



**B.Sc. III
BIOTECHNOLOGY**

PAPER – I

PLANT, ENVIRONMENTAL AND INDUSTRIAL BIOTECHNOLOGY

MM-50

UNIT-I

1. Introduction to Plant cell and Tissue culture: History, Scope and Application.
2. Tissue culture Media and Cellular Differentiation.
3. Protoplast Isolation and Fusion, Organogenesis, Embryogenesis, Anther and Ovary culture.

UNIT-II

1. Agrobacterium Mediated Transformation, Ti and Ri Plasmid.
2. Bt Gene and Bt Cotton, Edible vaccines and Genetically modified plants- Golden Rice, Herbicide Resistance, Drought Resistance.
3. Germplasm storage and Cryopreservation.

UNIT-III

1. General Introduction and Scope of Environmental Biotechnology.
2. Environmental Pollution and its type.
3. Solid Waste Management: Principle of management, Types of Sources, Effect of Solid waste, Concept of composting and Vermi composting.
4. Wastewater Treatment: Physical, Chemical, and Biological.

UNIT-IV

1. Biofertilizer and Biopesticides- Cyanobacteria, Bacteria, Fungi; Significance and Practices.
2. Bioremediation of Xenobiotics compounds.
3. Types of IPR-Patents, Copyright, Trademark, G.I., Patenting Genes and Life form.

UNIT-V

1. Types of Bioreactor: Design of Stirred tank, Fluidized bed.
2. Fermentation: Lactic acid and Alcohol.
3. Industrially important Microorganisms: Isolation, Preservation (Slant, Mineral Oil and Lyophilize) and its application.
4. Food Technology: Food spoilage. Canning, Packing and Food Preservation.



B.Sc. III
BIOTECHNOLOGY

PAPER – II

IMMUNOLOGY, ANIMAL AND MEDICAL BIOTECHNOLOGY

MM-50

UNIT-I

1. Concept of Immunity: Innate and Acquired, Humoral and Cell mediated Response.
2. Cells and Organs involved in Immune system-Structure and Function.
3. Antigen, Antibody: Types, Structure and Functions.

UNIT-II

1. Cytokines
2. Autoimmune diseases- Hemolytic Anemia, Rheumatoid arthritis, Insulin dependent diabetes.
3. Immuno deficiencies. Diseases-SCID, AIDS.

UNIT- III

1. Antigen-Antibody Interaction: Agglutination, Precipitation, RIA, ELISA, Immuno Electrophoresis and Immunofluorescence.
2. Immunity of Infectious Diseases: Protozoa (Malaria, Kalaazar), Bacteria (T.B., Typhoid) and Virus (Influenza, Pox).
3. Fundamental of Epidemic Diseases: Swine flu and Dengue.

UNIT-IV

1. Animal Cell Culture and Growth Media.
2. Primary, Secondary culture and Established Cell line Culture.
3. Tissue engineering: Basic Concept, Transgenic animal: Mice and Sheep.

UNIT-V

1. Hypersensitivity, Interferon and Monoclonal antibody.
2. Organ Transplantation, Biology of Cancer.
3. *In vitro* fertilization and Embryo Transfer.



List of Books-

1. A test Book of Biotechnology: Indu Shekher Thakur, 2nd edition. I.K. International Pvt. Ltd., New Delhi.
2. Biotechnology (Fundamentals and Applications): S.S. Purohit - Agrobios (India), Jodhpur.
3. Fundamentals of Microbiology and Immunology: Ajit Kr. Banerjee, Nirmalya Banerjee -New central Book Agency (P) Ltd., Kolkata.
4. Plant Biotechnology: H.S. Chawla - Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
5. Plant Biotechnology: B.D. Singh - Kalyani Publication, New Delhi.
6. Biotechnology: Fundamental & Application (2005) S.S. Purohit
7. Immunology: J. Kubey et al. 7th edition.
8. Immunology: Roitt et al.
9. Fundamental of Immunology: W. Paul.
10. Plant Tissue culture: K.K.De.
11. Plant Tissue Culture (Practical): H.S. Chawla.
12. Biochemistry & Molecular Biology of Plant: Buchanan, Grissemen & Jones 2nd edition.
13. Tools and Techniques in Biotechnology (2011) M. Debnath



List of Practical's

PLANT, ENVIRONMENTAL, INDUSTRIAL AND MEDICAL BIOTECHNOLOGY

1. Preparation of Tissue culture media.
2. Sterilization of plant material.
3. Seed Germination, Root, Shoot and Callus Culture.
4. Determination of total dissolved solids of water.
5. Determination of DO, BOD, COD of water.
6. Determination of Coliform by MPN Test.
7. Production of Enzymes/Antibiotics/Acids.
8. Effect of Biopesticides on microorganism
9. Antigen Antibody interaction- Determination of Blood Group and Rh factor.
10. Widal Test
11. VDRL Test.
12. ELISA Test.
13. Perform of Immuno-diffusion



SHAHEED NANDKUMAR PATEL VISHWAVIDYALAYA RAIGARH (C.G.)

SCHEME FOR PRACTICAL EXAMINATION

Time: 4 hrs.

MM-50

1. Experiment based on Paper - I

(i) Plant tissue culture

08 marks

(ii) Environment / Industrial

07marks

2. Experiment based on Paper - II

15 marks

3. Spots

10marks

4. *Viva-voce*

05marks

5. Sessional/ Record

05marks



REFERENCE BOOKS

1. Physical chemistry, G.M.Barrow. International Student Edition McGraw Hill.
2. University General Chemistry, CNR Rao, Macmillan.
3. Physical Chemistry R.A.Alberty, Wiley Eastn.
4. The elements of Physical Chemistry P.W.Alkin,Oxford.
5. Physical Chemistry through problems, S.K.Dogra, Wiley Eastern.
6. Physical Chemistry B.D.Khosla.
7. Physical Chemistry, Puri & Sharma.
8. Bhoutic Rasayan, Puri & Sharma.
9. Bhoutic Rasayan, P.L.Soni.
10. Bhoutic Rasayan, Bahl & Tuli.
11. Physical Chemistry, R.L.Kapoor, Vol- I-IV.
12. Introduction to quantum chemistry,A.K.Chandra,Tata McGraw Hill.
13. Quantum Chemistry,Ira N.Levine, Prentice Hall.



**SHÀHEED NANDKUMAR PATEL VISHWAVIDYALAYA RAIGARH (C.G.)
B.SC.-III (BOTANY) PAPER –I**

**(ANALYTICAL TECHNOLOGY PLANT PATHOLOGY,
EXPERIMENTAL EMBRYOLOGY, ELEMENTARY BIOSTATISTICS,
ENVIRONMENTAL POLLUTION AND CONSERVATION)**

UNIT-I

Structure, Principle and applications of analytical instrumentation.

Chromatography technique, Oven, Incubator, Autoclave, Centrifuge, Spectrophotometere

UNIT-II

Plant Tissue culture techniques, growth media, totipotency, protoplast culture, somatic hybrids and cybrids, micropropagation , somaclonal variations, haploid culture.

Analytical techniques: Microscopy-Light microscope, Electron microscope

UNIT-III

General principles of plant pathology, general symptoms of fungal, bacterial and viral diseases, mode of infection, diseases resistance and control measures, plant quarantine. A study of epidemiology and etiology of following plant diseases.

Rust diseases of wheat, Tikka diseases of ground nut, Red rot of sugar can, Bacterial blight of rice, Yellow vein mosaic of b hindi, Little leaf of brinjal.

UNIT-IV

Introduction to pollution, green house gases, Ozone depletion, Dissolve oxygen, B.O.D., C.O.D.

Bio magnification, Eutrophication, Acid precipitation, Phytoremediation, Plant indicators, Biogeographical Zones of India, Concept of biodiversity, CBD, MAB, National parks and biodiversity Hot spots, Conservation strategies, Red Data Book, IUCN threat categories, invasive species, endemic species, concept of sustainable development.

UNIT-V

ELEMENTARY BIOSTATISTICS:

Introduction and application of Biostatics, measure of central tendency-Mean, Median, Mode, measures of dispersal-Standard deviation, standard error.

Books Recommended:

Singh, RS, *Plant Diseases*, Oxford & IBH, New Delhi.

Pandey, BP, *Plant Pathology*, S.Chand Publishing, New Delhi

Sharma, PD, *Microbiology and Plant pathology*, Rastogi Publications, Meerut

Sharma PD, *Mycology and Phytopathology*, Rastogi Publications, Meerut

Singh JS, Singh SP and Gupta, SR, *Ecology Environmental Science and Conservation*, S. Chand Publishing, New Delhi

Sharma, PD. *Ecology and Environment*, Rastogi Publications, Meerut

Bhojwani, SS and Razdan, MK, *Plant Tissue Culture:Theory and Practices*, Elsevier

Sharma AK, *Text book of Biostatistics*, Discovery Publishing House Pvt. Ltd.



SHAHEED NANDKUMAR PATEL VISHWAVIDYALAYA RAIGARH (C.G.)

B.Sc.-III (BOTANY) PAPER –II

**(GENETICS, MOLECULAR BIOLOGY, BIOTECHNOLOGY AND
BIOCHEMISTRY)**

UNIT-I

Cell and cell organelles, organization and morphology of chromosomes, giant chromosomes, cell division, Mendel's laws, gene interactions, linkage and crossing over, chromosomal aberration, polyploidy, sex linked inheritance, sex determination, cytoplasmic inheritance, gene concept: cistron, muton, recon.

UNIT-II

Nucleic acids, structure and forms of DNA and RNA, DNA/RNA as genetic material, replication of DNA, biochemical and molecular basis of mutation, genetic code and its properties, mechanism of transcription and translation in prokaryotes, regulation of gene expression, Operon model.

UNIT-III

Recombinant DNA, Enzymes in recombinant DNA technology, cloning vectors (Plasmid, Bacteriophages, Cosmids, Phagemids), gene cloning, PCR, Application of Biotechnology; G.M.Plants, Monoclonal antibodies, DNA finger printing

UNIT-IV

Protein: Chemical composition, primary, secondary and tertiary structure of Proteins.

Carbohydrate: general account of monosaccharides, disaccharids and Polysaccharides

Fat: Structure and properties of fats and fatty acids, synthesis and breakdown.

UNIT-V

ENZYMES: Nomenclature and classification, components of enzyme, theories of enzyme action, enzyme kinetics (Michaelis-Menten constant), allosteric enzymes, isozymes, Abzymes. Ribozymes, factors affecting enzyme activity.

Books Recommended:

Nelson, DL, Cox, MM, Lehninger *Principles of Biochemistry*, W.H. freeman and Company, New York, USA.

Cooper, GM, *The Cell: A Molecular Approach*, ASM Press & Sunderland, Washington, D.C. Sinauer Associates, MA.

Singh BD, *Fundamental of Genetics*, Kalyani Publication

Singh BD, *Genetics*, Kalyani Publication

Gupta, PK, *Cell and Molecular Biology*, Rastogi Publications, Meerut

Singh, BD, *Biotechnology: Expanding Horizons*, Kalyani publications

Gupta, PK, *Elements of Plant Biotechnology*, Rastogi Publications, Meerut

Gupta, SN, *Concepts of Biochemistry*, Rastogi Publications, Meeru

Jain, JL., Jain S, Jain, N, *Fundamentals of Biochemistry*, S Chand Publishing, New Delhi

B.Sc.-III (Botany)

Practical

1. Study of host parasite relationship of plant diseases listed above.
2. Demonstration of preparation of Czapek's Dox medium and Potato dextrose agar medium, sterilization of culture medium and pouring.
3. Inoculation in culture tubes and petriplates.
4. Gram Staining.
5. Microscopic examination of Curd.
6. Study of plant diseases as listed in the theory paper.
7. Biochemical test of carbohydrate and protein.
8. Instrumentation techniques



SHAHEED NANDKUMAR PATEL VISHWAVIDYALAYA RAIGARH (C.G.)

PRACTICAL SCHEME

TIME: 4 Hrs.

M.M. : 50

1.	Plant Disease/Symptoms	10
2.	Instrumentation techniques	05
3.	Staining of Microbes	05
4.	Tissue Culture techniques	05
5.	Spotting	10
6.	Project Work/ Field Study	05
5.	Viva-Voce	05
6.	Sessional	05



SHAHEED NANDKUMAR PATEL VISHWAVIDYALAYA RAIGARH (C.G.)

NEW CURRICULUM OF B.Sc. PART III

CHEMISTRY

The new curriculum will comprise of three papers of 33, 33 and 34 marks each and practical work of 50 marks. The Curriculum is to be completed in 180 working days as per UGC norms and conforming to the directives of Govt. of Chhattisgarh. The theory papers are of 60 hrs. each duration and practical work of 180 hrs duration.

Paper – I **INORGANIC CHEMISTRY** **60 Hrs., Max Marks 33**

UNIT-I

METAL-LIGAND BONDING IN TRANSITION METAL COMPLEXES

(A) Limitations of valence bond theory, Limitation of Crystal Field Theory, Application of CFSE, tetragonal distortions from octahedral geometry, Jahn–Teller distortion, square planar geometry. Qualitative aspect of Ligand field and MO Theory.

(B) Thermodynamic and kinetic aspects of metal complexes. A brief outline of thermodynamic stability of metal complexes and factors affecting the stability, substitution reactions of square planar complexes, Trans- effect, theories of trans effect. Mechanism of substitution reactions of square planar complexes.

UNIT-II

MAGNETIC PROPERTIES OF TRANSITION METAL COMPLEXES

Types of magnetic behavior, methods of determining magnetic susceptibility, spin only formula, L-S coupling, correlation of $\mu_{\text{so}}(\text{spin only})$ and μ_{eff} values, orbital contribution to magnetic moments, application of magnetic moment data for 3d metal complexes.

Electronic spectra of Transition Metal Complexes.

Types of electronic transitions, selection rules for d-d transitions, spectroscopic ground states, spectro-chemical series. Orgel-energy level diagram for d^1 and d^2 states, discussion of the electronic spectrum of $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ complex ion.

UNIT-III

ORGANOMETALLIC CHEMISTRY

Definition and classification of organometallic compounds on the basis of bond type. Concept of hapticity of organic ligands. Metal carbonyls: 18-electron rule, electron count of mononuclear,

polynuclear and substituted metal carbonyls of 3d series. General methods of preparation (direct combination, reductive carbonylation, thermal and photochemical decomposition) of mono and binuclear carbonyls of 3d series.

Structures of mononuclear and binuclear carbonyls of Cr, Mn, Fe, Co and Ni using VBT. π -acceptor behavior of CO (MO diagram of CO to be discussed), Zeise's salt: Preparation and structure.

Catalysis by Organometallic Compounds –

Study of the following industrial processes and their mechanism :

1. Alkene hydrogenation (Wilkinsons Catalyst)
2. Polymeration of ethane using Ziegler – Natta Catalyst

UNIT-IV

BIOINORGANIC CHEMISTRY

Essential and trace elements in biological processes, Excess and deficiency of some trace metals, Toxicity of some metal ions (Hg, Pb, Cd and As), metalloporphyrins with special reference to hemoglobin and myoglobin. Biological role of alkali and alkaline earth metals with special reference to Ca^{2+} and Mg^{2+} , nitrogen fixation.

UNIT-V

HARD AND SOFT ACIDS AND BASES (HSAB) Classification of acids and bases as hard and soft. Pearson's HSAB concept, acid-base strength and hardness and softness. Symbiosis, Applications of HSAB principle.

INORGANIC POLYMERS

Types of inorganic polymers, comparison with organic polymers, synthesis, structural aspects and applications of silicones. Silicates, phosphazenes and polyphosphate.

REFERENCE BOOKS

1. Basic Inorganic Chemistry, F. A. Cotton, G. Wilkinson and P. L. Gaus, Wiley.
2. Concise Inorganic Chemistry, J. D. Lee, ELBS.
3. Concepts of Models of Inorganic Chemistry, B. Douglas, D. Mc Daniel and J. Alexander, John Wiley.
4. Inorganic Chemistry, D. E. Shriver, P. W. Atkins and C. H. Langford, Oxford.

5. Inorganic Chemistry, W. W. Porterfield, Addison – Wiley.
6. Inorganic Chemistry, A. G. Sharp, ELBS.
7. Inorganic Chemistry, G. L. Miessler and D. A. Tarr, Prentice Hall.
8. Advanced Inorganic Chemistry, Satya Prakash.
9. Advanced Inorganic Chemistry, Agarwal and Agarwal.
10. Advanced Inorganic Chemistry, Puri, Sharma, S. Naginchand.
11. Inorganic Chemistry, Madan, S. Chand.
12. Aadhunik Akarbanic Rasayan, A. K. Shrivastav & P. C. Jain, Goel Pub.
13. Uchchattar Akarbanic Rasayan, satya Prakash & G. D. Tuli, Shyamal Prakashan.
14. Uchchattar Akarbanic Rasayan, Puri & Sharma.
15. Selected topic in Inorganic Chemistry by Madan Malik & Tuli, S. Chand.



UNIT-I HETEROCYCLIC COMPOUNDS

Classification and nomenclature, Structure, aromaticity in 5-membered and 6-membered rings containing one heteroatom; Synthesis, reactions and mechanism of substitution reactions of: Furan, Pyrrole (Paal-Knorr synthesis, Knorr pyrrole synthesis, Hantzsch synthesis), Thiophene, Pyridine (Hantzsch synthesis), Indole (Fischer indole synthesis and Madelung synthesis), Quinoline and isoquinoline, (Skraup synthesis, Friedlander's synthesis, Knorr quinoline synthesis, Doebner-Miller synthesis, Bischler-Napieralski reaction, Pictet- Spengler reaction, Pomeranz-Fritsch reaction).

UNIT II

A. ORGANOMETALLIC REAGENT

Organomagnesium compounds: Grignard reagents formation, structure and chemical reactions.

Organozinc compounds: formation and chemical reactions.

Organolithium compounds: formation and chemical reactions.

B. ORGANIC SYNTHESIS VIA ENOLATES

Active methylene group, alkylation of diethylmalonate and ethyl acetoacetate, Synthesis of ethyl acetoacetate: The Claisen condensation. Keto-enol tautomerism of ethyl acetoacetate.

Robbinson annulations reaction.

UNIT-III BIOMOLECULES

A. CARBOHYDRATES

Occurrence, classification and their biological importance. Monosaccharides: relative and absolute configuration of glucose and fructose, epimers and anomers, mutarotation, determination of ring size of glucose and fructose, Haworth projections and conformational structures; Interconversions of aldoses and ketoses; Killiani Fischer synthesis and Ruff degradation; Disaccharides – Structural comparison of maltose, lactose and sucrose.

Polysaccharides – Elementary treatment of starch and cellulose.

B. AMINO ACIDS, PROTEINS AND NUCLEIC ACIDS

Classification and Nomenclature of amino acids, Configuration and acid base properties of

amino acids, Isoelectric Point, Peptide bonds, Protein structure, denaturation/ renaturation, Constituents of nucleic acid, DNA, RNA nucleoside, nucleotides, double helical structure of DNA.

UNIT-IV

SYNTHETIC POLYMERS

A. Addition or chain growth polymerization, Free radical vinyl polymerization, Ziegler-Natta polymerization, Condensation or Step growth polymerization, polyesters, polyamides, phenols- formaldehyde resins, urea-formaldehyde resins, epoxy resins and polyurethanes, natural and synthetic rubbers.

B. SYNTHETIC DYES

Colour and constitution (Electronic Concept). Classification of Dyes. Chemistry of dyes. Chemistry and synthesis of Methyl Orange, Congo Red, Malachite Green, Crystal Violet, phenolphthalein, fluorescein, Alizarine and Indigo.

UNIT-V

A. INFRA-RED SPECTROSCOPY

Basic principle, IR absorption Band their position and intensity, IR spectra of organic compounds.

B. UV-VISIBLE SPECTROSCOPY

Beer Lambert's law, effect of Conjugation, Types of electronic transitions λ_{\max} , Chromophores and Auxochromes, Bathochromic and Hypsochromic shifts, Intensity of absorption Visible spectrum and colour.

C. NMR SPECTROSCOPY

Basic principles of Proton Magnetic Resonance, Tetramethyl silane (TMS) as internal standard, chemical shift and factors influencing it; Spin – Spin coupling and coupling constant (J); Anisotropic effects in alkene, alkyne, aldehydes and aromatics, Interpretation of NMR spectra of simple organic compounds. ¹³CMR spectroscopy: Principle and applications.

REFERENCE BOOKS

1. Organic Chemistry, Morrison and Boyd, Prentice-Hall.
2. Organic Chemistry, L. G. Wade Jr. Prentice Hall.

3. Fundamentals of Organic Chemistry, Solomons, John Wiley.
4. Organic Chemistry, Vol I, II, III S. M. Mukherjee, S. P. Singh and R. P. Kapoor, Wiley Easters (New Age).
5. Organic Chemistry, F. A. Carey, McGraw Hill.
6. Introduction to Organic Chemistry, Struiweisser, Heathcock and Kosover, Macmillan.
7. Acheson, R.M. Introduction to the Chemistry of Heterocyclic compounds, John Wiley & Sons (1976).
8. Graham Solomons, T.W. Organic Chemistry, John Wiley & Sons, Inc.
9. McMurry, J.E. Fundamentals of Organic Chemistry, 7th Ed. Cengage Learning IndiaEdition, 2013.
10. Kalsi, P. S. Textbook of Organic Chemistry 1st Ed., New Age International (P) Ltd. Pub.
11. Clayden, J.; Greeves, N.; Warren, S.; Wothers, P.; Organic Chemistry, Oxford University Press.



UNIT-I

QUANTUM MECHANICS–I

Black-body radiation, Planck's radiation law, photoelectric effect, Compton effect. Operator: Hamiltonian operator, angular momentum operator, Laplacian operator, postulate of quantum mechanics, eigen values, eigen function, Schrodinger time independent wave equation, physical significance of ψ & ψ^2 , application of Schrodinger wave equation to particle in a one dimensional box, hydrogen atom (separation into three equations) radial and angular wave functions.

UNIT-II

A. QUANTUM MECHANICS–II

Quantum Mechanical approach of Molecular orbital theory, basic ideas-criteria for forming M.O. and A.O., LCAO approximation, formation of H_2^+ ion, calculation of energy levels from wave functions, bonding and antibonding wave functions, Concept of σ , σ^* , π , π^* orbitals and their characteristics, Hybrid orbitals- sp , sp^2 , sp^3 Calculation of coefficients of A.O.'s used in these hybrid orbitals.

Introduction to valence bond model of H_2 , comparison of M.O. and V.B. models. Huckel theory, application of Huckel theory to ethene, propene, etc.

UNIT III

SPECTROSCOPY

Introduction: Characterization of Electromagnetic radiation, regions of the spectrum, representation of spectra, width and intensity of spectral transition, Rotational Spectrum of Diatomic molecules. Energy levels of a rigid rotor, selection rules, determination of bond length, qualitative description of non-rigid rotator, isotopic effect.

Vibrational Spectroscopy: Fundamental vibration and their symmetry vibrating diatomic molecules, Energy levels of simple harmonic oscillator, selection rules, pure vibrational spectrum, determination of force constant, anharmonic oscillator

Raman spectrum: Concept of polarizability, quantum theory of Raman spectra, stokes and antistokes lines, pure rotational and pure vibrational Raman spectra. Applications of Raman Spectra.

Electronic Spectroscopy: Basic principles, Electronic Spectra of diatomic molecule, Franck-

Condon principle, types of electronic transition, application of electronic spectra.

UNIT-IV

ELECTROCHEMISTRY-I

- A.** Electrolytic conductance: Specific and equivalent conductance, measurement of equivalent conductance, effect of dilution on conductance, Kohlrausch law, application of Kohlrausch law in determination of dissociation constant of weak electrolyte, solubility of sparingly soluble electrolyte, absolute velocity of ions, ionic product of water, conductometric titrations.
- B.** Theories of strong electrolyte: limitations of Ostwald's dilution law, weak and strong electrolytes, Elementary ideas of Debye-Huckel-Onsager's equation for strong electrolytes, relaxation and electrophoretic effects.
- C.** Migration of ions: Transport number, Determination by Hittorf method and moving boundary method, ionic strength.

UNIT-V

ELECTROCHEMISTRY-II

- A.** Electrochemical cell and Galvanic cells – reversible and irreversible cells, conventional representation of electrochemical cells, EMF of the cell and effect of temperature on EMF of the cell, Nernst equation Calculation of ΔG , ΔH and ΔS for cell reactions.
- B.** Single electrode potential : standard hydrogen electrode, calomel electrode, quinhydrone electrode, redox electrodes, electrochemical series
- C.** Concentration cell with and without transport, liquid - junction potential, application of concentration cells in determining of valency of ions, solubility product and activity coefficient
- D.** Corrosion-types, theories and prevention

REFERENCE BOOKS

1. Physical chemistry, G.M.Barrow. International Student Edition McGraw Hill.
2. University General Chemistry, CNR Rao, Macmillan.
3. Physical Chemistry R.A.Alberty, Wiley Eastn.
4. The elements of Physical Chemistry P.W.Alkin,Oxford.
5. Physical Chemistry through problems, S.K.Dogra, Wiley Eastern.
6. Physical Chemistry B.D.Khosla.
7. Physical Chemistry, Puri & Sharma.
8. Bhoutic Rasayan, Puri & Sharma.
9. Bhoutic Rasayan, P.L.Soni.
10. Bhoutic Rasayan, Bahl & Tuli.
11. Physical Chemistry, R.L.Kapoor, Vol- I-IV.
12. Introduction to quantum chemistry,A.K.Chandra,Tata McGraw Hill.
13. Quantum Chemistry,Ira N.Levine, Prentice Hall.



INORGANIC CHEMISTRY

Gravimetric analysis:

- Estimation of nickel (II) using Dimethylglyoxime (DMG).
- Estimation of copper as CuSCN
- Estimation of iron as Fe_2O_3 by precipitating iron as $\text{Fe}(\text{OH})_3$.
- Estimation of Al (III) by precipitating with oxine and weighing as $\text{Al}(\text{oxine})_3$ (aluminium oxinate).
- Estimation of Barium as BaSO_4

Inorganic Preparations:

- Tetraamminecopper (II) sulphate, $[\text{Cu}(\text{NH}_3)_4]\text{SO}_4 \cdot \text{H}_2\text{O}$
- Cis and trans $\text{K}[\text{Cr}(\text{C}_2\text{O}_4)_2 \cdot (\text{H}_2\text{O})_2]$ Potassium dioxalatodiaquachromate(III)
- Tetraamminecarbonatocobalt (III) ion
- Potassium tris(oxalate)ferrate(III)/ Sodium tris(oxalate)ferrate(III)
- Cu(I) thiourea complex, Bis (2,4-pentanedionate) zinc hydrate; Double salts (Chrome alum/ Mohr's salt)

ORGANIC CHEMISTRY

1. Preparation of organic Compounds

- Acetylation of one of the following compounds: amines (aniline, o-, m-, p- toluidines and o-,m-, p-anisidine) and phenols (β -naphthol, vanillin, salicylic acid)
- Benzoylation of one of the following amines (aniline, o-, m-, p- toluidines and o-, m-, panisidine) and one of the following phenols (β -naphthol, resorcinol, p cresol) by Schotten-Baumann reaction.
- Bromination of any one of the following: a. Acetanilide by conventional methods b. Acetanilide using green approach (Bromate-bromide method)
- Nitration of any one of the following: a. Acetanilide/nitrobenzene by conventional method b. Salicylic acid by green approach (using ceric ammonium nitrate).
- Reduction of p-nitrobenzaldehyde by sodium borohydride.
- Hydrolysis of amides and esters.
- Semicarbazone of any one of the following compounds: acetone, ethyl methyl ketone, cyclohexanone, benzaldehyde.

- Benzylisothiuronium salt of one each of water soluble and water insoluble acids (benzoic acid, oxalic acid, phenyl acetic acid and phthalic acid).
- Aldol condensation using either conventional or green method.
- Benzil-Benzilic acid rearrangement.
- Preparation of sodium polyacrylate.
- Preparation of urea formaldehyde.
- Preparation of methyl orange.

The above derivatives should be prepared using 0.5-1g of the organic compound. The solid samples must be collected and may be used for recrystallization, melting point and TLC.

2. Qualitative Analysis Analysis of an organic mixture containing two solid components using water, NaHCO_3 , NaOH for separation and preparation of suitable derivatives.
3. Extraction of caffeine from tea leaves.
4. Analysis of Carbohydrate: aldoses and ketoses, reducing and non-reducing sugars.
5. Identification of simple organic compounds by IR spectroscopy and NMR spectroscopy. (Spectra to be provided).
6. Estimation of glycine by Sorenson's formalin method.
7. Study of the titration curve of glycine.
8. Estimation of proteins by Lowry's method.
9. Study of the action of salivary amylase on starch at optimum conditions.
10. Effect of temperature on the action of salivary amylase.

PHYSICAL CHEMISTRY

Conductometry

- Determination of cell constant
- Determination of equivalent conductance, degree of dissociation and dissociation constant of a weak acid.
- Perform the following conductometric titrations:
 - i. Strong acid vs. strong base
 - ii. Weak acid vs. strong base
 - iii. Mixture of strong acid and weak acid vs. strong base
 - iv. Strong acid vs. weak base
- To determine the strength of the given acid conductometrically using standard alkali solution.
- To determine the solubility and solubility product of a sparingly soluble electrolyte conductometrically
- To study the saponification of ethyl acetate conductometrically.

Potentiometry/pH metry

Perform the following potention/pH metric titrations:

- i. Strong acid vs. strong base
- ii. Weak acid vs. strong base
- iii. Dibasic acid vs. strong base
- iv. Potassium dichromate vs. Mohr's salt
- v. Determination of pKa of monobasic acid

UV/ Visible spectroscopy

- Verify Lambert-Beer's law and determine the concentration of $\text{CuSO}_4/\text{KMnO}_4/\text{K}_2\text{Cr}_2\text{O}_7$ in a solution of unknown concentration
- Determine the concentrations of KMnO_4 and $\text{K}_2\text{Cr}_2\text{O}_7$ in a mixture.
- Study the kinetics of iodination of propanone in acidic medium.
- Determine the amount of iron present in a sample using 1,10-phenanthroline.
- Determine the dissociation constant of an indicator (phenolphthalein).
- Study the kinetics of interaction of crystal violet/ phenolphthalein with sodium hydroxide.
- Study of pH-dependence of the UV-Vis spectrum (200-500 nm) of potassium dichromate.
- Spectral characteristics study (UV) of given compounds (acetone, acetaldehyde, acetic acid, etc.) in water.
- Absorption spectra of KMnO_4 and $\text{K}_2\text{Cr}_2\text{O}_7$ (in 0.1 M H_2SO_4) and determine λ_{max} values.

Note: Experiments may be added/deleted subject to availability of time and facilities

REFERENCE BOOKS:

1. Vogel, A.I. Quantitative Organic Analysis, Part 3, Pearson (2012).31
2. Mann, F.G. & Saunders, B.C. Practical Organic Chemistry, Pearson Education (2009)
3. Furniss, B.S.; Hannaford, A.J.; Smith, P.W.G.; Tatchell, A.R. Practical Organic Chemistry, 5th Ed., Pearson (2012)
4. Ahluwalia, V.K. & Aggarwal, R. Comprehensive Practical Organic Chemistry: Preparation and Quantitative Analysis, University Press (2000).
5. Ahluwalia, V.K. & Dhingra, S. Comprehensive Practical Organic Chemistry: Qualitative Analysis, University Press (2000)
6. Manual of Biochemistry Workshop, 2012, Department of Chemistry, University of Delhi.



8 Hrs.

PRACTICAL EXAMINATION

M.M.50

Five experiments are to be performed.

1. **Inorganic** - Two experiments to be performed. Gravimetric estimation compulsory

08 marks. (Manipulation 3 marks)

Anyone experiment from synthesis and analysis

04 marks.

2. **Organic** - Two experiments to be performed. Qualitative analysis of organic mixture containing two solid components. compulsory carrying **08 marks** (03 marks for each compound and two marks for separation).

One experiment from synthesis of organic compound (Single step)

04 marks.

3. Physical-One physical experiment

12 marks.

4. Sessional

04 marks.

5. Viva Voce

10 marks.

In case of Ex-Students one mark each will be added to Gravimetric analysis and Qualitative analysis of organic mixture and two marks in Physical experiment.



SHAHEED NANDKUMAR PATEL VISHWAVIDYALAYA RAIGARH (C.G.)

COMPUTTER SCIENCE

PAPER - I

(Paper Code-0909)

COMPUTER HARDWARE PART-C

AIM : The emphasis is on the design concepts & organisational details of the common PC, leaving the complicated Electronics of the system to the computer engineers.

Objective of the Course :

1. To introduce the overall organisation of the microcomputers and operating systems.
2. To introduce the interaction of common devices used with computers with operating softwares, excluding the Assembly languages, with special reference to DOS/WINDOWS.
3. To introduce the working of hardware components, Micro-Processor and various chips used in micro-computers by operating system, without the use of electronic circuitry.
4. To introduce the use of operating systems architecture with IBM-PC & clones, excluding Assembly language, with forms an important part of hardwares.

N.B. : Since the computer organisation study is very vast & complicated, so the study is restricted only to the description and understanding part, hence the paper-setter is requested to keep this important factor in mind.

UNIT-1 : ORGANISATION OF Micro-Processor & MIRCO-COMPUTER :-

1. Introduction & organisation of M micro-Computer :

- (a) Basic Components of Micro-computer : Basic Block; Prom ram memory; Data memory; I/O Ports; Clock generator; Integration of functional blocks.
- (b) Interconnecting Components in a Micro-computer : Necessary functional block; Bussed architecture for microcomputer; memory addressing; Ad-dressing I/O ports; comparision of I/O mapped and memory mapped I/O.
- (c) Input Output Techniques : Non-CPU devices, Program & interrupt controlled I/O; Hardware controlled I/O or DMA.

2. An Introduction to the various as :

- (a) General understanding of different μP or CPU : Intel 8088, 286, 386, 486, 586 Pentium, P54C, MMX P55C; Motorola 6800 & 88100 series; CYRIX & AMD CPUs.
- (b) The Registers of CPU : (Give Example of P-8088) Register organisation of 8088, Scrach pad segment, pointer, Index and Flag, Registers.
- (c) Memory addressing modes of P-8088 : Segment offset; Data addressing modes; Addressing for branch instructions.
- (d) I/O Addressing with P-8088 : Memory mapped I/O & I/O mapped I/O.

UNIT-2 : SYSTEM HARDWARE ORGANISATION OF COMPUTERS :

1. Hardware Organisation of the Personal Computer :

- (a) Block diagram with various parts of PC.
- (b) The Mother Board of General P.C. : 8088 CPU; ROM & RAM; Keyboard

& its interface; System timer/counters; Hardware interrupt vectoring; DMA controller & channels; Interfacing to audio speaker; Bus slots & factory cards.

- (c) The Serial I/O ports, COM-1 & COM-2.
- (d) The parallel Port for Printer.
- (e) Expansion Slots for RAM.
- (f) Disk Controllers : For floppy, Hard disk, CD-ROM & Cassets drives.

2. The Video Display of PCs :

- (a) Video Monitors; Monochrome and colour.
- (b) Video Display Adapters & Their Video Modes; Monochrome & colour graphics adapters.
- (c) Video Control Through ANSI-SYS.
- (d) Video Control Through ROM-BOIS : INT 10H.
- (e) Direct Video Control; Monochrome & colour graphics adapters.
- (f) Installing Customized Character Sets.

UNIT-3 : ORGANISATION OF OPERATING SYSTEM WITH SYSTEM HARDWARE :

1. The ROM-BIOS Services :

- (a) Introduction to UNIX, ENIX, SUN, solaris, DOS & MAC with special reference to DOS & Windows, its ver., as DOS becomes more popular than others in PCs.
- (b) The ROM-BIOS Diskette Services, INT 13H.
- (c) The ROM-BIOS Serial Port Services, INT 14H.
- (d) The ROM-BIOS Keyboard Services, INT 16H.
- (e) The ROM-BIOS Printer Services, INT 17H.
- (f) Miscellaneous Service Provided by the ROM-BIOS : INT 05H, INT 11H, INT 12H, INT 18H, INT 19H, INT 1AH.

2. The fundamental of Operating System viz. DOS/WINDOWS :

- (a) The loading of DOS & Its Basic Structure ; ROM bootstrap, IO.SYS, DOS.SYS & Command.COM.
- (b) The Execution of the programs under DOS ; EXEC functions, program segment prefix; Features of COM & EXE program files.
- (c) Device Handling by Dos ; FDD, HDD, CON, Keyboard, PRN, AUX, CLOCK and NUL devices; Block devices; Character devices; Driver installation sequence.
- (d) File Structures of DOS ;
- (e) The DOS Interrupts : INT 20H-2FH
- (f) The DOS functions through INT 21H; Discuss only the understanding part of various other DOS function to handle hard & softwares.
- (g) Installation of windows : Important system files in windows.

UNIT-4 : ORGANIZATION & HANDLING BY OPERATING SYSTEMS :

1. Disk and Files under DOS :

- (a) Logical Structure of a Disk : Organisation of disk for use; Boot record ; FAT

files; disk or root directory.

- (b) File Organisation on a DOS disk : Logical volumes ; Sub directories; Volume labels.
- (c) Manipulating Files under DOS : File attributes ; date and time, file Access; FCB functions.

2 Memory Allocation, Program Loading and Execution :

- (a) Memory Management under DOS : EXEC loader; Memory Management & its functions; Modifying a Program's memory allocation.
- (b) Loading and Executing Programs under DOS : The EXEC function ; Memory considerations; parameter blocks; calling & returning from EXEC.
- (c) Loading the program overlays through EXEC.

UNIT-5 : ORGANISATION OF HARDWARE BY OPERATING SYSTEM :

1 Interrupt Handling through DOS :

- (a) Types of interrupts.
- (b) Interrupt Vector Table in PC.
- (c) Interrupt Service Routines.
- (d) Special Interrupts in PC : Clock Interrupt; The -C or Break Interrupt ; DOS reserved interrupt INT 28H ; Patching memory resident routines.

2. Filters for DOS :

- (a) Filters in operating systems.
- (b) Redirection of I/O under DOS.
- (c) The Filters Supplied with DOS.
- (d) Writing Filters to run under DOS.

3. Handling of Various Versions of Windows O.S. :

- (a) Setup Installation
- (b) Trouble shooting
- (c) Networking features

Text Book :

- 1 Hardware and Software of Personal Computers.
By Sanjay K. Bose. (Wiley Eastern Ltd. New Delhi).

Supporting Text Books :

- 1 Digital System from Gates to Microprocessor.
By Sanjay K. Bose. (Wiley Eastern Ltd. New Delhi).
- 2 Computer Fundamentals : Architecture & Organisation.
By B. Ram.. (Wiley Eastern Ltd. New Delhi).

Reference Books :

- 1 IBM PC-XT and Clones : By Govinda Rajalu.
- 2 Microprocessor and interfacing : By Douglas Hall.
- 3 Insight the IBM-PC : Peter Norton.
- 4 Microprocessor System : 8086/8088 family architecture, programming & design : By Liu and Gibson.



SHAHEED NANDKUMAR PATEL VISHWAVIDYALAYA RAIGARH (C.G.)

PAPER - II

(Paper Code-0910)

Atm : To introduce DBMS and RDBMS using Back-end tool and Front-end tool.

Object of the Course :

1. To introduce Data Base Management System concepts.
2. To introduce the Relational Database Management System and Relational Database Design.
3. To introduce the RDBMS software and utility of query language.
4. To introduce basic concept of GUI Programming and database connectivity using Visual Basic.

UNIT-1 : CONCEPT OF D.B.M.S. AND DATA MODELS

- (a) Introduction to DBMS :- Purpose of Data base systems, views of data, Data Modeling Database Languages, Transaction management, Storage Management, Database Administrator and User, Database System Structure.
- (b) E-R Model : Basic concepts, Constraints, Keys, Mapping Constraint, E-R Diagram, Weak and Strong Entity sets, E-R Database Schema, Reduction of an E-R Schema to Table.

UNIT-2. : RELATIONAL DATABASE MANAGEMENT SYSTEM

- (a) Relational Model : Structure of Relational Database, Relational Algebra, Domain Relational Calculus, Extended Relational- Algebra Operation, Modification of database, Views.
- (b) Relational Database Design : Pitfalls in Relational Database Design, Decomposition Functional Dependencies, Normalization : 1NF, 2NF, BCNF, 3NF, 4NF, 5NF.

UNIT-3 : INTRODUCTION TO RDBMS SOFTWARE - ORACLE

- (a) Introduction : Introduction to personal and Enterprises Oracle, Data Types, Commercial Query Language, SQL, SQL*PLUS.
- (b) DDL and DML : Creating Table, Specifying Integrity Constraint, Modifying Existing Table, Dropping Table, Inserting Deleting and Updating Rows in as Table, Where Clause, Operators, ORDER BY, GROUP Function, SQL Function, JOIN, Set Operation, SQL Sub Queries. Views : What is Views, Create, Drop and Retrieving data from views.
- (c) Security : Management of Roles, Changing Password, Granting Roles & Privilege, with drawing privileges.
- (d) PL/SQL : Block Structure in PL/SQL, Variable and constants, Running PL/SQL in the SQL*PLUS, Data base Access with PL/SQL, Exception Handling, Record Data type in PL/SQL, Triggers in PL/SQL.

UNIT-4 : G.U.I. PROGRAMMING

- (a) Introduction to Visual Basic : Event Driven Programming, IDE, Introduction to Object, Controlling Objects, Models and Events, Working with Forms, MDI Form Working with standard Controls.
- (b) Overview of Variables, Declaring, Scope, Arrays, User defined data types, Constants, Working with procedures : Function, Subroutine, and Property.

Working with Data, Time, Format, String, and Math's Function. Controlling Program Execution: Comparison and Logical Operators, If...Then statements, Select Case Statement, Looping Structures, Exiting a loop. Error Trapping and Debugging.

- (c) File Organization : Saving data to file, Sequential and Random access file, the desing and coding.

UNIT-5 : V DATA BASE PROGRAMMING IN VB

- (a) Introduction :- Concept of DAO, RDO, ADO, input validation : field & form level validation, ADO object model : the ADO object Hierarchy, the connection object, the command object, record set object, parameter object, field object, record object, stream object, Error object, parameter object.
- (b) Using Bound control to Present ADO data : Using the ADO data control, ADO data control properties, binding simple controls : Data list, data combo, Data Grid, Data Form Wizard : single form wizard, Grid form, master/Detail form. Programming the ADO data control : Refresh method, Event, Hierarchical flex Grid control.
- (c) Data Environment & Data Report : Creating connection, Using command object in the data Environment, Data Environment option and operation, Binding Form to the data Environment, ADO Events in the Data report, Print Preview, Print, Export, Data report in code : Data reports Events, Binding data reports Directly.

REFERENCE BOOKS :

- 1 Data Base System Concept : By Hery F. Korth, Tata McGraw Hill
- 2 Fundamental of Data Base : Nawathe & Elmasri (Pearson educations)
System Concept
- 3 Oracle Complete Reference : By Oracle Press
- 4 Introduction to OOPS & VB : By V.K. Jain, Vikas Publishing House
- 5 Database Programming VB 6 : By B.P.B. Publication

PRACTICALS :

1 Practicals on Oracle :

At least 20 practicals covering the SQL, PL/SQL, Triggers, Views.

2 Practicals on Visual Basic :

At least 20 pracricals on VB that covering basic and data controls components.



B . S c . P a r t I I I

ELECTRONICS

Paper I

ELB 301: Industrial Electronics

Theory:

Max. Marks :50

Unit-1

Thyristors: Principles and operations of SCR, Voltage amplifier gate characteristics of SCR, Characteristics of two transistor models, Thyristor construction, Rectifier circuit using SCR, GTO, Operation and characteristics of DIAC, TRIAC, Silicon Controlled Switch, Silicon Unilateral Switch, Silicon Bilateral Switch, and Light activated SCR. Turn ON/OFF Mechanism: Basics of turn on and turn off methods

Unit-2

Applications of SCR: Multiple connections of SCR, Series operation, Triggering of series connected SCR, Parallel operation, Triggering of parallel connected SCR, SCR di/dt calculation, Snubber circuit, dv/dt calculation across SCR, Types of converters, Full wave controlled rectifier with resistive load, FWCR with inductive load, FWCR with free wheeling diode .

Unit-3

Inverters: Types of inverters, Single phase bridge inverter, Mc Murray impulse communication inverter, Single phase half bridge voltage source inverter, Single phase full bridge voltage inverter, Step down choppers, Step up choppers, Chopper classification.

Other Applications: Induction heating, Resistance welding, Over voltage protection, Zero voltage switch, SMPS, UPS, DC circuit breaker, Battery charger, AC static switch, DC static switch, Time delay, Fan regulator using TRIAC .

Unit-4

PCB Fundamentals: PCB Advantages, components of PCB, Electronic components, IC's, Surface Mount Devices (SMD). Classification of PCB - single, double, multilayer and flexible boards, Manufacturing of PCB, PCB standards.

Schematic & Layout Design: Schematic diagram, General, Mechanical and Electrical design considerations, Placing and Mounting of components, Conductor spacing, routing guidelines, heat sinks and package density, Net list, creating components for library, Tracks, Pads, Vias, power plane,



grounding, Lead cutting and Soldering Techniques, Testing and quality controls.PCB Technology Trends, Environmental concerns in PCB industry.

Unit-5

Analog/Digital Multimeter : Analog multimeter, AC and DC measurement, conversion of analog output to digital form (A/D), Dual ramp A/D converter, digital measuring system, multimeter block diagram, voltage, current and resistance measurements. Frequency counter : Elements of electronic counter, decade counting assembly temperature compensated crystal oscillator, universal counter, measurement modes; frequency measurement, period measurement, time interval measurement, measurement errors : gating errors, time base error, trigger level error.

Suggested Books:

1. Ramamourthy “ Thyristor and their applications” East-West Publishers, 2nd Edition
2. Shamir K Datta “ Power Electronics and Controllers” PHI, 3rd Edition
3. Power Electronics: Devices, Circuits and Industrial Applications
4. V.R. Moorthy Oxford University Press; First Edition edition
5. Printed circuit Board – Design & Technology by Walter C. Bosshart, Tata McGraw Hill.
6. Printed Circuit Board –Design, Fabrication, Assembly & Testing by R.S.Khandpur, TATA McGraw Hill Publisher
7. Electronics Instrumentation H.S.Kalsi McGraw Hill Education; 3 edition (1 July 2017)
8. Modern Electronic Instrumentation and Measurement Techniques Albert Helfrick and William D Cooper Prentice Hall India Learning Private Limited
9. Electronic Instrumentation and Measurements David A. Bell Oxford University Press India; Third edition (12 April 2013)



Paper II

ELB 302 :Mobile Application Programming and Introduction to VHDL

Theory:

Max. Marks: 50

Unit-1

Introduction: What is mobile Application Programming, Different Platforms, Architecture and working of Android, iOS and Windows phone 8operating system, Comparison of Android, iOS and Windows phone 8

Android Development Environment: What is Android, Advantages and Future of Android, Tools and about Android SDK, Installing Java, Eclipse, and Android, Android Software Development Kit for Eclipse, Android Development Tool: Android Tools for Eclipse, AVDs: Smartphone Emulators, Image Editing,

Unit-2

Android Software Development Platform: Understanding Java SE and the Dalvik Virtual Machine, Directory Structure of an Android Project, Common Default Resources Folders, The Values Folder, Leveraging Android XML, Screen Sizes, Launching Your Application: The AndroidManifest.xml File, Creating Your First Android Application

Android Framework Overview: The Foundation of OOP, The APK File, Android Application Components, Android Activities: Defining the User Interface, Android Services: Processing in the Background, Broadcast Receivers: Announcements and Notifications, Content Providers: Data Management, Android Intent Objects: Messaging for Components, Android Manifest XML: Declaring Your Components

Unit-3

Views and Layouts, Buttons, Menus, and Dialogs, Graphics Resources in Android: Introducing the Drawables, Implementing Images, Core Drawable Subclasses, Using Bitmap, PNG, JPEG and GIF Images in Android, Creating Animation in Android

Handling User Interface(UI) Events: An Overview of UI Events in Android, Listening for and Handling Events , Handling UI Events via the View Class, Event Callback Methods, Handling Click Events, Touchscreen Events, Keyboard Events, Context Menus, Controlling the Focus,

Unit-4

Content Providers: An Overview of Android Content Providers, Defining a Content Provider, Working with a Database



Intents and Intent Filters: What is an Intent, Implicit Intents and Explicit Intents, Intents with Activities, Intents with Broadcast Receivers **Advanced Android, New Features in Android 4.4, iOS**

Development Environment: Overview of iOS, iOS Layers, Introduction to iOS application development

Windows phone Environment: Overview of windows phone and its platform, Building windows phone application

Unit-5

Introduction to VHDL: Structure of HDL Module, Comparison of VHDL and Verilog, Introduction to Simulation and Synthesis Tools, Test Benches. VHDL Modules, Delays, data flow style, behavioral style, structural style, mixed design style, simulating design. Introduction to Language Elements, Keywords, Identifiers, White Space Characters, Comments, format. VHDL terms, describing hardware in VHDL, entity, architectures, concurrent signal assignment, event scheduling, statement concurrency, structural designs, sequential behavior, process statements, processexecution, sequential statements, architecture selection, configuration statements

Suggested Books:

1. Beginning Android 4, OnurCinar , Apress Publication
2. Professional Android 4 Application Development, Reto Meier, Wrox
3. Beginning iOS 6 Development: Exploring the iOS SDK, David Mark, Apress
4. Beginning Windows 8 Application Development, IstvánNovák, ZoltanArvai, GyörgyBalássy and David Fulop
5. Professional Windows 8 Programming: Application Development with C# and XML,Allen Sanders and Kevin Ashley, WroxPublication
6. Programming with Mobile Applications: Android, iOS, and Windows Phone 7 ,Thomas Duffy, Course Technology, Cengage Learning 2013
7. A VHDL Primer – J. Bhasker, Prentice Hall, 1999, III Edition. Verilog HDL-A guide to digital design and synthesis-Samir Palnitkar, Pearson, 2nd edition.



ELECTRONICS LABORATORY

The scheme of practical examination will be as follows-

Experiment	--	30
Viva	--	10
Sessional	--	10
Total	--	50

ELB 303P: INDUSTRIAL ELECTRONICS & PCB Design LAB (Hardware and Circuit Simulation Software)

MM-25

Max.Marks:25

1. Study of I-V characteristics of DIAC
2. Study of I-V characteristics of a TRIAC
3. Study of I-V characteristics of a SCR
4. SCR as a half wave and full wave rectifiers with R and RL loads
5. DC motor control using SCR.
6. DC motor control using TRIAC.
7. AC voltage controller using TRIAC with UJT triggering.
8. Study of parallel and bridge inverter.
9. Design of snubber circuit
10. Study of chopper circuits

Design and Fabrication of Printed Circuit Boards

1. Design automation, Design Rule Checking; Exporting Drill and Gerber Files; Drills; Footprints and Libraries Adding and Editing Pins, copper clad laminates materials of copper clad laminates, properties of laminates (electrical & physical),
2. Study of soldering techniques. Film master preparation, Image transfer, photo printing, Screen Printing, Plating techniques etching techniques,
3. Study of Mechanical Machining operations, Lead cutting and Soldering Techniques, Testing and quality controls.
4. Study of Lead cutting and Soldering Techniques, Testing and quality controls.



Suggested Books:

1. Printed circuit Board – Design & Technology by Walter C. Bosshart, Tata McGraw Hill.
2. Printed Circuit Board –Design, Fabrication, Assembly & Testing by R.S.Khandpur, TATA McGraw Hill Publisher

ELB 304 P: Mobile Application & VHDL Lab

M.M.- 25

Mobile communication Lab

1. Develop an application that uses GUI components, Font and Colors.
2. Develop an application that uses Layout Managers and event listeners.
3. Develop a native calculator application.
4. Write an application that draws basic graphical primitives on the screen.
5. Develop an application that makes use of database.
6. Develop an application that makes use of RSS Feed.
7. Implement an application that implements Multi threading.
8. Develop a native application that uses GPS location information.
9. Implement an application that writes data to the SD card.
10. Implement an application that creates an alert upon receiving a message.
11. Write a mobile application that creates alarm clock.

Introduction to VHDL

12. Write the VHDL Code & Simulate it for the following gates.
 - a. Two I/P AND Gates.
 - b. Two I/P OR Gates.
 - c. Two I/P NAND Gates
 - d. Two I/P NOR Gates.
 - e. Two I/P Ex-OR Gates.
 - f. NOT Gates
13. Write VHDL programs for the following circuits, check the wave forms and the hardware generated
 - a. Half adder b. Full adder



SHAHEED NANKUMAR PATEL VISHWAVIDYALAYA RAIGARH (C.G.)

MATHEMATICS

There shall be three theory papers. Two compulsory and one optional. Each paper carrying 50 marks is divided into five units and each unit carry equal marks.

B.Sc. Part-III PAPER - I ANALYSIS

REAL ANALYSIS

UNIT-I Series of arbitrary terms. Convergence, divergence and oscillation. Abel's and Dirichlet's test. Multiplication of series. Double series. Partial derivation and differentiability of real-valued functions of two variables. Schwarz and Young's theorem. Implicit function theorem. Fourier series. Fourier expansion of piecewise monotonic functions.

UNIT-II Riemann integral. Integrability of continuous and monotonic functions. The fundamental theorem of integral calculus. Mean value theorems of integral calculus. Improper integrals and their convergence. Comparison tests. Abel's and Dirichlet' tests. Frullani's integral. Integral as a function of a parameter. Continuity, derivability and integrability of an integral of a function of a parameter.

COMPLEX ANALYSIS

UNIT-III Complex numbers as ordered pairs. Geometrical representation of complex numbers. Stereographic projection. Continuity and differentiability of complex functions. Analytic functions. Cauchy-Riemann equations. Harmonic functions. Elementary functions. Mapping by elementary functions. Mobius transformations. Fixed points, Cross ratio. Inverse points and critical mappings. Conformal mappings.

METRIC SPACES

UNIT-IV Definition and examples of metric spaces. Neighbourhoods, Limit points, Interior points, Open and Closed sets, Closure and interior. Boundary points, Sub-space of a metric space. Cauchy sequences, Completeness, Cantor's intersection theorem. Contraction principle, construction of real numbers as the completion of the incomplete metric space of rationals. Real numbers as a complete ordered field.

UNIT-V Dense subsets. Baire Category theorem. Separable, second countable and first countable spaces. Continuous functions. Extension theorem. Uniform continuity, isometry and homeomorphism. Equivalent metrics. Compactness, sequential compactness. Totally bounded spaces. Finite intersection property. Continuous functions and Compact sets, Connectedness, Components, Continuous functions and Connected sets.

REFERENCES :

1. T.M. Apostol, Mathematical Analysis, Narosa Publishing House, New Delhi, 1985.
2. R.R. Goldberg, Real Analysis, Oxford & IBH publishing Co., New Delhi, 1970.
3. S. Lang, Undergraduate Analysis, Springer-Verlag, New York, 1983.
4. D. Somasundaram and B. Choudhary, A First Course in Mathematical Analysis, Narosa Publishing House, New Delhi, 1997.
5. Shanti Narayan, A Course of Mathematical Analysis, S. Chand & Co. New Delhi.
6. P.K. Jain and S.K. Kaushik, An introduction to Real Analysis, S. Chand & Co., New Delhi, 2000.
7. R.V. Churchill and J.W. Brown, Complex Variables and Applications, 5th Edition, McGraw- Hill, New York, 1990.
8. Mark J. Ablowitz and A.S. Fokas, Complex Variables : Introduction and Applications, Cambridge University Press, South Asian Edition, 1998.
9. Shanti Narayan, Theory of Functions of a Complex Variable, S. Chand & Co., New Delhi.
10. E.T. Copson, Metric Spaces, Cambridge University Press, 1968.
11. P.K. Jain and K. Ahmad, Metric Spaces, Narosa Publishing House, New Delhi, 1996.
12. G.F. Simmons, Introduction to Topology and Modern Analysis, McGraw-Hill, 1963.



SHAHEED NANDKUMAR PATEL VISHWAVIDYALAYA RAIGARH (C.G.)

B.Sc. Part-III PART - II ABSTRACT ALGEBRA

- UNIT-I** Group-Automorphisms, inner automorphism. Automorphism of groups and their computations, Conjugacy relation, Normaliser, Counting principle and the class equation of a finite group. Center for Group of prime-order, Abelianizing of a group and its universal property. Sylow's theorems, Sylow subgroup, Structure theorem for finite Abelian groups.
- UNIT-II** Ring theory-Ring homomorphism. Ideals and quotient rings. Field of quotients of an integral domain, Euclidean rings, polynomial rings, Polynomials over the rational field. The Eisenstein criterion, polynomial rings over commutative rings, Unique factorization domain. R unique factorisation domain implies so is $R[x_1, x_2, \dots, x_n]$. Modules, Submodules, Quotient modules, Homomorphism and Isomorphism theorems.
- UNIT-III** Definition and examples of vector spaces. Subspaces. Sum and direct sum of subspaces. Linear span, Linear dependence, independence and their basic properties. Basis. Finite dimensional vector spaces. Existence theorem for bases. Invariance of the number of elements of a basis set. Dimension. Existence of complementary subspace of a finite dimensional vector space. Dimension of sums of subspaces. Quotient space and its dimension.
- UNIT-IV** Linear transformations and their representation as matrices. The Algebra of linear transformations. The rank nullity theorem. Change of basis. Dual space. Bidual space and natural isomorphism. Adjoint of a linear transformation. Eigenvalues and eigenvectors of a linear transformation. Diagonalisation. Annihilator of a subspace. Bilinear, Quadratic and Hermitian forms.
- UNIT-V** Inner Product Spaces-Cauchy-Schwarz inequality. Orthogonal vectors. Orthogonal Complements. Orthonormal sets and bases. Bessel's inequality for finite dimensional spaces. Gram-Schmidt Orthogonalization process.

REFERENCES :

1. I.N. Herstein, Topics in Algebra, Wiley Eastern Ltd., New Delhi, 1975.
2. N. Jacobson, Basic Algebra, Vols. I & II. W.H. Freeman, 1980 (also published by Hindustan Publishing Company).
3. Shanti Narayan, A Text Book of Modern Abstract Algebra, S.Chand & Co. New Delhi.
4. K.B. Datta, Matrix and Linear Algebra, Prentice Hall of India Pvt. Ltd., New Delhi, 2000.
5. P.B. Bhattacharya, S.K. Jain and S.R. Nagpal, Basic Abstract Algebra (2nd Edition) Cambridge University Press, Indian Edition, 1997.
6. K. Hoffman and R. Kunze, Linear Algebra, (2nd Edition), Prentice Hall. Englewood Cliffs, New Jersey, 1971.
7. S.K. Jain, A. Gunawardena and P.B. Bhattacharya, Basic Linear Algebra with MATLAB. Key College Publishing (Springer-Verlag) 2001.
8. S. Kumaresan, Linear Algebra, A Geometric Approach, Prentice-Hall of India, 2000.
9. Vivek Sahai and Vikas Bist, Algebra, Narosa Publishing House, 1997.
10. I.S. Luther and I.B.S.Passi, Algebra, Vol. I-Groups, Vol. II-Rings. Narosa Publishing House (Vol. I-1996, Vol. II-1999)
11. D.S. Malik, J.N. Mordeson, and M.K. Sen, Fundamentals of Abstract Algebra, McGraw- Hill International Edition, 1997.



SHAHEED NANDKUMAR PATEL VISHWAVIDYALAYA RAIGARH (C.G.)

B.Sc. Part-III

PAPER - III - (OPTIONAL)

(I) PRINCIPLES OF COMPUTER SCIENCE

- UNIT-I** **Data Storage** - Storage of bits. Main Memory. Mass Storage. Coding Information of Storage. The Binary System. Storing integers, storing fractions, communication errors.
Data Manipulation - The Central Processing Unit. The Stored-Program Concept. Programme Execution. Other Architectures. Arithmetic/Logic Instructions. Computer- Peripheral Communication.
- UNIT-II** **Operating System and Networks** - The Evolution of Operating System. Operating System Architecture. Coordinating the Machine's Activities. Handling Competition Among Process. Networks. Networks Protocol.
Software Engineering - The Software Engineering Discipline. The Software Life Cycle. Modularity. Development Tools and Techniques. Documentation. Software Ownership and Liability.
- UNIT-III** **Algorithms** - The Concept of an Algorithm, Algorithm Representation. Algorithm Discovery. Iterative Structures. Recursive Structures. Efficiency and Correctness. (Algorithms to be implemented in C++).
Programming Languages - Historical Perspective. Traditional Programming Concepts, Program Units. Language Implementation. Parallel Computing. Declarative Computing.
- UNIT-IV** **Data Structures** - Arrays. Lists. Stacks. Queues. Trees. Customised Data Types. Object Oriented Programming.
File Structure - Sequential Files. Text Files. Indexed Files. Hashed Files. The Role of the Operating System.
Database Structure - General Issues. The Layered Approach to Database Implementation. The Relational Model. Object-Oriented Database. Maintaining Database Integrity. E-R models
- UNIT-V** **Artificial Intelligence** - Some Philosophical Issues. Image Analysis. Reasoning, Control System Activities. Using Heuristics. Artificial Neural Networks. Application of Artificial Intelligence.
Theory of Computation - Turing Machines. Computable functions. A Non computable Function. Complexity and its Measures. Problem Classification.

REFERENCES :

1. J. Glen Brookshear, Computer Science : An Overview, Addition -Wesley.
2. Stanley B. Lippman, Josee Lojoie, C++ Primer (3rd Edition), Addison-Wesley.



SHAHEED NANDKUMAR PATEL VISHWAVIDYALAYA RAIGARH (C.G.)

B.Sc. Part-III PAPER - III - (OPTIONAL) (II) DISCRETE MATHEMATICS

UNIT-I **Sets and Propositions** - Cardinality. Mathematical Induction, Principle of inclusion and exclusion. **Computability and Formal Languages** - Ordered Sets. Languages. Phrase Structure Grammars. Types of Grammars and Languages. Permutations. Combinations and Discrete Probability.

UNIT-II **Relations and Functions** - Binary Relations, Equivalence Relations and Partitions. Partial Order Relations and Lattices. Chains and Antichains. Pigeon Hole Principle.

Graphs and Planar Graphs - Basic Terminology. Multigraphs. Weighted Graphs. Paths and Circuits. Shortest Paths. Eulerian Paths and Circuits. Travelling Salesman Problem. Planner Graphs. Trees.

UNIT-III **Finite State Machines** - Equivalent Machines. Finite State Machines as Language Recognizers. **Analysis of Algorithms** - Time Complexity. Complexity of Problems. Discrete Numeric Functions and Generating Functions.

UNIT-IV **Recurrence Relations and Recursive Algorithms** - Linear Recurrence Relations with constant coefficients. Homogeneous Solutions. Particular Solution. Total Solution. Solution by the Method of Generating Functions. Brief review of Groups and Rings.

UNIT-V **Boolean Algebras** - Lattices and Algebraic Structures. Duality, Distributive and Complemented Lattices. Boolean Lattices and Boolean Algebras. Boolean Functions and Expressions. Propositional Calculus. Design and Implementation of Digital Networks. Switching Circuits.

REFERENCES :

1. C.L. Liu, Elements of Discrete Mathematics, (Second Edition), McGraw Hill, International Edition, Computer Science Series, 1986



SHAHEED NANDKUMAR PATEL VISHWAVIDYALAYA RAIGARH (C.G.)

B.Sc. Part-III

PAPER - III - (OPTIONAL)

(III) PROGRAMMING IN C AND NUMERICAL ANALYSIS

(Theory & Practical)

Theory component will have maximum marks 30.

Practical component will have maximum marks 20.

UNIT-I Programmer's model of a computer. Algorithms. Flow Charts. Data Types. Arithmetic and input/output instructions. Decisions control structures. Decision statements. Logical and Conditional operators. Loop. Case control structures. Functions. Recursions. Preprocessors. Arrays. Puppeting of strings. Structures. Pointers. File formatting.

Numerical Analysis

UNIT-II **Solution of Equations:** Bisection, Secant, Regula Falsi, Newton's Method, Roots of Polynomials. **Interpolation:** Lagrange and Hermite Interpolation, Divided Differences, Difference Schemes, Interpolation Formulas using Differences. Numerical Differentiation. Numerical Quadrature: Newton-Cote's Formulas. Gauss Quadrature Formulas, Chebychev's Formulas.

UNIT-III **Linear Equations:** Direct Methods for Solving Systems of Linear Equations (Guass Elimination, LU Decomposition, Cholesky Decomposition), Iterative Methods (Jacobi, GaussSeidel, Relaxation Methods).

The Algebraic Eigenvalue problem: Jacobi's Method, Givens' Method, Householder's Method, Power Method, QR Method, Lanczos' Method.

UNIT-IV **Ordinary Differential Equations:** Euler Method, Single-step Methods, Runge-Kutta's Method, Multi-step Methods, Milne-Simpson Method, Methods Based on Numerical Integration, Methods Based on Numerical Differentiation, Boundary Value Problems, Eigenvalue Problems.

Approximation: Different Types of Approximation, Least Square Polynomial Approximation, Polynomial Approximation using Orthogonal Polynomials, Approximation with Trigonometric Functions, Exponential Functions, Chebychev Polynomials, Rational Functions.

Monte Carlo Methods

Unit-V Random number generation, congruential generators, statistical tests of pseudo-random numbers. Random variate generation, inverse transform method, composition method, acceptance rejection method, generation of exponential, normal variates, binomial and Poisson variates.

Monte Carlo integration, hit or miss Monte Carlo integration, Monte Carlo integration for improper integrals, error analysis for Monte Carlo integration.

REFERENCES :

1. Henry Mullish and Herbert L. Cooper, Spirit of C: An Introduction to Modern Programming, Jaico Publishers, Bombay.
2. B.W. Kernighan and D.M. Ritchie. The C Programming Language 2nd Edition, (ANSI features) Prentice Hall, 1989.
3. Peter A Darnel and Philip E. Margolis, C : A Software Engineering Approach, Narosa Publishing House, 1993.
4. Robert C. Hutehison and Steven B. Just, Programming using C Language, McGraw Hill, 1988.
5. Les Hancock and Morris Krieger, The C Primer, McGraw Hill, 1988.
6. V. Rajaraman, Programming in C, Prentice Hall of India, 1994.
7. Byron S. Gottfried, Theory and Problems of Programming with C, Tata McGraw-Hill Publishing Co. Ltd., 1998.
8. C.E. Froberg, Introduction to Numerical Analysis, (Second Edition), Addison-Wesley, 1979.
9. James B. Scarborough, Numerical Mathematical Analysis, Oxford and IBHPublishing Co. Pvt. Ltd. 1966.



SHAHEED NANDKUMAR PATEL VISHWAVIDYALAYA RAIGARH (C.G.)

10. Melvin J. Maron, Numerical Analysis A Practical Approach, Macmillan publishing Co., Inc. New York, 1982.
11. M.K. Jain, S.R.K. Iyengar, R.K. Jain, Numerical Methods Problems and Solutions, New Age International (P) Ltd., 1996.
12. M.K. Jain, S.R.K. Iyengar, R.K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age International (P) Ltd., 1999.
13. R.Y. Rubistein, Simulation and the Monte Carlo Methods, John Wiley, 1981.
14. D.J. Yakowitz, Computational Probability and Simulation, Addison-Wesley, 1977.

PAPER - III - (OPTIONAL)
(IV) PRACTICAL
PROGRAMMING IN C AND NUMERICAL ANALYSIS

LIST OF PRACTICAL TO BE CONDUCTED...

1. Write a program in C to find out the largest number of three integer numbers.
2. Write a program in C to accept monthly salary from the user, find and display income tax with the help of following rules :

Monthly Salary	Income Tax
9000 or more	40% of monthly salary
7500 or more	30% of monthly salary
7499 or less	20% of monthly salary

3. Write a program in C that reads a year and determine whether it is a leap year or not.
4. Write a program in C to calculate and print the first n terms of fibonacci series using looping statement.
5. Write a program in C that reads in a number and single digit. It determines whether the first number contains the digit or not.
6. Write a program in C to computes the roots of a quadratic equation using case statement.
7. Write a program in C to find out the largest number of four numbers using function.
8. Write a program in C to find the sum of all the digits of a given number using recursion.
9. Write a program in C to calculate the factorial of a given number using recursion.
10. Write a program in C to calculate and print the multiplication of given 2D matrices.
11. Write a program in C to check that whether given string palindrome or not.
12. Write a Program in C to calculate the sum of series:

$$1 + x + \frac{1}{2!}x^2 + \frac{1}{3!}x^3 + \dots + \frac{1}{n!}x^n$$

13. Write a program in C to determine the grade of all students in the class using Structure. Where structure having following members - name, age, roll, sub1, sub2, sub3, sub4 and total.
14. Write a program in C to copy one string to another using pointer. (Without using standard library functions).
15. Write a program in C to store the data of five students permanently in a data file using file handling.



SHAHEED NANDKUMAR PATEL VISHWAVIDYALAYA RAIGARH (C.G.)

MICROBIOLOGY

BSc-3rd

Paper- I: Medical Microbiology and Immunology

UNIT-1: AIR BORNE DISEASES

Air borne diseases: Types- Tuberculosis, Pertussis, Diphtheria, Influenza, Small & Chicken pox, Mumps, Measles. Symptoms, treatment and prevention.

UNIT-2: WATER BORNE DISEASES

Concept and cause of water borne diseases; Types, Hepatitis, Dysentery, Diarrhea, Cholera, typhoid. Symptoms, treatment and prevention.

UNIT-3: CLINICAL DISEASE AND DIAGNOSIS

Clinical diseases: Diabetes, Asthma, multiple sclerosis, rheumatoid arthritis, cancer. Symptoms, Treatment and prevention.

UNIT-4: BASIC CONCEPT OF IMMUNITY

Immune system: Structure and function of the cells, tissues and organs of immune system. Types of immunity- humoral and cell-mediated, innate, acquired immunity. **Antigen- Antibody**: types, properties. Hapten, adjuvants, Immuno-globulins: Structure types, Properties and their function - Theory of antibody production.

UNIT-5: IMMUNO DISEASE DIAGNOSIS

Methods based on Ag-Ab interaction- precipitation, agglutination, ELISA, RIA, Immuno-electrophoresis, PCR based diagnosis method for infectious diseases.

Text Books Recommended:

1. Immunology: Kuby.
2. General Microbiology by Power and Daganiwala.
3. Zinssers Microbiology by K. J Wolfgang, McGraw- Hill Company.
4. Medical Microbiology; N. C. Dey and T.K. Dey, Allied agency, Calcutta.
5. Bacteriological Techniques by FJ Baker.
6. A Textbook of Microbiology; Dubey & Maheshwari; S. chand & Sons.
7. Scott's Diagnostic Microbiology by EJ Baron.



Paper- II: Environmental, industrial and Agricultural Microbiology

UNIT-1: AIR MICROBIOLOGY

Basics of Aerobiology, Microbes in atmosphere, source of microorganism in air, droplet nuclei, infectious dust, and bio-aerosol. Factors affecting microbial survival in the air. Sampling, collection and Isolation of microbes from air.

UNIT-2: WATER MICROBIOLOGY

Basic concept, water zonation, eutrophication, microbial community in natural water. Determining the quality of water-bacteriological evidence for fecal pollution, indicator of fecal pollution. Water purification methods. Disinfection of potable water supply.

UNIT-3: SOIL MICROBIOLOGY.

Soil as an environmental culture medium, microbes of soil. Brief account of microbial interactions-symbiosis, mutualism, commensalism, competition, predation, parasitism. Microbiological examination of soil. Rhizosphere- concept and role of microbes, rhizosphere and non rhizosphere micro-flora. Mycorrhiza.

UNIT-4: INDUSTRIAL MICROBIOLOGY.

Introduction and brief history and scope, important microbes in various industries. Fermentation- definition, types-Aerobic and anaerobic, Batch and SSF. Important products bread, cheese, vinegar, fermented dairy products and oriented fermented food involving microbes. Microbial cells as food. SCP -mushroom cultivation, production of alcohol and fermented beverages, beer and Wine

UNIT-5: AGRICULTURAL MICROBIOLOGY

History of Agricultural Microbiology; Microbes and their importance in maintenance of soil, Biogeochemical cycles, role of microbes in maintaining the fertility of soil. Bio fertilizers –Bacterial, azotobacter and vermiform compost. Soil microorganism -association with vascular plants- phyllosphere, Rhizobium, Rhizoplane associative nitrogen fixation. Bio-fertilizers - Cyanobacterial and Azolla

Text Books Recommended:

1. Hugo, W.B., Russell, A.D, pharmaceutical Microbiology 4th edition. Blackwell scientific publications / Oxford.
2. Russell and Ayliffe, G. A .J (1982) Principles and practice of Disinfection, preservation and sterilization Oxford:
3. Gregory P.H. Microbiology of the atmosphere.2nd edition. Leonard Hill.
4. Food Microbiology by WC Frazier and D Westhoff.
5. Agricultural Microbiology by Bhagyaraj and Rangaswamy.
6. Bioremediation by KH Baker and DS Herson



SHAHEED NANDKUMAR PATEL VISHWAVIDYALAYA RAIGARH (C.G.) PRACTICAL

M. M. 50

- Isolation of bacteria from air and soil (crop fields)
- Isolation of fungi from air and soil
- Relationship between OD and CFU measurements.
- Measurement of fungal growth by dry weight and wet weight
- Study of rhizospheric and phyllospheric microbes from economically important plants.
- Biodegradation study of some organic molecules
- Microbial assessment of potable water.
- Determination of BOD, COD and dissolved oxygen.
- Determination of blood group by slide agglutination test./TLC/DLC
- Determination of hemoglobin.
- Determination of quality of milk by MBRT
- Isolation of Rhizobium from root nodules.

Scheme of practical examination

Time	4 hour	MM- 50
1. Exercise on immunological test		10
2. Exercise on water analysis		10
3. Exercise on isolation and characterization of micro organism		05
4. Spotting (1 to 5)		10
5. Viva voce		05
6. Sessional		10
		Total- 50



RELATIVITY, QUANTUM MECHANICS, ATOMIC MOLECULAR AND NUCLEAR PHYSICS

Unit-1 Reference systems, inertial frames, Galilean invariance propagation of light, Michelson-Morley experiment, search for ether. Postulates for the special theory of relativity, Lorentz transformations, length contraction, time dilation, velocity addition, variation of mass with velocity, mass-energy equivalence, particle with zero rest mass.

Unit-2 Origin of the quantum theory : Failure of classical physics to explain the phenomena such as black-body spectrum, photoelectric effect, Compton effect, Wave-particle duality, uncertainty principle, de Broglie's hypothesis for matter waves, the concept of Phase and group velocities, experimental demonstration of matter waves. Davisson and Germer's experiment. Consequence of de Broglie's concepts, Bohr's complementary Principle, Bohr's correspondence principle, Bohr's atomic model, energies of a particle in a box, wave packets. Consequence of the uncertainty relation, gamma ray microscope, diffraction at a slit.

Unit-3 Quantum Mechanics: Schrodinger's equation, Statistical interpretation of wave function, Orthogonality and normalization of wave function, Probability current density, Postulatory basis of quantum mechanics, operators, expectation values, Ehrenfest's theorem, transition probabilities, applications to particle in a one and three dimensional boxes, harmonic oscillator in one dimension, reflection at a step potential, transmission across a potential barrier.

Unit-4 Spectra of hydrogen, deuterium and alkali atoms spectral terms, doublet fine structure, screening constants for alkali spectra for s, p, d and f states, selection rules. Discrete set of electronic energies of molecules, quantisation of vibrational and rotational energies, determination of inter-nuclear distance, pure rotational and rotation vibration spectra. Dissociation limit for the ground and other electronic states, transition rules for pure vibration and electronic vibration spectra. Raman effect, Stokes and anti-Stokes lines, complimentary character of Raman and infrared spectra, experimental arrangements for Raman spectroscopy.

Unit-5 Structure of nuclei:- Basic Properties of Nuclei: (1) Mass, (2) Radii, (3) Charge, (4) Angular Momentum, (5) Spin, (5) Magnetic Moment (μ), (6) Stability and (7) Binding Energy, Nuclear Models:- Liquid Drop Model, Mass formula, Shell Model, Types of Nuclear reactions, laws of conservation, Q-value of reactions, Interaction of Energetic particles with matter, Ionization chamber, GM Counter, Cloud Chambers, Fundamental Interactions, Classification of Elementary Particles, Particles and Antiparticles, Baryons, Hyperons, Leptons, and Mesons, Elementary Particle Quantum Numbers: Baryon Number, Lepton Number, Strangeness, Electric Charge, Hypercharge and Isospin, introductory idea of discovery of Higg's Boson.

TEXT AND REFERENCE BOOKS:

1. H.S. Mani and G.K. Metha: "Introduction to Modern Physics"" (Affiliated East-West Press, 1989).
2. A Beiser, "Prospective of Modern Physics".
3. H.E. White, Introduction to Atomic Physic".
4. Barrow, "Introduction to Molecular Physics".
5. R.P. Feynman, R.B. Leighton and M Sands, "The Feynman Lectures on Physics", Vol.III (B.I. Publications, Bombay, Delhi, Calcutta, Madras).
6. T.A. Littlefield and N Thorley, "Atomic and Nuclear Physics" (Engineering Language Book Society)
7. H.A. Enge, "Introduction to Nuclear Physics", (Addision-Wesly)
8. Eisenberg and Resnick, "Quantum Physics of Atoms, Molecules, Solids, Nuclei and Particles" (John Wiley)
9. D.P. Khandelwal, "Optics and Atomic Physics", (Himalaya Publishing House, Bombay, 1988).
10. Quarks and Leptons, F. Halzen and A.D. Martin, Wiley India, New Delhi, 1984.
11. Radiation detection and measurement, G.F. Knoll (John Wiley & Sons, 2000).
12. Theoretical Nuclear Physics, J.M. Blatt & V.F.Weisskopf (Dover Pub.Inc., 1991).



SOLID STATE PHYSICS, SOLID STATE DEVICES AND ELECTRONICS

- Unit-1** Amorphous and crystalline solids, Elements of symmetry, seven crystal system, Cubic lattices, Crystal planes, Miller indices, Laue's equation for X-ray diffraction, Bragg's Law, Bonding in solids, classification. Cohesive energy of solid, Madelung constant, evaluation of Parameters, Specific heat of solids, classical theory (Dulong-Petit's law), Einstein and Debye theories, Vibrational modes of one dimensional monoatomic lattice, Dispersion relation, Brillouin Zone.
- Unit-2** Free electron model of a metal, Solution of one dimensional Schrödinger equation in a constant potential, Density of states, Fermi Energy, Energy bands in a solid (Kronig-Penny model without mathematical details), Difference between Metals, Insulator and Semiconductors, Hall effect, Dia, Para and Ferromagnetism, Langevin's theory of dia and para-magnetism, Curie- Weiss's Law, Qualitative description of Ferromagnetism (Magnetic domains), B-H curve and Hysteresis loss.
- Unit-3** Intrinsic and extrinsic semi conductors, Concept of Fermi level, Generation and recombination of electron hole pairs in semiconductors, Mobility of electrons and holes, drift and diffusion currents, p-n junction diode, depletion width and potential barrier, junction capacitance, I-V characteristics, Tunnel diode, Zener diode, Light emitting diode, solar cell, Bipolar transistors, pnp and npn transistors, characteristics of transistors, different configurations, current amplification factor, FET and MOSFET Characteristics.
- Unit-4** Half and full wave rectifier, rectifier efficiency ripple factor, Bridge rectifier, Filters, Inductor filter, L and π section filters, Zener diode, regulated power supply using zener diode, Applications of transistors, Bipolar Transistor as amplifier, h-parameter, h-parameter equivalent circuit, Transistor as power amplifier, Transistor as oscillator, principle of an oscillator and Barkhausen's condition, requirements of an oscillator, Wein-Bridge oscillator and Hartley oscillator.
- Unit-5** Digital Circuits: Difference between Analog and Digital Circuits, Binary Numbers, Decimal to Binary and Binary to Decimal Conversion, AND, OR and NOT Gates (Realization using Diodes and Transistor), NAND and NOR Gates as Universal Gates, XOR and XNOR Gate, De Morgan's Theorems, Boolean Laws, Simplification of Logic Circuit using Boolean Algebra, Digital to Analog Converter, Analog to Digital Converter.

TEXT AND REFERENCE BOOKS:

1. Introduction to solid state physics: C. Kittel.
2. Solid State Physics: A.J. Dekkar.
3. Electronic Circuits: Mottershead.
4. Electronic Circuits: Millman and Halkias.
5. Semiconductor Devices: S.M. Sze.
6. Electronic devices: T.L. Floyd.
7. Device and Circuits: J. Millman and C. Halkias.
8. Electronic Fundamental and Applications: D. Chatopadhyay and P.C. Rakshit.
9. Electricity and Magnetism: K.K. Tiwari.
10. Fundamental of electronics: v.k. Mehta
11. Unified Physics Part III: R.P. Goyal, shiv lal Agrawal & company.

PRACTICALS

Minimum 16 (Eight from each group)

Experiments out of the following or similar experiments of equal standard

1. Determination of Planck's constant.
2. Determination of e/m by using Thomson tube.
3. Determination of e by Millikan's methods.
4. Study of spectra of hydrogen and deuterium (Rydberg constant and ratio of masses of electron proton).
5. Absorption spectrum of iodine vapour.
6. Study of alkali or alkaline earth spectra using a concave grating.
7. Study of Zeeman effect for determination of a Lande g -factor.
8. Analysis of a given band spectrum.
9. Study of Raman spectrum using laser as an excitation source.
10. Study of absorption of alpha and beta rays.
11. Study of statistics in radioactive measurement.
12. Coniometric study of crystal faces.
13. Determination of dielectric constant.
14. Hysteresis curve of transformer core.
15. Hall-probe method for measurement of magnetic field.
16. Specific resistance and energy gap of semiconductor.
17. Characteristics of transistor.
18. Characteristics of tunnel diode.
19. Study of voltage regulation system.
20. Study of regulated power supply.

21. Study of lissajous figures using CRO.
22. Study of VTVM.
23. Study of RC and TC coupled amplifiers.
24. Study of AF and RF oscillators.
25. Find roots of $f(x) = 0$ by using Newton-Raphson Method.
26. Find root of $f(x) = 0$ by using secant method.
27. Integration by Simpson rule.
28. To find the value of V at
29. String manipulations.
30. Towers of Hanoi (Non-recursive).
31. Finding first four perfect numbers.
32. Quadratic interpolation using Newton's forward-difference formula of degree two.

TEXT AND REFERENCE BOOKS:

1. B.G. Strechman, Solid state electronics devices II edition (Prentice-Hall of India New Delhi 1986)
2. W.D. Stanley, Electronics devices, circuits and applications (Prentice-Hall new jersey, USA 1988).
3. S. Lipschutz and A Poe; Schaum's outline of theory and problems of programming with Fortran (Mc Graw-Hill Book Co. Singapore, 1986).
4. C Dixon, Numerical Analysis.



SHAHEED NĀNDKUMAR PATEL VISHWAVIDYALAYA RAIGARH (C.G.)

Zoology
B.Sc. Part- III

Paper-I

**ECOLOGY, ENVIRONMENTAL BIOLOGY, TOXICOLOGY,
MICROBIOLOGY AND MEDICAL ZOOLOGY**

Unit: I (Ecology)

- Aims and scopes of ecology
- Major ecosystems of the world-Brief introduction
- Population- Characteristics and regulation of densities
- Communities and ecosystem
- Bio-geo chemical cycles
- Air & water pollution
- Ecological succession

Unit: II (Environmental Biology)

- Laws of limiting factor
- Food chain in fresh water ecosystem
- Energy flow in ecosystem- Trophic levels
- Conservation of natural resources
- Environmental impact assessment

Unit: III (Toxicology)

- Definition and classification of Toxicants
- Basic Concept of toxicology
- Principle of systematic toxicology
- Heavy metal Toxicity (Arsenic, Mercury, Lead, Cadmium)
- Animal poisons- snake venom, scorpion & Bee poisoning
- Food poisoning

Unit: IV (Microbiology)

- General and applied microbiology
- Microbiology of domestic water and sewage
- Microbiology of milk & milk products
- Industrial microbiology: fermentation process, production of penicillin, alcoholic beverages, bioleaching.

Unit:V (Medical Zoology)

- Brief introduction to pathogenic microorganisms, Rickettsia, Spirochaetes, AIDS and Typhoid
- Brief account of life history & pathogenicity of the following pathogens with reference to man: prophylaxis & treatment
- Pathogenic protozoans Entamoeba, Trypanosome & Plasmodium
- Pathogenic helminthes- Schistosoma
- Nematode pathogenic parasites of man
- Vector insects



Zoology
B.Sc. Part- III
Paper II

GENETICS, CELL PHYSIOLOGY, BIOCHEMISTRY, BIOTECHNOLOGY AND BIOTECHNIQUES

Unit: I (Genetics)

- Linkage & linkage maps, Sex Determination and Sex Linkage
- Gene interaction- Incomplete dominance & Codominance, Supplementary gene, Complementary gene, Epistasis Lethal gene, Pleiotropic gene and multiple alleles.
- Mutation: Gene and chromosomal mutation
- Human genetics: chromosomal alteration: Down, Edward, Patau, Turner and Klinefelter Syndrome Single gene disorders: Alkaptonuria, Phenylketonuria, Sickle cell anemia, albinism and colour blindness

Unit: II (Cell Physiology)

- General idea about pH & buffer
- Transport across membrane: Diffusion and Osmosis
- Active transport in mitochondria & endoplasmic reticulum
- Enzymes-classification and Action

Unit: III (Biochemistry)

- Amino acids & peptides- Basic structure & biological function
- Carbohydrates & its metabolism- Glycogenesis; Gluconeogenesis; Glycolysis; Glycogenolysis; Cori-cycle
- Lipid metabolism- Oxidation of glycerol; Oxidation of fatty acids
- Protein Catabolism- Deamination, transamination, transmethylation

Unit: IV (Biotechnology)

- Application of Biotechnology
- Recombinant DNA & Gene cloning
- Cloned genes & other tools of biotechnology (Tissue culture, Hybridoma, Transgenic Animals and Gene library)

Unit: V (Biotechniques)

1. Principles & techniques about the Following :
 - (i) pH meter
 - (ii) Colorimeter
 - (iii) Microscopy- Light microscopes: Compound, Phase contrast & Electron microscopes
 - (iv) Centrifuge
 - (v) Separation of biomolecules by Chromatography & Electrophoresis



SHAHEED NANDKUMAR PATEL VISHWAVIDYALAYA RAIGARH (C.G.)

Zoology B.Sc. Part- III

Practical

The practical work in general shall be based on syllabus prescribed in theory.

The candidates will be required to show knowledge of the following:

- Estimation of population density, percentage frequency, relative density.
- Analysis of producers and consumers in grassland.
- Detection of gram-negative and gram-positive bacteria.
- Blood group detection (A,B,AB,O)
- R. B. C. and W.B.C count
- Blood coagulation time
- Preparation of hematin crystals from blood of rat
- Observation of Drosophila, wild and mutant.
- Chromatography-Paper or gel.
- Colorimetric estimation of Protein.
- Mitosis in onion root tip.
- Biochemical detection of Carbohydrate, Protein and Lipid.
- Study of permanent slides of parasites, based on theory paper.
- Working principles of pH meter, colorimeter, centrifuge and microscope.

Scheme of marks distribution

Time: 3:30hrs

• Hematological Experiment	08
• Ecological Experiment: Grassland Ecosystem/ Population Density/Frequency/relative density	06
• Bacterial staining	05
• Biochemical experiment	06
• Practical based on Instrumentation (Chromatography/ pH meter/microscope/centrifuge.	05
• Spotting (5 spots)	10
7 Viva	05
8. Sessional	05



SHAHEED NANDKUMAR PATEL VISHWAVIDYALAYA RAIGARH (C.G.)

ZOOLOGY

PEPER - I

Ecology, Environmental-biology ; Toxicology ; Microbiology and Medical Zology.

2 Attempting one question from each unit will be compulsory. 100% chice be given.

UNIT-I (ECOLOGY)

- 1 Aims and scopes of Ecology.
- 2 Major ecosystems of the world-Brief intruduction
- 3 Population- Characteristics and regualtion of densities.
- 4 Communities and Ecosystems.
- 5 Biogeochemical cycles
- 6 Air and water pollution
- 7 Ecological succession

UNIT-II (ENVIRONMENTAL BIOLOGY)

- 1 Laws of limiting factors
- 2 Food chain in a freshwater ecosystem.
- 3 Energy flow in ecosystem-Trophic levels
- 4 Conservation of Natural resources
- 5 Environmental impact Assessment

UNIT-III (TOXICOLOGY)

- 1 Definition of Toxicity
- 2 Classification of toxicants
- 3 Principle of systematic toxicology
- 4 Toxic agents and their action- Metallic and inorganic agents
- 5 Animal poisons - Snake-venom, Scorpion and bee poisoning
- 6 Food Poisoning

UNIT-IV (MICROBIOLOGY)

- 1 General and Applied microbiology.
- 2 Microbiology of Domestic water and sewage
- 3 Microbiology of milk and milk products
- 4 Industrial microbiology

UNIT-V (MEDICAL MICROBIOLOGY)

- 1 Brief introduction to pathogenic micro-Organisms , Rickettsia, Spirochaetes and Bacteria.
- 2 Brief account of life-history and pathogenicity of the following pathogens with reference to man ; Prophylaxis and treatment -
 - (a) Pathogenic Protozoans - Entamoeba, Trypanosoma, and Giardia
 - (b) Pathogenic helminths - Schistosoma
 - (c) Nematode Pathogenic parasites of man
- 3 Vector insects



SHAHEED NANDKUMAR PATEL VISHWAVIDYALAYA RAIGARH (C.G.)

ZOOLOGY

PEPER- II

(GENETIC'S, CELL PHYSIOLOGY, BIOCHEMISTRY, BIOTECHNOLOGY AND BIOTECHNIQUES)

Note : Attempting one question from each unit will be compulsory, 100% choice be given.

UNIT-I (GENETIC'S)

1. Linkage and Linkage maps
2. Varieties of gene expression - Multiple alleles ; lithogenesis ; Pleiotropic genes; gene interaction ; epistasis.
3. Sex chromosome systems, and sex-linkage.
4. Mutation and chromosomal alterations ; meiotic consequences.
5. Human genetics - chromosomal and single gene disorders (somatic cell genetics)

UNIT-II (CELL PHYSIOLOGY)

1. General idea about pH and Buffer.
2. Transport across membrane - cell membrane; Mitochondria and Endoplasmic reticulum.
3. Active transport and its mechanism; Active transport in Mitochondria and Endoplasmic reticulum.
4. Hydrolytic enzymes - Their chemical nature, Activation and specificity.

UNIT-III (BIOCHEMISTRY)

1. Amino acids and Peptides - Basic structure and biological function.
2. Carbohydrate and its metabolism - Glycogenesis; Gluconeogenesis; glycolysis, Glycogenolysis; Cori-cycle.
3. Lipid metabolism - Oxidation of glycerol; oxidation of fatty acid.
4. Protein metabolism - Deamination, Transamination, Transmethylation; Biosynthesis of Protein;

UNIT-IV (BIOTECHNOLOGY)

1. Biotechnology - Scope and importance.
2. Recombinant DNA and Gene cloning.
3. Cloned genes and other tools of biotechnology.
4. Applications of biotechnology in (i) Pharmaceutical industry, and (ii) Food processing industry.

UNIT-V (BIOTECHNIQUE)

Principles and techniques about the following

1. pH meter
2. Colorimeter
3. Microscopy-Light microscopes, Phase contrast and Electron microscopes.
4. Centrifugation
5. Separation of biomolecules by chromatography, and Electrophoresis
6. Histochemical methods for determination of Protein, Lipids, and carbohydrate



SHAHEED NANDKUMAR PATEL VISHWAVIDYALAYA RAIGARH (C.G.)

PRACTICAL WORK

The Practical work in general shall be based on syllabus prescribed in theory.

The candidates will be required to show knowledge of the following :

1. Estimation of population density, Percentage frequency, Relative density.
2. Analysis of Producers and consumers in grassland.
3. Detection of gram-negative and gram-positive bacteria.
4. Blood group detection (A,B, AB & O).
6. R.B.C., W.B.C. count.
6. Blood coagulation time.
7. Preparation of **haemin** crystals from blood of rat.
8. Observation of Drosophila, wild and mutant.
9. Chromatography-Paper or gel.
10. Colorimetric estimation of Haemoglobin
11. Mitosis in onion root tip.
12. Biochemical detection of Carbohydrate, Protein and Lipid.
13. Study of Permanent slides of Parasites, based on theory paper.
14. Working Principles of pH meter, Colorimeter, centrifuge and microscopes.

SCHEDULE FOR PRACTICAL EXAMINATION

Duration : 4 Hrs.

Max Marks : 50

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|--|----------|
| 1. Haematological Experiment :
(R.B.Cs./W.B.Cs. Counting/Blood group detection) | 08 marks |
| 2. Ecological Experiment :
(Estimation of Population Density/Frequency/relative Density) | 06 marks |
| 3. Staining of Gram +ve and Gram -ve Bacteria/cytological
experiment : Mitosis in onion root tip | 05 marks |
| 4. Biochemical Experiment :
(biochemical detection of carbohydrate/protein lipid) | 06 marks |
| 5. Chromatography | 05 marks |
| 6. Spotting :
Study of permanent slides of Parasites : 3
Comments on working Principles of pH meter /
Colorimeter / centrifuge and Microscope : | 10 marks |
| 7. Viva Voce | 05 marks |
| 8. Sessional : | 05 marks |
