Cell Division and Cell Cycle

1.7 Significance of mitosis and meiosis

UNIT - II : Mendel's Laws and Mechanism of Inheritance

2.1 Mendel's experiments - Factors contributing to success of Mendel's experiments

2.2 Law of segregation - Monohybrid ratio

2.3 Law of Independent assortment - Dihybrids, Trihybrids

2.4 Deviation from Mendel's Laws - partial or incomplete dominance, co-dominance

2.5 Penetrance and expressivity, pheotropism

2.6 Epistatic gene interaction - Modified dihybrid ratios (12:3:1; 9:7; 15:1; 9:3:4:, 9:6:1; 13:3)

2.7 Genes and environment - phenocopies.

2.8 Linkage and recombination - Discovery of linkage, cytological proof of crossing over Recombination frequency and map distance Interference and co incidence Mitotic crossing over in Drosophila

2.9 Mechanism of sex determination-genie balance theory - Drosophila Homogametic and Heterogametic theory (Human, Mamalian, Birds)

2.10 X - linked inheritance (eg. Haemophilia)

UNIT - III : Structure and Function of Nucleic Acids

3.1 DNA as the genetic material - Griffiths-experiments on transformation in Streptococcus pneumoniae. Avery, McEleod and Mc Carty's experiment Hershey - Chase experiments' with radio-labelled T2 bacteriophage

3.2 RNA as genetic material - Tobacco Mosaic Virus

3.3 Structure of DNA - Watson and Crick Model Forms of DNA - A, B and Z forms of DNA, Super coiled and related DNA - Role of topoisomerases

3.4 DNA Replication - Models of .DNA replication (Semi-conservative, non-conservative models)

Mechanisms of DNA replication - Linear and circular - Rolling circle and theta mechanism of replication

3.6. DNA damage and Repair

UNIT - IV : Concepts of Biostatistics and Bioinnformatics

4.1 Concept-of probability, basic laws and its application to Mendelian segre gation. Concept of probability distribution. Binomial and Poisson distributions, Normal distribution and their application to biology

4.2 Concept of sampling and sampling distribution. Concept of test of hypothesis. Applications of West statistics to biological problems/ data: Chi-square, statistic applications in biology

4.3 Simple Regression and Correlation. Concept of analysis of variance (one way classification).

4.4 Introduction to Bioinformatics

Biological Databases - Nucleotide sequence and Protein databases, their utilization in Biotechnology, Storage of biological data in databanks, data retrieval from databases and their utilization

SECOND YEAR

Paper - II

BIOLOGICAL CHEMISTRY AND MICROBIOLOGY

Unit - I : BIOMOLECULES

1.1 Carbohydrates: Importance, classification and properties

1.2 Structure, configuration and biochemical importance of monosaccharides (glucose and fructose)

1.3 Dissacharides - Structures and biochemical importance of sucrose and trehalose Physiologically important glycosides (streptomycin, cardiac glycosides, ouabain)

1.4 Structure and function of homo polysaccharides - starch, inulin, cellulose and glycogen Stricture and function of heteropolysaccharides - Hyaluronic acid

1.5 Proteins: Classification, structure and properties amino acids.

1.6 Peptide bond - Synthesis and characters

1.7 Primary, secondary, tertiary and quaternary structures of proteins

1.8 Lipids: Fatty acids: Saturated and unsaturate.

1.9 Triacylglycerols, Spingolipids, Sterols Phospholipids (phosphatidic acid, phosphatidylcholine)

1.10 Enzymes: Classification and nomenclature of enzymes Kinetics of enzyme catalyzed reactions

1.11 Factors influencing enzymatic reactions

(a) pH
(b) Temperature
(c) Substrate concentration
(d) Enzyme concentration

1.12 Enzyme Inhibition - Competitive and non-competitive

UNIT - II : Intermediary Metabolism

2.1 Glycolysis

2.2 Citric acid cycle

2.3 Gluconeogenesis and its significance

2.4 Mitochondria! electron transport Chemiosmotic theory of ATP synthesis

2.5 B-Oxidation of fatty acid

2.6 Deamination, decarboxylation and transamination reactions of amino acids

2.7 Catabolism of amino acids - phenyl alanine and tyrosine (Phenylketonuria and albinism)

2.8 Photosynthesis - Light reaction and photophosphorylation

2.9 Carbon Assimilation

Unit-III : Fundamentals of Microbiology

3.1 Outlines of classification of microorganisms

3.2 Structure and general characters of Viruses, Bacteria, Fungi and Micro Algae (one example from each group)

3.3 Disease causing pathogens and their symptoms (examples: Typhoid, HIV only)

3.4 Isolation, identification and preservation of microorganisms (Bacteria)

3.5 Identification methods of Fungi and useful Micro Algae

3.6 Methods of sterilization

3.7 Bacterial reproduction and growth kinetics (batch and continuous cultures)

3.8 Pure cultures and cultural characteristics

UNIT - IV : Principles and Applications of Biophysical Techniques

4.1 Microscopy - Light, Inverted, Fluorescent and Electron microscopy

4.2 Colorimetry - Beer - Lambert's Law

4.3 UV-VIS Spectrophotomefry

4.4 Chromatography

(a) Paper (b) Thin Layer (c) Ion-exchange (d) Gel-filtration

4.5 Electrophoresis - Native gels and SDS-PAGE, Agarose

4.6 Centrifugation and filtration - Basic Principles

4.7 Dialysis and lyopholization

4.8 Radio isotopes and their-use in biology

Practical Paper - II

Practicals :

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 anthron method

6. Separation of amino acids by paper Chromatography
7. Electrophoretic separation of proteins (SDS-PAGE)
8. Technique of Micrometry (Stage and ocular)
9. Enzyme assay - Catalase or Invertase (or any other enzyme)
10. Preparation of routine microbiological media)
11 Isolation of common non-pathogenic bacteria
12. Staining and identification of bacteria - E.coli, Pseudomonas, Bacillus and Staphylococcus

Recommended Books

1. Biochemistry - By Dr.U.Satyanarayana, U.Chakrapani
2. Biochemistry - By J.L.Jain
3. Biochemistry - By Conn and Stumpf
4. Biochemistry - By Lehninger
5. Textbook of Medical Biochemistry - By S. Ramakrishnan, R. Rajan, and; K.G. Prasannan (Orient Longman)
6. Biochemistry - By Stryer
7. Biochemistry - By Voet and Voet
8. Biochemistry (Jaypee) - By Vasudevan
9. Biochemistry - By Daivd Rawn
10. General Biochemistry - By J.H. Well
11. Biochemistry - By K. Trehan
12. Biochemical Methods - By S. Sadasivam and A. Manickam
13. An introduction to Practical Biochemistry - By T. PIummer
14. Experimental Biochemistry-A student Companion - By V. Deshapande and B. Sasidhar Rao
15. Practical Biochemistry- By Upadhayay, Wilson and Wilson, Wilson & Walker
16. Biochemistry - Viva Series
17. Text Book of Microbiology - By Ananthanarayan and Paniker
18. Microbiology - By Cappuccino (Pearson Education)
19. Microbiology - By Tortora (Pearson Education)
20. Microbiology - B.J.Pelczar, E.S.N.Cfan and N.R.Kreig, McGraw Hill Publ.
21. General Microbiology - By Stanier, R.YJ.L. Ingrahm, M.L. Wheel is & P.R.Painle
21. General Microbiology - By Powar (Vol. I and Vol. II)
22. Practical Microbiology - By Aneja

THIRD YEAR

Paper - III

MOLECULAR BIOLOGY, GENETIC ENGINEERING AND IMMUNOLOGY

UNIT - I : Gene and Genome organization

1.1 Organization of nuclear genome - Genes and gene numbers - essential and non essential genes

1.2 Denaturation and renaturation of DNA - Tm values and Cot curves

1.3 Kinetic classes of DNA - Single copy sequences, and repeated sequences. Inverted, tandem and palindromic repeats

1.4 Satellite DNA

1 5 Mitochondnal genome organization (eg: Human)

1 6 Chloroplast genome organization in plants

1 7 Organization of eukaryotic genes - Exons, introns, promoters and terminators

1 8 Gene families and clusters - eg. Globin gene, histones and ribosomal genes.

UNIT-II : Gene expression and Gene regulation

2 1 Prokaryotic and Eukaryotic Transcription
Post-transcriptional modifications (Capping, polyadenylation, splicing and alternate splicing)

2 2 Translation

Genetic code and its features, Wobble Hypothesis

Synthesis of polypeptides - initiation, elongation and termination in prokaryotes and eukaryotes

2 3 Regulation of gene expression in prokaryotes
and eukaryotes Operon concept in bacteria - Lac operon

UNIT - III : Recombinant DNA Technology

3 1 Enzymes used in gene cloning : Restriction endonucleases, Ligases, Phosphatases, Methylases, Kinases

3 2 Cloning vehicles - Plasmids, Cosmids, Phage vectors, Shuttle vectors

3 3 Baculovirus vector system, Expression vectors - expression cassettes

3 4 Construction of genomic and cDNA libraries

3 5 Identification of cloned genes

3 6 Principles involved in Blotting Techniques - Souther, Northern and Western

3 7 Principles and Applications of PCR Technology

3 8 DNA Finger printing technique and its applications

UNIT - IV : Basics of Immunology

2.1 introduction to immune system - Organs and cells of the immune system

2 2 Antigens, Haptens - physico-chemical characteristics

2 3 Structure of different immunoglobulins and their functions - Primary and secondary antibody responses

2 4 Antigen - Antibody Reaction

2 5 The Major Histocompatibility gene complex and its role in organ transplantation, Generation of antibody diversity

2 6 Hypersensitivity - Coombs classification, Types of hypersensitivity

2 7 Autoimmune diseases - mechanisms of auto immunity

Practicals :

1 isolation of DNA from plant/animal/bacterial cells

2 Analysis of DNA by agarose gel electrophoresis

3 Restriction digestion of DNA

4 Immuno-diffusion test

5 ELlSATest

6 Microagglutmation using microtiter plates (eg. ABO and Rh Blood grouping)

7 Viability tests of cells/bacteria (Evans blue test or Trypan blue test)

8 Coomb's test

9 Preparation of competent cells of Bacteria

10 Bacterial transformation and selection of transformants under pressure (antibiotic).

Recommended Books

1 Concepts in Biotechnology - By D. Balasubramanian, C.F.A. Bryce, K. Dharmalingam, J. Green and Kunthala Jayaraman

2 Essential Immunology - By I. Roitt, Publ: Blackwell

3 Molecular Biology of the Gene - By Watson, Hopkins, Goberts, Steitz and Weiner (Pearson Education)

4 Cell and Molecular Biology - By Robertis & Robertis, Publ: Waverly

5 Text Book of Biotechnology - By H.K. Das (Wiley Publications)

6 Gene Structure & Expression - By J.D. Howkins, Publ: Cambridge

7 Genetic Engineering - By R. Williamson, Publ: Academic Press

8 Test Book of Molecular Biology - By K.S. Sastry, G. Padmanabhan & C. Subramanyan, Publ: Macmillan India

9 Microbial Genetics - By S.R. Maloy, J.E. Cronan & D. Freifelder, Publ: Jones & Barlett

10 Principles of Gene Manipulation - By R.W. Old & S.B. Primrose, Publ: Blackwell

11 Genes - By B. Lewin - Oxford Univ. Press

12 Molecular Biology & Biotechnol - By H.D. Kumar, Publ: Vikas

13 immunology - By G. Reever & I. Todd, Publ: Blackwell

14 From Genes to Clones - By E.L Winnacker, Publ: Panima, New Delhi

15 Methods for General & Molecular Bacteriology - By P. Gerhardf et al., Publ: ASM

16 Molecular Biotechnology - By G.R. Click and J.J. Pasternak, Publ: Panima

17 Recombmant DNA - By J.D. Watson et al., Publ: Scikentific American Books

18 Immuno diagnostics - By S.C. Rastogi, Publ: New Age

19 Molecular Biology - By D. Freifelder, Publ: Narosa

20 Genes and Genomes - By Maxine Singer and Paul Berg

21 Cell and Molecular Biology - By S.C. Rastogi

22 Genetic Engineering and Biotechnology - By V. Kumar Gera

23 Essentials of Biotechnology - By P.K. Gupta

24 Introduction to Applied Biology and Biotechnology - By K. Vaidyanath, K. Pratap Reddy and K. Satya Prasad

25 Laboratory Experiments in Microbiology - By M. Gopal Reddy, M.N. Reddy, D.V.R; Sai Gopal and K.V. Mallaiah

26 Immunology - By Kubey
27 Gene Biotechnology - By Jogdand
28 Genome - T.A. Brown
29 Gene Cloning - T.A. Brown
30 Biotechnology. IPRs and Biodiversity - By M.B. Rao and Manjula Guru (Pearson Education)
31 Introduction to Biotechnology - By W.J. Thieman and M.A. Palladino (Pearson Education)
30 Genetic Engineering - By Boylan (Pearson Education)
31 New Frontiers in Biotechnology - By Irfan Ali Khan and Atiya Khanum (Ukaaz Publications)
32 Basic Concepts of Biotechnology - By Irfan Ali Khan and Atiya Khanum (Ukaaz Publications)
33 Advances in Biotechnology - By Irfan Ali Khan and Atiya Khanum (Ukaaz Publications)
34 Genetic Engineering - By Sandhya Mitra.

PAPER - IV

APPLICATIONS OF BIOTECHNOLOGY

UNIT - I : **Animal Biotechnology**

1 1 Introduction to animal biotechnology

1 2 Principles of animal cell culture - culture vessels

1 3 Cell culture media preparation, sterilization, types of cultures

1 4 Establishment and preservation of cell lines

15 Explants and cell disaggregation

1 6 Culture of cells and tissues (including Stem cells and their application)

1 7 *in vitro* fertilization and embryo transfer technology

1 8 Methods of gene transfer - Microinjection and viral mediated gene transfer techniques

Production of transgenic animals and molecular pharming

1 9 Principles of Ex *vivo* and *In vivo* gene therapy

UNIT - II : Plant Biotechnology

2 1 Composition of media (Murashige and Skoog's and Gamborg's only)

Preparation of media and methods of sterilizations

2 2 Role of plant growth regulators in differentiation

2 3 Induction of callus

2 4 Meristem culture and production of virus free plants

Clonal propagation of plants on a commercial scale (Somatic embryogenesis and organogenesis)

2 5 Mass cultivation of cell cultures and process engineering - batch and continuous cultures, Bioreactors

2 6 Production of commercially useful compounds by plant cell culture

2 7 Methods of gene transfer techniques *(Agrobacterium,* Microprojectile bombardment)

2 8 Applications of recombimant DMA technology in agriculture

29 Production of therapeutic proteins from transgenic plants

UNIT - III : Industrial Biotechnology

3 1 Introduction to industrial biotechnology.

3 2 Primary and secondary metabolic products of microorganisms

3 3 Screening and isolation and preservation of industrial microorganisms

3 4 Principles of Fermentation technology

3 5 Commercial production of fuels and chemicals by microbial fermentations

3 6 Fermentative production of microbial enzymes (amylases, proteases), and antibiotics

3 7 Fermentative production of foods and dairy products

3 8 Animal cells as bioreactors; characteristics of bioreactors, expression and over production of targeted proteins - human growth hormones - production of á and â-interferons monoclonal antibodies

3 9 Good manufacturing practices, Biosafety issues, Bioethics

310 intellectual Property Rights and Patenting issues

Unit - IV : Environmental Biotechnology

4 1 introduction to environmental biotechnology

4 2 Renewable and non-renewable energy resources

4 3 Conventional energy sources and their impact on environmental

4 4 Non-conventional fuels and their impact on environment (biogas, bioethanol, microbial hydrogen production)

4 5 Microbiological quality of milk, food and water

4 6 Microbiological treatment of municipal and industrial effluents

4 7 Microbial degradation of pesticides and toxic chemicals

4 8 Biopesticides and Biofertilizers (Nitrogen fixing, phosphate solubilizing microorganisms)

4 9 Microbial ore leaching

410 Introduction to Bioremediation

Practicals :

1. Preparation of media, and initiation of callus from any one selected plant species
2. Micropropagation of plants (any one)
3. Preparation of synthetic seeds
4. Production of wine using common yeast
5. Production of hydrogen or biogas using cow/cattle dung
6. isolation of microbes from soil or industrial effluents
7. Preparation of media and culture of animal cells/tissues
8. Cell disaggregation and cell counting
9. Cytotoxicity of the cells using the dye MTT method
10. Estimation of BOD in water samples
11. Production of alcohol by fermentation and Estimation of alcohol by colorimetry
12. Production of biofertilizers *(Azolla)*
13. Growth curves of bacteria, Measurement of growth in liquid cultures
    Quality testing of milk by MBRT

Recommended Books

1 Strategies m Transgenic Animal Sciences - By Glemn M.M. and James M. Robl ASM Press 2000.

2 Practical Biotechnology - Methods and Protocols - By S. Janarthanan and S. Vincent (Universities Press)

3 Animal Cells as Bioreactors - By Terence Gartoright, Cambridge Univ Press

4 Molecular Biotechnology - By Chinnarayappa (Universities Press)

5 Principles and Practice of Animal Tissue Culture - By Sudha Gangal (Universities Press)

6 introduction to Veterinary Genetics -By F.W. Nicholas, Oxford University Press.

7 Text Book of Biotechnology - By H.K. Das (Wiley Publications)

8 Biotechnology -By H.J. Rehm and G. Reed Vol-1-86 VIH Publications, Germany

9 Guide for the care and use of lab animals National Academy Press.

10 Biogas Technology - By b.T. Nijaguna

11 Biotechnology - I - By R.S. Setty and G.R. Veena .

12 Biotechnology - II - By R S. Setty and V. Sreekrishna

13. Introduction to Plan Tissue Culture - By M.K. Razdan (Oxford and IBH Publishing Company, New Delhi)

14. Introduction to Plant Biotechnology - By H.S. Chawla (Oxford and IBH Publishing comp., New Delhi.)

15. Biotechnology - By. K. Trehan

16. Industrial Microbiology - By L.E. Casida

17. Food Microbiology - By M.R. Adams and M.O. Moss

18. Introduction to Biotechnology - By M.R. Adams and M.O. Moss

19. Frontiers of Plant Tissue Culture - By T.A. Thorpe

20. Plant Tissue Culture - Theory and Practice - By S.S. Bhojwani and M.K. Razdan.

21. Biotechnology - By U. Satyanarayana

22. Plant Biotechnology New Products and Applications - By J. Hammond, P. McGarvey, and V. Yusibov

23. Plant Tissue Culture - Basic and Applied - By Timir Baran Jha and B. Ghosh

24. Essentials of Biotechnology for Students - By Satya N. Das

25. Plant Tissue Culture - By Kalyan Kumar De

26. Bioethics - Readings and Cases - By B.A. Brody and H.T. Engelhardt. Jr. (Pearson Education)

27. Biotechnology, IPRs and Biodiversity - By M.B. Rao and Manjula Guru (Pearson Education)
24. Bioprocess Engineering - By Shuler (Pearson Education)
25. Emerging Trends in Biotechnology - By Irfan Ali Khan and Atiya Khanum (Ukaaz Publications)
26. Modern Concepts in Biotechnology - By Irfan Ali Khan and Atiya Khanum (Ukaaz Publications)
27. Essential of Biotechnology - By Irfan Ali Khan and Atiya Khanum (Ukaaz Publications)
28. Fundamentals of Medical Biotechnology - By Irfan Ali Khan and Atiya Khanum (Ukaaz Publications)
29. Biotechnology in the Welfare on Mankind - By Irfan Ali Khan and Atiya Khanum, Volume I, (Ukaaz Publications)
30. Biotechnology in the Welfare of Mankind - By Irfan Ali Khan and Atiya Khanum, Volume II, (Ukaaz Publications)
31. Gene. Genomics and Genetic Engineering - By Irfan Ali Khan and Atiya Khanum (Ukaaz Publications)

B.Sc.
INDUSTRIAL MICROBIOLOGY

INDUSTRIAL MICROBIOLOGY
FIRST YEAR

PAPER - I

FUNDAMENTALS OF INDUSTRIAL MICROBIOLOGY, BIOSTASTISTICS TOOLS AND TECHNIQUES

1. **Introduction**

   Discovery of microbial world, The experiments of Pasteur, The era of the discovery of antibiotics, The discovery of the Anaerobic life, The physiological significance of fermentation

2. **Classification,** characteristics and ultra-structure of microbes: bacteria, algae, fungi, actinomycetes, mycoplasma and viruses.

3. **Fundamentals of sterilization** Preparation of media methods, Isolation of micro organisms, Culture preservation and stability, preservation of microbes, serial subculture, preservation by over laying culture with mineral oil, lyophilization or freeze drying.

4. **Biostastics Tools and Techniques** Basic idea of probability, distribution patterns, normal binomial and poisson distribution, sampling methods, mean, mode and median, chisquare, statistical analysis of variance, transformation, exponential and logarithmic functions.

5. **General account of instrumentation** Paper Chromatography, Thin layer chromatography, Column chromatography, Gas chromatography, Affinity chromatography, Gel filtration, basic principles and usage of pH meter, absorption and emission spectroscopy, principle and law of absorption of radiation, use of densitometry, fluorimetry, colorimetry, polarography, centrifugation principles and applications. Microscopy: Simple microscopy, phase contrast microscopy, fluorescence and electron microscopy.

6. **Computer Hardware and Software,** harword graphics, lotus and DOS computer application in fermentation technology justification and planning.

PAPER - I

PRACTICALS

1. Preparation of media, autoclaving and sterilization of glassware, maintenance of culture room.
2. Isolation and maintenance of microbes of different groups.
3. Single spore culture
4. Camera lucida drawing.
5. Standard plate count.
6. Haemo cytometer.
7. Isolation of phytopathogens.
8. Isolation of soil Microorganisms.
9. Isolation of thermophilic Microorganisms.
10. Bacterial smear preparation.
11. Simple staining of bacteria.
12. Differential staining of bacteria.
13. Staining of bacterial spores.
14. Bacterial motility.
15. Biostatics problems: mean, mode, median, chi-square test.
16. Paper chromatographic separation of carbohydrates, amino acids, pigments and organic acids.
17. Measurements of pH of fruit juice.
18. Electrophoretic separation of protein.
19. Centrifugal separation of proteins.
20. Absorption spectra of protein nucleic acids and pigments.
21. Description and identification of some common fungi, algae and bacteria.
22. Microbiological instruments:
    a. Autoclave
    b. Hot air oven
    c. Microscope
    d. pH meter
    e. Electrophoresis
    f. Spectrophotometer colorimeter
    g. Centrifuge
    h. BOD incubator.

SECOND YEAR

PAPER- II

MICROBIAL AND MOLECULAR GENETICS, MICROBIAL PHYSIOLOGY AND BIOCHEMISTRY.

1. **Physiological properties** Diffusion, gaseous exchange, osmosis, plasmolysis, biochemical properties of membrane, passive and active transport.

2. **Photosynthesis** Photo synthetic microbes, oxygenic/non oxygenic reaction centres, electron transport, photophosphorylation, Calvin cycle (dark reaction) phosphoenol carboxylase, photorespiration and its significance.

3. **Respiratory pathways** Respiratory pathways, breakdown of carbohydrates through Glycolysis, Krebs cycle, fermentation, pentose phosphate pathway, oxidative and substrate level phosphorylation, significance of Krebs cycle, gluconeogenesis, regulation of glucogenesis and glycogenolysis.

4. **Nitrogen metabolism** Nitrogen fixation in symbiotic and free living system, photosynthetic systems, oxygen and hydrogen regulation of nitrogen fixation nitrification, denitrification and ammonifying bacteria, transamination and deamination reactions.

5. **Methylotrophs** Methanogens and methylotrophs, sulphur utilizing bacteria, sulphate reduction pathway, economic importance of methylotrophs and sulphur utilizing bacteria, use of nucleotides as nitrogen source for growing of certain micro organisms (pathway of nucleic acid break down).

6. **Carbohydrates** Lipids and aminoacids, classification of carbohydrates, chemical structure and property and starch, cellulose, glycogen, synthesis of purines and pyramidines saturated and unsaturated fatty acids, biosynthesis of fatty acids, distribution and function of lipids and microorganisms, degradation of lipids by alpha, beta and mega oxidation, lipids peroxidation, structure of amino acids and classification of essential aminoacids based on polarity.

7. **Enzymes** Classification, coenzyme, cofactor, thermodynamics explanation of coenzyme catalysis, reaction orders derivation of Michaelis-Menton equation, competitive and non competitive

inhibition, Kinetics of allosteric regulation of enzymes. Isozymes, factors contributing to catalytic efficiency of enzymes.

8. **Nucleic acids** DNA as genetic material, structure of DNA and RNA, DNA replication (conservative and semi conservative replication, conformational flexibility of DNA) replication in eukaryotes. The genetic code central dogma, reverse transcriptase gene,transcription polymerases, transcription product of DNA, t RNA, mRNA and r RNA, synthesis of RNA in eucaryotes and prokaryotes, catabolite effect, operative and repressors post- transcriptional processing of RNA.

9. **Molecular biology of protein synthesis** Translation and protein synthesis in eukaryotes and prokaryotes. RNA synthesis, activation of amino acids, inhibitors of protein synthesis. Gene expression, catabolite repression. Regulation of gene expression, operon concept. Open Catabolite Activator Protein (CAP), positive and negative control and gene expression in prokaryotes. Lac operon, Britton and Davidson model of gene regulation in eukaryotes.

10. **Mutations** Molecular mechanism of mutation, forward and reverse mutation, transition, transversion, chemical induced mutations, radiations and base analogues induced mutations mutation frequency applications of mutations mechanisms of repair, repair of radiation induced damage, SOS repair, transcriptional repair and dark repair.

11. **Genetic recombination in bacteria,** transformation, transduction and conjugation, use of transformation, transduction and conjugation in genetic mapping, preparation of genetic maps.

12. **Extra chromosomal genetic materials,** plasmids cosmids, transposons insertion sequence over lapping gene, silent genes, exon and intron, evolutionary significance of silent gene, ribonucleic protein, genetic recombinant DNA technology.

PAPER - II

PRACTICALS

1. Isolation of antibiotic resistant bacteria.
2. Replica plate technique for isolation of mutants.
3. Measurement of mutation frequency in bacteria.
4. Demonstration of lysogeny in Escherichia coli.
5. Mutant isolation by gradient plate technique.
6. Location of site of mutation by using plasmid curing agent acrydine orange.
7. Isolation and purification of DNA.
8. Isolation and purification of RNA.
9. Effect of UV light on mutation frequency in bacteria.
10. Demonstration of photo repair mechanism.
11. Extraction and identification of lipids by thin layer chromatography.
12. Estimation of glycogen in bacterial cell.
13. Estimation of alkaline phosphatase activity.
14. Derivation of Michalis- Menton constant of alkaline phosphatase.
15. Measurement of competitive inhibition of ammonium uptake using structural analogue methyl amine.
16. Change in protein conformation due to ph, heat, ionic concentration by observing ultraviolet.
17. Separation of isozyme by polyacrylamide electrophoresis.
18. Measurement of relative enzyme activity of cellulase.
19. Measurement of cellulases by reducing sugar assay test.
20. Demonstration of plasmolysis, Osmosis, Active and Transport mechanism.
21. Measurement of nitrate uptake by microorganisms.
22. Measurement of ammonium uptake by microorganisms.
23. Estimation of nitrate and nitrite reduced by microorganisms.
24. Demonstration of evolution of oxygen in light and uptake of oxygen in dark by photosynthetic microorganisms.
25. Demonstration of photosynthesis, electron transport by 2,6, dichlorophenol indophenol reduction test.
26. Effect of different inhibitors of dichlorophenol indophenol reduction.

THIRD YEAR

PAPER- III

ENVIRONMENTAL AND AGRICULTURE MICROBIOLOGY

1. **Environment:** Soil, water and air environment. Microbes and concepts of environment. Environment induced genetic and physiological adaption in microbes. Microbial population of air, water and soil.

2. **Biogeochemical cycling:** The carbon cycle Trophic relationship. Microbial mobilization and immobilization of carbon within the biosphere.

3. **Population interaction:** Neutralism, commensalism, synergies mutualism. Microbe- microbe interaction, plant- microbe interaction. Animal- microbe interaction. Competition, commensalism, parasitisms, predation.

4. Soil fertility and management of agricultural soils, influence of available nitrogen on soil fertility, crop rotation, soil management practices.

5. Microbial diseases of crops and their control symptoms, mechanisms of microbial pathogenicity. Transmission of plant pathogens, viral diseases, viroid diseases, bacterial diseases, fungal diseases.

6. Pesticide microbiology, biomagnifications, biodegradation, microbiology control pesticide disease.

7. Solid waste disposal, sanitary land fills composting.

8. Treatment of liquid waste, sewage treatment, primary treatment, secondary treatment, tertiary treatment, disinfection.

9. Treatment and safety of water supplies, disinfection of potable water, bacterial indicators of water safety, standards for tolerable levels of fecal contamination.

10. Biodegradation of environmental pollutants. Alkyl- Benzyl sulphonates and oil pollution.

11. Nitrogen fertilizers, symbiotic association, *Rhizobium, Frankia, Azospirillum, Azotobacter, Cyanobacteria*.

12. Production and quality control in biofertilizers, microbes, assessment

of nitrogen fixing ability of different strain under controlled and field conditions, direct and indirect methods, culture production, fermenter, storage culture, carrier, packing, quality control, ISI standards, inoculums requirements, packing marketing and storage, inoculums requirements, methods of applications.

PAPER - III
PRACTICALS

1. Isolation of microorganisms from air.
2. Isolation of microorganisms from water.
3. Isolation of microorganisms from soil.
4. Isolation of microorganisms from bacteriophage in water samples.
5. Total count of bacteria from water.
6. Isolation and counting of fecal bacteria and water analysis.
7. IMVIC test for faecal bacteria and water analysis.
8. Measurement of chloride, phosphorus and nitrates in water sample.
9. Biochemical test for identification of different bacteria from water.
10. Estimation of BOD and COD of water sample.
11. Standard methods of water analysis.
12. Nodulation by Rhizobium.
13. Counting of number of nodules from legume plants.
14. Isolation of VAM spores from soil sample.
15. Identification of VAM spores.
16. Demonstration of nitrogen fixating ability of bacteria in different nitrogen media.
17. Demonstration of nitrogen fixation by Gas liquid chromatography.
18. Measurement of total phosphate, nitrate, nitrite and ammonium in soil.
19. Measurement of organic matter in soil.
20. Isolation of free living nitrogen fixer from soil.
21. Demonstration of Mycorrhizal spores in the soil.

PAPER- IV

FOOD MICROBIOLOGY, FERMENTATION TECHNOLOGY AND IMMUNOBIOTECHNOLOGY AND TISSUE CULTURE.

1. Food spoilage, representative spoilage process, spoilage of fruits and vegetables, meats, other foods, indicators of human pathogens associated with food.

2. Food preservation (General account)

3. Microbiological product of food fermented and ented diary products.

   (b) Indian Food, fermented meats, leaving of breads, alcoholic beverages, single cell protein.

   (c) Fermentation Technology.

4. The fermentation industry.

   Selection of industrial microorganisms, production, process of fermentation, media aeration, pH, temperature, batch versus continuous, culture immobilized enzymes downstream processing and product recovery and quality control of industrial products.

5. Production of pharmaceuticals, antibiotics, penicillin, Vit B12.

6. Production of organic acids; citric acid, lactic acid.

7. Production of amino acids; lysine, glutamic acid.

8. Production of enzymes, protease, amylase, production of solvents, acetone-butanol, production of fuels, ethanol and hydrogen.

9. Microbially enhanced recovery of mineral resources, bioleaching of metals, oil recovery.

10. Biodegradation: paper wood, plant textiles, metal corrosion.

11. Mushroom cultivation.

12. History and scope of immunology, types of immunity, physiology of immune response, antigen- antibody reaction, immunoglobulins, structure, distribution and function.

13. Production of vaccines, Monoclonal antibodies (Hybridoma technology).

14. Biotechnology programmes and regulation: role of international organizations in biotechnology; Govt. programmes for biotechnology development; Governmental regulations of recombinant DNA research; regulations for disposal of biohazardous materials, patenting biotechnology processes and products; mycotoxins hazards in the production of fungal products health hazards during microbial spoilage carcinogenic, mutagenic ceratogenic biologicals.

15. Basic concepts of plant tissue and animal cell culture.

PAPER - IV
PRACTICALS

1. Measurement and production of citric acid by *A. niger.*
2. Measurement and production of ethanol by *Saccharomyces.*
3. Demonstration of IAA production by soil fungi.
4. Demonstration for the cultivation of mushroom.
5. Measurement of invitro production of IAA by soil fungi.
6. Demonstration for the identification of mushroom by spore print.
7. Demonstration for the transformation of steroids.
8. Demonstration for the production of amino acids by soil fungi.
9. Estimation of streptomycin.
10. Isolation and identification of microorganisms of spoiled food.
11. Isolation *of A.flavus* from spoiled food.
12. In vitro production of aflatoxin by *A.flavus*
13. Inhibitory effect of low temperature on microbial contamination of milk.
14. Titration of antigens and antibodies.
15. Precipitation reaction of antigen and antibody.
16. Callus formation by root organ culture from egg plant.

Reference books:

Microbiology	Pelzer,Reid & Chan
Microbiology	RA.Atlas
General Microbiology	Powar & Daginwala
General Microbiology	R.Y.Stainer

Microbiology	K.S.Bilgrani & R.N Verm
Microbiology	Hans G.Schiegal
General Microbiology	P.D.Sharma & Kumar
Microbiology	S.B.Sullia
Microbiology	K.S.Bilgrami & HC Dube
General Microbiology	Purohit
General Microbiology	Devis & Harper
The Microbiological world	R.Y.Stainere *et.al.*
The Text Book of Microbiology	R.Ananthanarayana
Microbiological methods	C.H.Collins & D.N.Iyre
Microbiology	G.Guru
Fundamentals Principles of Microbiology	Corpenter
The prokaryotes Vol I & II	M.P.Stayn
An Introduction of Bacteria	V.Sinha *et. al*
Statistics	Mishra & Mishra
Statistics	D.N.Elhance
Tools & Techniques	Welson & Goulding
Lab Techniques in Biology	Swaroop, Pathak and Arora
Fermentation Technology	Whittaker
Principles of genetics	E.J.Gardner
Genes IV	Levin
The genetics of Bacteria and viruses	William Hayes
Principles of Biochemistry	Lehninger
Microbial Biochemistry	Moat
Outlines of Biochemistry	Moat & Foster
Microbial Energetics	Deves
Biochemistry	Keshv. Trehan
Soil microbiology	Martin Alexander
Soil microbiology	N.S.Subba Rao
Soil microbiology	Maruthi
Soil microbiology	M.Alexander
Pesticide Microbiology	Hills & Wright
Plant Diseases	R.H.Singh
Plant Pathology	R.S.Malhotra

Principal of Plant Infectier	Vender Phank
Agricultural Microbiology	N.S.Ranga Swamy
Plant & Soil Microbiology	N.S.Subba Rao
Biology Nitrogen Fixation	N.S.Subba Rao
Modern Plant Pathology	K.S.Bilgrani & H.C.Dube
Mycology	R.S.Meharothro
Mycorrhiza	A.Verma & B.Hock
Atmospheric biopopulation	S.J.Tilak
Aeromicrobiology	Frazier
Modern Microbiology	J.M.Jay
Modern Microbiology	Bunwant
Standard Methods for Water Analysis	APHA
Industrial Microbiology	A.H.Patel
Industrial Microbiology	Priscatt & Dumm
Fermentation Technology	Whittaker
Methods in Microbiology	J.R.Nerris, D.J.Road & A.K.Verma
Biology of Cyanobacteria	Carr & Whittar
Nitrogen fixation	Sprent & Sprent
Immunology	Davis
Immunology	G.P.Talwar
Microbiology Laboratory Manual	S.M.Reddy & S.Ram Reddy
Microbiology Vol. I to IV	S.M.Reddy *et. al.*

B.Sc. COMPUTER SCIENCE

FIRST YEAR

THEORY PAPER - I

PC SOFTWARE AND 'C' PROGRAMMING

UNIT – I : Fundamentals of Computers

Computer definition – Types of Computer – Logical Organization of a Digital Computer – Memory: Main Memory : RAM, ROM and Cache – Secondary Memory : Magnetic type, Floppy disk, Hard disk, Compact disk – Input devices – Output devices – Operating system : Definition, functions of an operating system, Types of Operating systems : Brief details of batch processing, Multi Programming, multi tasking, time sharing, real time operating systems – Introduction to DOS, DOS internal commands, DOS External Commands – Introduction to Windows, Desktop, File, Folder, My Computer, My documents, Recycle bin, Internet Explorer, Windows Explorer – Types of Programming Languages.

UNIT – II : MS Word and MS Power Point

Word Basics : Starting word, Creating a new document, Opening prexisting document, The parts of a word window, Typing text, Selecting text, Deleting text, Undo, Redo, Repeat, Inserting text, Replacing text, Formatting text, Cut, Copy, Paste – Printing.

Formatting Your Text and Documents : Auto format, Line spacing, margins, Borders and Shading. Working with Headers and Footers: Definition of headers and footers, creating basic headers and footers, creating different headers and footers for odd and even pages.

Tables : Creating a simple table, Creating a table using the table menu, Entering and editing text in a table, selecting in table, adding rows, changing row heights, Deleting rows, Inserting columns, Deleting columns, changing column width.

Graphics : Importing graphics, Clip part, Insert picture, Clip Art Gallery, using word's drawing features, drawing objects, text in drawing.

Templates : Template types, using templates, exploring templates, modifying templates.

Macros : Macro, Recording macros, editing macros, running a macro.

Mail Merge : mail Merge concept, Main document, data sources, merging data source and main document. Overview of word menu options word basic tool bar.

Power Point : Basics, Terminology, Getting started, Views.

Creating Presentations : Using auto content wizard, Using blank presentation option, Using design template option, adding slides, Deleting a slide, Importing Images from the outside world, Drawing in power point, Transition and build effects, Deleting a slide, Numbering a slide, Saving presentation, Closing presentation, Printing presentation elements.

UNIT – III : MS Excel and MS Access

MS Access

Creating a Simple Database and Tables : Creating a contacts Databases with wizard, The Access Table Wizard, Creating Database Tables without the wizard, Field Names, Data Types and Properties, Adding, deleting fields, renaming the fields in a table.

Forms: The Form Wizard, Saving Forms, Modifying Forms.

Entering and Editing Data : Adding Records, Duplicating previous entries without Retyping, Undo, Correcting Entries, Global Replacements, Moving from Record to Record in a table.

Finding, Sorting and Displaying Data: Queries and Dynasets, Creating and using select queries, Returning to the Query Design, Multilevel Sorts, Finding incomplete matches, Showing All Records after a Query, Saving Queries, Crosstab Queries.

Printing Reports : Simple table, Form and Database printing, Defining advanced Reports, Manual Reporting, properties in Reports, Saving Reports.

Relational Databases: Flat Versus Relational, Types of Relationships, Viewing Relationships, Defining and Redefining Relationships, Creating and Deleting Relationships.

MS Excel

Excel Basics: Overview of Excel features, Getting started, Creating a new worksheet, Selecting cells, Entering and editing text, Entering and editing Numbers, entering and editing Formulas, Referencing cells, moving cells, copying cells, sorting cell data, inserting rows,

inserting columns, Inserting cells, Deleting parts of a worksheet, clearing parts of a worksheet.

Formatting : Page setup, changing column widths and Row heights, auto format, changing font sizes and Attributes, centering text across columns, using border buttons and Commands, changing colours and shading, hiding rows and columns.

Introduction to functions: Parts of a functions, Functions Requiring Add-ins, The Function Wizard.

Examples functions by category : Data and time functions, Engineering functions,Math and Trig functions, Statistical functions, Text functions.

Excel Charts : Chart parts and terminology, Instant charts with the chard wizard, creation of different types of charts, printing charts, deleting charts – Linking in Excel.

Excel Graphics : Creating and placing graphic objects, Resizing Graphics, Drawing Lines and Shapes.

UNIT – IV : C Language fundamentals

Introducton – 'C' Fundamentals : Programming – High Level Languages – compiling programs – Integrated Development Envoronments – Language Interpreters – Compiling your first program – Running your program – understanding your first program – comments – variables, Data types, and Arithmetic Expressions : working with variables – Understanding Data types and constants – working with Arithmetic Expressions – The Assignment operators – The printf function – The scanf function.

Decision making : The if statement – the if else construct – Nested if statements – The else if construct – The switch statement – Boolean variables – The conditional operator – program looping : The for statement – Relational operators – Nested for loops – The while statement – The do statement – The break statement – The continue statement – working with Arrays : Defining an array – Initializing Arrays – character Arrays – The const Qualifier – Multidimensional arrays- variable length Arrays. Working with Functions : Defining a Function-Arguments and Local variables – Returning Function Results – Function calling – Declaring Return Types and Argument types – Top Down programming – Functions and Arrays – global variables – Automatic and static variables – Recursive Functions.

UNIT – V : Programming in C

Working with structures : Defining structure – Functions and structures – Initializing structures – Array of structures – structures containing structures – structures containing Arrays – Structure variants – Character strings : Arrays of characters – variable length character strings – Escape characters – character strings, structures and arrays – character operations.

Pointers : Defining a pointer variable – using pointers in Expressions – pointers and structures (Exclude Linked List – Pointers and Functions – pointers and Arrays – operations on pointers – pointers and Memory address. Operations on Bits : Bit operators – Bit fields

The preprocessor : The # define statement – The # operator – The #include statement – conditional compilation. More on Data Types : Enumerated Data Types – The typedef statement – Data Type conversions Input and Output Operations in "C" : Character I/O – formatted I/O – Input and Output Operations with Files – Special functions for working with Files.

Miscellaneous and Advanced Features : The Goto Statement, the null statement, working with unions the comma operator-type qualifiers.

Prescribed Books :

1. Peter Norton, Introduction to Computers, Sixty edition Tata McGraw Hill (2007).
2. Ron Mansfield, Working in Microsoft Office, Tata McGraw Hill (2008) (Chapters : 4 to 9, 11, 12, 13, 14, 15, 16, 17, 18, 19, 24, 25, 28, 30, 31, 33, 34, 35)
3. Stephen G Kochan, Programming in C, Third Edition, Pearson Education (2007) (Chapters: 1 to 14, 16, 17)

Reference Books :

1. Michael Miller, Absolute Beginners Guide to Computer Basics, Fourth Edition, Pearson Education (2007).
2. Deborah Morley, Charles S. Parker, Under Standing Computers today and tomorrow, 11th Edition, Thomson (2007).
3. Ed Bott, Woody Leonhard, Using Microsoft Office 2007, Pearson Education (2007).

4. Beyron S Gottfried, Programming with C, Second Edition, Tata McGraw Hill (2007).
5. Ashok N. Kamathane, Programming with ANSI and Turbo C, Pearson Education (2008).
6. Rajaraman, Introduction to Information Technology, PHI.
7. Balaguruswamy .E., Fundamentals of Computing, TMH (2008).

FIRST YEAR

PRACTICAL PAPER - I

PRODUCTIVITY TOOLS AND 'C' LAB PRODUCTIVITY TOOLS LAB CYCLE

MS-WORD

1. Design a visiting card for Managing Director of a Company with following specification

i. Size of visiting card is 3.5" x 2"
ii. Name of a company with big font using Water Mark
iii. Phone number, fax number and e-mail address with appropriate symbols
iv. Office and residence address separated by line.

2. Create letter head of accompany

i. Name of Company on the top of the page with big font and good style
ii. Phone numbers, fax numbers, e-mail address with appropriate symbols
iii. Main products manufactured to be described at the bottom
iv. Slogans if any should be specified in bold at the bottom

3. Creation of your Bio-Data : consisting Name, email-id, Contact Address, Carrier Objective, Educational Qualifications, Social activities, achievements.

MS-POWER POINT

1. Make a Power point presentation on your strengths, weaknesses, hobbies, factors that waste your time.
2. Make a Power point presentation on any Current affair (Not less than 8 slides)
3. Make a Power point presentation to represent your College profile.

4. Make a Power point presentation of all the details of the books that you had studied in B.Sc. First Year.

MS-ACCESS

1. **Create a database using MS-ACCESS with atleast 5 records**

   TABLE 1 STRUCTURE : REGISTER NUMBER NAME DOB GENDER CLASS
   TABLE 2 STRUCTURE : REGISTER NUMBER M1 M2 M3 M4 M5 TOTAL

   Maintain the relationship between two tables with REGISTER NUMBER as a Primary Key and answer the following queries: Show the list of students with the following fields as one query

   REGISTER NUMBER NAME **GENDER TOTALMARKS**

2. **Maintain the relationship between above two tables with REGISTER NUMBER as a Primary Key and answer the following reports:**

   Reports must have following columns

   Reports with REGISTER NUMBER, NAME, MARKS OF ALL SUBJECTS and TOTAL

   Report2 with REGISTER NUMBER, TOTAL , PERCENTAGE.

3. **Create a database using MS-ACCESS with at least 5 records**

   TABLE1 STRUCTURE:EMP-CODE EMP-NAME AGE GENDER DOB

   TABLE2 STRUCTURE:EMP-CODE BASIC-PAY

   Maintain the relationship between two tables with EMP-CODE as a Primary Key generate the following reports:

   REPORT 1: EMP-CODE EMP-NAME BASIC-PAY DA HRA GROSS-SALARY

   REPORT 2: EMP-CODE EMP-NAME AGE GENDER GROSS-SALARY

MS-EXCEL

1. **Create an electronic spreadsheet in which you enter the following decimal numbers and convert into Octal, Hexadecimal and Binary numbers Vice versa.**

   Decimal Numbers: 35, 68, 95,165,225,355,375,465
   Binary Numbers: 101, 1101, 111011, 10001, 110011001, 111011111.

2. **The ABC Company shows the sales of different products for 5 years. Create column chart, 3D-column and Bar chart for the following data**

YEAR PRODUCT-1 PRODUCT-2 PRODUCT-3 PRODUCT-4

2003 1000 800 900 1000
2004 800 80 500 900
2005 1200 190 400 800
2006 400 200 300 1000
2007 1800 400 400 1200

3. **Create a suitable examination data base and find the sum of the marks(total) of each student and respective class secured by the student rules:**

Pass if marks in each subject >=35
Distinction if average>=75
First class if average>=60 but <75
Second class if average>=50 but <60
Third class if average>=35 but <50
Fail if marks in any subject is <35
Display average marks of the class, subject wise and pass percentage.

C-PROGRAMMING LAB CYCLE

1. Program for
   i. Sum of factors of a number
   ii. Sum of digits of a number
2. Program to check whether a given number is
   i. Prime number or not
   ii. Perfect number or not
   iii. Armstrong number or not
3. Program using recursion for
   i. Factorial of a given number
   ii. Fibonacci series
4. Program for roots of a quadratic equation
5. Program using functions
   i. With out return value
   ii. With return value
   iii. With parameters iv. With out parameters
6. Program to find largest/smallest of n numbers by using arrays

7. Program for sorting an array
8. Program for matrix addition & subtraction
9. Program for matrix multiplication
10. Program for transpose of a given matrix
11. Program for (with and without string functions)
    i. Comparison of two strings
    ii. Concatenation of two strings
    iii. Length of a string
12. Program to process student information. Student structure consists Sno, Sname, Marks in 6 subjects, Total, average. Calculate total and average of n students and assign grade with following criteria.

    Grade A : All pass and avg >=75
    Grade B: All pass and avg>=60 and avg<75
    Grade C: All pass and avg>=50 and avg<60
    Grade D: All pass and avg>=40 and avg<50
    Grade E: If fails in one or more subjects.
13. Program for (i) Nesting of Structure (ii) Passing structures to functions.
14. Program to demonstrate (i) Unions (ii) enumerated data types.
15. Program for sum of diagonal elements of a square matrix?
16. Program to access-(i) array elements (ii) Structure elements using pointers.
17. Program for sorting strings using pointers.
18. Program to count number of (i) words (ii) lines (iii) Special Characters in a given text.
19. Program to create a file to store and retrieve strings using fputs () and fgets ().
20. Program to create a file to store and update employee records. The employee record consists (ENO, ENAME, DEPTNO, DEPTNAME, BASICSALARY, HRA, DA, DEDUCTION, TOTALSALARY and NETSALARY.
21. Program to evaluate following expressions.
22. Program to find Square root of a given no.
23. Program to create table of Triangular Numbers.
24. Program for reversing digits of a no.
25. Program for Base Conversion.

SECOND YEAR

THEORY PAPER - II

OBJECT ORIENTED PROGRAMMING WITH JAVA AND DATA STRUCTURES.

UNIT - 1: Java Fundamentals

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. (Chapters: 1,2,3,4)

UNIT - 2: Oops Concepts in Java

Operators and Expressions: Arithmetic Operators - Relational Operators- Logical Operators - Assignment Operators - Increment and Decrement Operators - Conditional Operators - Bitwise Operators - Special Operators - Arithmetic Expressions - Evaluation of Expressions - Precedence of Arithmetic Operators - Operator Precedence and Associativity.

Decision Making and Branching: Decision Making with If statement - Simple If Statement-If else Statement-Nesting If else Statement-the elseif Ladder-The switch Statement - The ?: operator.

Decision Making and Looping: The while statement - The do statement - The for statement - Jumps in Loops. 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. (Chapters : 5,6,7,8)

UNIT - 3: Packages and Interfaces in Java

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.

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. (CHAPTERS: 9,10,11)

UNIT - 4: Multithreaded programming and Applets.

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. (Chapters: 12, 13, 14)

UNIT - 5: Data Structures

Sorting: Bubble Sort - Selection Sort - Insertion Sort - Quick Sort- Stacks and Queues: Stacks - Queues - Circular Queue - Deques - Priority Queue - Parsing Arithmetic Expressions - Linked List: Simple Linked List - Finding and Deleting Specified Links - Double Ended Lists - Abstract Data types - Sorted Lists - Doubly Linked Lists - Advanced Sorting : Quick Sort - Binary Trees : Tree Terminology - Finding a Node - Inserting a Node - Traversing the Tree - Finding Maximum and Minimum values - Deleting a Node - Efficiency of Binary Trees - Trees Represented as Arrays - Graphs: Introduction to Graphs - Searches - Minimum Spanning Tree - Topological Sorting with Directed Graphs - Connectivity in Directed Graphs. (Chapters : 3,4,5,7 (Only Quick Sort), 8,13)

Prescribed 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)

Reference Books :

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).

SECOND YEAR

PRACTICAL PAPER - II

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+. .._l/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 piogram 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

21. Program to create, insert, delete and display operations on single linked list?
22. Program to create , insert, delete and display operations on double linked list ?
23. Program to create , insert, delete and display operations on circular single linked list ?

24. Program to split a single linked list
25. Program to reverse a single linked list
26. Program to implement Insertion Sort.
27. Program to implement PUSH and POP operations on Stack using array method.
28. Program to implement PUSH and POP operations on Stack using Linked list method.
29. Program to implement insert and delete operations on Queue using array method.
30. Program to implement insert and delete operations on Queue using linked list method.
31. Program to implement insert and delete operations on Priority Queue?
32. Program to implement insert and delete operations on Double Ended Queue?
33. Program to evaluate postfix expression by using Stack?
34. Program to construct Binary Search Tree and implement tree traversing Techniques.
35. Program to delete a leaf node from binary search tree.
36. Program to implement Selection Sort.
37. Program to implement Bubble Sort.
38. Program to implement Operations on Circular Queue.
39. Program to implement Quick Sort.
40. Program to Find number of Leaf nodes and Non-Leaf nodes in a Binary Search Tree.
41. Program for Insertion Sort.

THIRD YEAR

THEORY PAPER - III :
DATABASE MANAGEMENT SYSTEMS

UNIT-1

Database Systems: Introducing the database and DBMS, Why the database is important, Historical Roots: Files and File Systems, Problems with File System Data Management, Database Systems.

Data Models: The importance of Data models, Data Model Basic Building Blocks, Business Rules, The evaluation of Data Models, Degree of Data Abstraction.

The Relational Database Model: A logical view of Data, Keys, Integrity Rules, Relational Set Operators, The Data Dictionary and the system catalog, Relationships within the Relational Database, Data Redundancy revisited, Indexes, Codd's relational database rules. (Chapters -1: 1.2 to 1.6,2,3)

UNIT-2

Entity Relationship Model: The ER Model, Developing ER Diagram, Database Design Challenges: Conflicting Goals.

Advanced Data Modeling: The Extended Entity Relationship Model, Entity clustering, Entity integrity: Selecting Primary keys, Design Cases: Learning Flexible Database Design.

Normalization of database tables: Database Tables and Normalization, The need for Normalization, The Normalization Process, Improving the design, Surrogate Key Considerations, High level Normal Forms, Normalization and database design, denormalization. (Chapters: 4,6,5)

UNIT - 3

Introduction to SQL: Data Definition Commands, Data Manipulation Commands, Select queries, Advanced Data Definition Commands, Advanced Select queries, Virtual Tables, Joining Database Tables.

Advanced SQL: Relational Set Operators, SQL Join Operators, Subqueries and correlated queries, SQL Functions, Oracle Sequences, Updatable Views, and Procedural SQL.

Database Design: The Information System, The Systems Development Life Cycle, The Database Life Cycle, Database Design Strategies, Centralized Vs Decentralized design. (Chapters: 7,8(8.1 to 8.7),9)

UNIT - 4

Transaction Management and Concurrency Control: What is transaction, Concurrency control, Concurrency control with locking Methods, Concurrency control with time stamping methods, concurrency control with optimistic methods, database recovery management.

Distributed Database Management Systems: The evolution of Distributed Database Management Systems, DDBMS advantages and Disadvantages, Distribution Processing and Distribution Databases, Characteristics of Distributed database management systems, DDBMS Components, Levels of Data and Process distribution, Distributed database Transparency Features, Distributed Transparency, Transaction Transparency, Performance Transparency and Query Optimization, Distributed Database Design, Client Server Vs DDBMS. (Chapters: 10, 12)

UNIT - 5

The Data Warehouse: The need for data analysis, Decision support systems, The data warehouse, Online A nalytical Processing, Star schemas, Data mining, SQL extension for OLAP.

Database Administration: Data as a Corporate asset, The need for and role of databases in an organization, The evolution of the database administration function, The database environment's Human Component, Database administration Tools, The DBA at work: Using Oracle for Database Administration. (Chapter: 13:13.1 to 3.5,13.7,13.8,15:15.1,15.2,15.4,15.5,15.6,15.8)

Prescribed Text Book:

1. Peter Rob, Carlos Coronel, Database Systems Design, Implementation and Management, Seventh Edition, Thomson (2007)

Reference Books:

1. Elimasri / Navathe, Fundamentals of Database Systems, Fifth Edition, Pearson Addison Wesley (2007).

2. Raman A Mata - Toledo/Panline K Cushman, Database Management Systems, Schaum's Outlibe series, Tata McGraw Hill (2007).

3. C.J.Date, A.Kannan, S.Swamynathan, An Introduction to Database Systems, Eight Edition, Pearson Education (2006).

4. Michel Kifer, Arthur Bernstein, Philip M. Lewis, Prabin K. Pani Graphi, Database Systems: An application oriented Approach, seond edition, pearson education (2008).

5. Atul Kahate, Introduction to Database Management Systems, Pearson Education (2006).

PAPER - 4.2 :
GUI PROGRAMMING

Detailed Syllabus

UNIT-1

Getting Started with Visual Basic 6.0: Introduction to Visual Basic, Visual Basic 6.0 Programming Environment, working with Forms, Developing an Application, Variables, Data types and Modules, Procedures and Control Structures, Arrays in Visual Basic

Working with Controls: Introduction, Creating and Using Controls, Working with Control Arrays.

Menus, Mouse Events and Dialog Boxes: Introduction, Mouse Events, Dialog Boxes. (Chapters:1,2,3)

UNIT - 2

Graphics, MDI and Felx Grid: Introduction, Graphics for application, Multiple Document Interface(MDI), Using FlexGrid Control.

Object Linking and Embedding: Introduction, OLE Fundamentals, Using OLE Container Control, Using OLE Automation Objects, OLE Drag and Drop.

Objects and Classes: Introduction to Objects. Working with Objects, Classes and Class Modules.

Working with Add-Ins: Introduction to Add-Ins, Building Add-Ins. (Chapters: 4, 8, 9, 14)

UNIT - 3

File and File system Controls: Introduction, File System Controls, Accessing Files, Interface with Windows.

ODBC and Data Access Objects: Evolution of Computing Architectures, Data Access Options.

ODBC using Data Access Objects and Remote Data Objects: Open Database Connectivity, Remote Data Objects.

Working with ActiveX Data Objects: An overview of ADO and OLEDB, ADO object Model. (Chapters: 17,5,6,16)

UNIT - 4

Data Environment and Data Report: Introduction, Data Environment Designer, Data Report.

All about ActiveX Controls: Introduction, Constituents of ActiveX Control, Exposing AcrivX Control Properties.

ActiveX EXE and ActiveX DLL: Introduction to ActiveX EXE and ActiveX DLL, Creating and ActiveX EXE Component, Creating an ActiveX DLL Component. (Chapters: 7,10,11)

UNIT - 5

ActiveX Document Fundamentals: What is an ActiveX Document, Active Server Pages.

Built-in ActiveX Controls: Working with Built-in ActiveX Controls, Additional ActiveX Controls.

Introducing Web Browser and DHTML: Introduction, Internet Tools in Visual Basic, Using DHTML in Visual Basic. (Chapters: 12,13,15)

Prescribed Text Book:

1. Content Development Group, Visual Basic 6.0 Programming, Tata McGraw-Hill Publishing Company Limited (2007).

Reference Books :

1. Deitel and Deitel, Visual Basic 2005, Third Edition, Pearson Education (2007).
2. Noel Jerke, Visual Basic 6, The complete reference, Tata Mcgraw Hill (2006).
3. Byran S. Gottfried, Visual Basic, Schaum's outlines, Tata Mcgraw Hill (2004).